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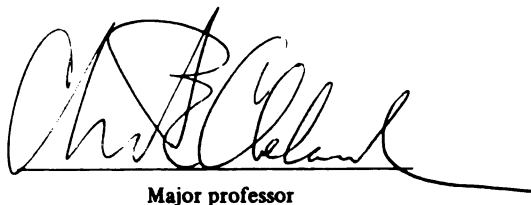
BOUNDARIES AND INTERACTION
IN THE EARLY LATE WOODLAND
OF SOUTHERN LOWER MICHIGAN

presented by

Janet Gail Brashler

has been accepted towards fulfillment
of the requirements for

Ph.D. degree in Anthropology



Major professor

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BOUNDARIES AND INTERACTION
IN THE EARLY LATE WOODLAND
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Dissertation for the Degree of Ph.D.

MICHIGAN STATE UNIVERSITY

JANET GAIL BRASHLER

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ABSTRACT

BOUNDARIES AND INTERACTION IN THE EARLY LATE WOODLAND OF SOUTHERN LOWER MICHIGAN

By

Janet Gail Brashler

Primary among the aims of anthropology are the description and comparison of observed cultural variability and the formulation of general models of human behavior. In anthropological archaeology, these aims are accomplished by defining, describing and comparing patterns of material culture, the products of now unobservable human behavior. The current study examines a collection of 1452 ceramic vessels from southern lower Michigan with the purpose of identifying and describing the nature of cultural boundaries between groups during the early Late Woodland period, A.D. 500 to A.D. 1200.

Ceramic data used in the study are from 17 early Late Woodland habitation and mortuary sites which are coded for 95 discrete attributes. A series of related hypotheses concerning the structuring of ceramic materials with respect to broad environmental characteristics are formulated and tested. Testing of hypotheses is accomplished by constructing classifications of ceramics using a series of computerized statistical techniques which derive from numerical methods of classification, namely, monothetic subdivision, polythetic agglomeration and seriation. Consequently, one contribution of the study is a

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comparison of the results generated by the above methods, and assessment of their relative value in solving similar anthropological problems.

The major contribution of the study, however, is the identification of three distinct cultural traditions during the early Late Woodland in the study area. The nature of boundary relationships between the three traditions is discussed, as are changes which occur over time within the ceramic assemblage of each tradition. In addition, a testable general model of the early Late Woodland in southern Lower Michigan is proposed, and areas where further research is needed are identified.

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CHAPTER I

INTRODUCTION AND PROBLEM

Introduction

The identification, description and comparison of diverse human groups are major themes in anthropological research. Within socio-cultural anthropology these themes have been addressed by constructing models of society abstracted from observed behavior. Direct observation of differences between cultures, their boundaries, and the interaction within and across boundaries is not possible for anthropologists studying prehistoric societies. Instead, such behavior must be inferred by the archaeologist from the relationships inherent in material cultural remains. Nonetheless, principles from the study of contemporary ethnic groups and their boundaries can be used to formulate testable models. The archeological data with which the models will be constructed in this study are from the Early Late Woodland (A.D. 500 - A.D. 1200) period in southern lower Michigan.

In anthropological literature, an ethnic group has been defined as a group which is:

1. largely biologically self-perpetuating
2. shares fundamental cultural values, realized in overt unity in cultural forms
3. makes up a field of communication and interaction
4. has a membership which identifies itself, and is identified by others, as constituting a category distinguishable from other categories of the same order (Barth, 1969: 11-12).

An ethnic group as defined above, expresses its cultural distinctiveness in two ways. First, members of an ethnic group

share a basic value orientation of normative ideas of what is appropriate behavior. The second expression of cultural distinctiveness is in overt signals manifest in the way people dress, speak, or general life style (Barth, 1969:24). It is the latter series of expressions of group membership which are of particular interest to prehistorians. Some remains of overt signals are likely to be preserved, though not always, in the archeological record. From these signals, behavior of groups with respect to identification of themselves as a distinct cultural unit may be inferred. In addition, it is possible to infer that cultural interaction with the group is more frequent than interaction with non-group members.

Overt signals of ethnic distinctiveness are the "index fossils" archaeologists use to isolate and define specific cultural horizons and traditions. An horizon "in some cases...might represent the culture of a single people or ethnic group" (Caldwell, 1958:3) at some moment in time. Caldwell (1958:3) further states that a tradition may be defined archeologically as an "areally based continuity (with) space-time limits (which) mark the effective contrast with neighboring traditions" (parenthesis mine).

A tradition can be conceived of as a self-perpetuating ethnic group which identifies itself as distinct and which through time transmits its distinctive value orientation as well as signals of ethnic affiliation to succeeding generations. Study of the spatial and temporal distributions of overt signals or messages left in the prehistoric record therefore should produce insightful results concerning the nature of interaction within and between the culture or cultures involved.

For this study, ceramics will be used to identify and describe change within ethnic groups during the early Late Woodland in southern lower Michigan. In addition, data from the ethnographic record, environmental information and other relevant archeological studies will be used to develop models characterizing the identified ethnic groups and the nature of boundaries between them.

Archeologists have long recognized and used ceramic styles as signals or messages indicative of social organization and ethnic group boundaries (Wobst, 1977:328). Some efforts in this area have attempted to deal with shifting post-marital residence patterns over-time (Deetz, 1965; Whallon, 1968). Others have attempted to measure social distance and interaction between groups using ceramic attributes within a regional context (Lovis, 1973; Houart, 1973). Other studies have attempted to correlate social interaction measured in terms of ceramic and other artifact classes with broad environmental features (Brown, 1965). The current study takes a regional approach and attempts to correlate environmental features with ceramic data.

Archaeological research in the southern half of lower Michigan during the last twenty years has resulted in the excavation of over forty ceramic bearing Late Woodland sites. Published site reports suggested that ceramics, as well as other artifacts show "similarity to" or "influence from" artifacts found in other parts of Michigan or the Great Lakes area. Ware names for ceramics defined at one site were often extended to other sites, implying that the occupants of both sites belonged to the same cultural tradition. Never have site reports proposed anthropological explanations to account for the similarity observed in ceramics. Anthropological explanations go beyond simple

formal comparisons and attempt to explain why similarities exist between cultural phenomena according to some general rule or rules of human behavior. The absence of explanations is in part a result of inadequate ceramic typologies which lack systematic rigor and objectivity.

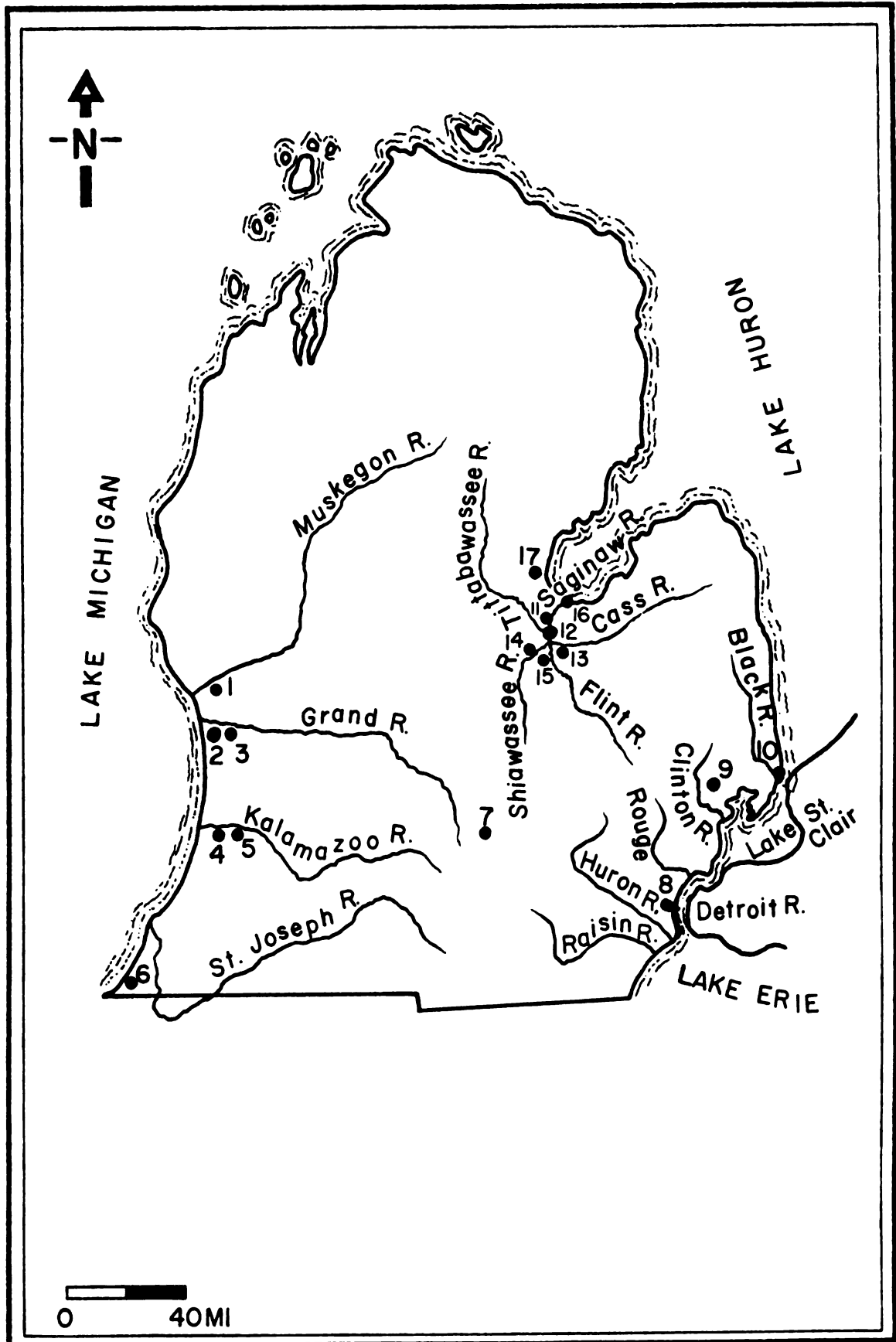
Within the last five years, enough early Late Woodland ceramic data has accumulated in southern lower Michigan so that an objective, systematic and regional analysis of ceramic types could be attempted with the goal of formulating anthropological explanations of why ceramics are similar or different. The present study examines ceramic data from 17 habitation and mortuary sites (Figure 1). Using the ceramic data, a series of spatial propositions are tested which help identify the location and boundaries of southern lower Michigan Late Woodland traditions or ethnic groups. Once a tradition or traditions have been identified, ceramics and sites within each tradition are chronologically ordered to determine continuity and change. In addition, ceramic typologies for each tradition are defined. Finally, the results of the ceramic analysis, ecological data, subsistence patterns and ethnographic evidence is brought together to examine differences between traditions, the character of their boundaries and the nature of interaction within and across boundaries.

Background to the Problem

Prior to the 1960's, analyses of southern Michigan ceramic material were for the most part, casual and unsystematic (Dustin, 1929; Greenman, 1937, 1939; et. al.). Such discussions in the absence of radiocarbon dating often failed to differentiate ceramics belonging to different cultural horizons. More recently, studies of Late Woodland

Figure 1.--Late Woodland Sites and Rivers in Southern Lower Michigan

- | | |
|-----------------------|------------------|
| 1. Spring Creek | 10. Draper Park |
| 2. Spoonville | 11. Valley Sweet |
| 3. Zemaitis | 12. Schultz |
| 4. Fennville | 13. Hodges |
| 5. Forty-Sixth Street | 14. Mahoney |
| 6. Moccasin Bluff | 15. Fosters |
| 7. Root | 16. Fletcher |
| 8. Fort Wayne Mound | 17. Butterfield |
| 9. Riviere Au Vase | |



ceramics in southern Michigan have attempted systematic intra-site classifications (Fitting, 1965; Flanders, 1965; Rogers, 1972; Brashler, 1973). The within site focus of the later analyses however, resulted in speculation whenever external relationships and geographic distribution of ceramic types were considered. Accuracy of such speculation depended on the subjective judgemental skills of the investigator.

In the type definition of Wayne Ware (Fitting, 1965: 159) geographic distribution and relationships were determined in the above subjective fashion. Wayne Ware is a series of ceramic types first identified at the Fort Wayne Mound, the Gibraltar and Riviere au Vase sites in southeastern Michigan (Figure 1). Subsequently, analysis of ceramics from the Spring Creek Site extended the Wayne Ware type concept to material from western Michigan (Fitting, 1968). Arguing for internal formal continuity within the ceramics of southern Michigan in the early Late Woodland period, Fitting (1968; 23-24; 1970: 174) explicitly extended the geographic limits of Wayne Ware beyond the original type sites and implied that ceramics made in those areas were part of the same cultural tradition in the absence of rigorous objective comparison. Similar undemonstrated extensions of the Wayne Ware concept have been applied to ceramic material in the Saginaw River drainage (Wobst, 1968; Bigony, 1970), Northern Ohio (Mackenzie, Blank, Murphy and Shane, 1973) and northern lower Michigan (Fitting, 1974). In the course defining a different ware category and a different tradition, Flanders (1965; 354-355) noted strong similarities in the lower Grand River valley area of western Michigan, between what was then thought to be late Middle Woodland Wayne Ware and Crockery Ware at the Spoonville site. Wayne Ware, however, has since been placed within

the Late Woodland period on the basis of radiocarbon evidence (Fitting, 1966; 1970) which suggests that Crockery Ware may also be Late Woodland in origin.

In southwestern lower Michigan, Rogers (1972) identified Allegan Ware, a series of ceramic types which she identified as qualitatively different than what she believed to be companion Wayne Ware types. Roger's conclusions were supported by selected chi-square tests of specific attributes which she asserts vary between Wayne and Allegan Ware. Using a statistically generated typology, Brashler (1973: 6) proposed and demonstrated that the presence of ceramics, having the same necessary defining criteria, was Wayne Ware, Allegan Ware, and Spring Creek Collared (a western Michigan Wayne variant defined by Fitting, [1968]) at the Fletcher site in the Saginaw Valley. The conclusion of the Fletcher site analysis (Brashler, 1973: 136-137) noted that "until large number of ceramics from both eastern and western Michigan are simultaneously analyzed" relationships between ceramics in southern lower Michigan will continue to be unclear.

Previous research thus indicates two general interpretations of Late Woodland ceramics and cultural traditions in southern lower Michigan. The first, held by Fitting (1968, 1970), Bigony (1970) Wobst (1968) and others, seems to suggest that most ceramic types from southern lower Michigan should be included in a single ceramic ware on the basis of observed, not demonstrated formal similarities. This view implies that the makers of pottery at sites all over the southern half of lower Michigan participated in the same cultural tradition. The second interpretation suggested by Rogers (1972), and in part suggested by Flanders (1965), proposes that two, perhaps several,

ceramic wares are to be found in southern lower Michigan during the Late Woodland. This view implies that two or more cultural traditions or ethnic groups existed side by side. If this view is correct, then the boundaries between these groups should be identifiable not only in terms of difference in ceramics as overt signals of the boundaries, but also in terms of ecological attributes and other observable cultural variables.

The current study accepts as demonstrated neither of the above interpretations. Only objective, systematic, concurrent analyses of ceramics from the whole of southern lower Michigan will allow the identification of spatial units and temporal change within them.

Nature of the Ceramic Sample

The sites which were selected for study had to have large, accessible ceramic collections. Consequently, a search was conducted for collections from previously excavated sites with an arbitrary minimum of 10 Wayne related ceramic vessels. Ten was selected as an arbitrary minimum. because of the probability that sampling error would be introduced. if many sites with small, perhaps non-representative, samples were included in the study. Ultimately, the sample size from the 17 selected sites varied between a low of five and a maximum of 279. Several sites, which had relatively low sample sizes, were nonetheless included in an attempt to ensure a representative sample. However, even though sites with small numbers of ceramic vessels were included in the study sample, the geographic distribution of sites is uneven. That is, early Late Woodland sites with ceramic collections large enough for this study, tend to be concentrated in four areas of southern lower Michigan. Between the four areas are no known sites which have been

excavated and produced ceramic collections, with the exception of the Root site. Therefore, all possible known sites were included in this study.

Ceramics from the 17 Wayne related sites examined in this study rarely came as whole vessels. The raw data, therefore consisted of rim fragments which were sorted by the investigator into minimal vessels for each site. Each rim from a site was compared to each other rim. Rims which matched along fractures, or which were identical in paste, temper, thickness, preparation and decoration were counted as minimal vessels.

Some discrepancies exist between the minimal vessel counts given in published site reports and the number of minimal vessels used here. There are two major reasons for discrepancies. First, occasionally ceramic material from a site was misplaced or lost in the years between its original analysis and the time at which it was coded for this study. Second, many minimal vessels were identified which were not appropriate for this study. Vessels which weren't appropriate or suitable lacked essential attributes, due to missing interiors, exteriors or lips; or the vessel may have been represented by a small rim sherd which lacked essential attributes. Sherds less than two centimeters in diameter were usually not included in the study sample because key attributes of rim eversion and exterior decoration which may have occurred on the shoulder of the vessel would not have been visible.

CHAPTER II

CHARACTERISTICS OF THE RESEARCH AREA

The following chapter examines significant natural and cultural factors in the research area. The purpose of the survey is to determine what variation in cultural adaptation and environment exists which may, in part, account for the presence of observed differences in the early Late Woodland ceramic assemblages.

Limits of the Research Area

The limits of the research area are determined by both physiographic and cultural criteria. On the west the research area is bounded by Lake Michigan while on the east, Lakes Huron and St. Clair, the Detroit and St. Clair rivers form a boundary. Of these two boundaries, Lake Michigan clearly is a more effective though certainly not impassable geographic barrier to culture contact. The eastern boundary, however, does not pose a substantial barrier to human movement as both the Detroit and St. Clair rivers are relatively narrow streams.

Defining northern and southern boundaries of the research area is somewhat more difficult because there are no major geographic features like those on the east and west. Northern and southern boundaries are not indicated by physical barriers, but are apparently social boundaries signalled by observed differences in the presence and density of Late Woodland ceramic types. Wayne and related ceramic wares become infrequent and occasional in Late Woodland sites north of

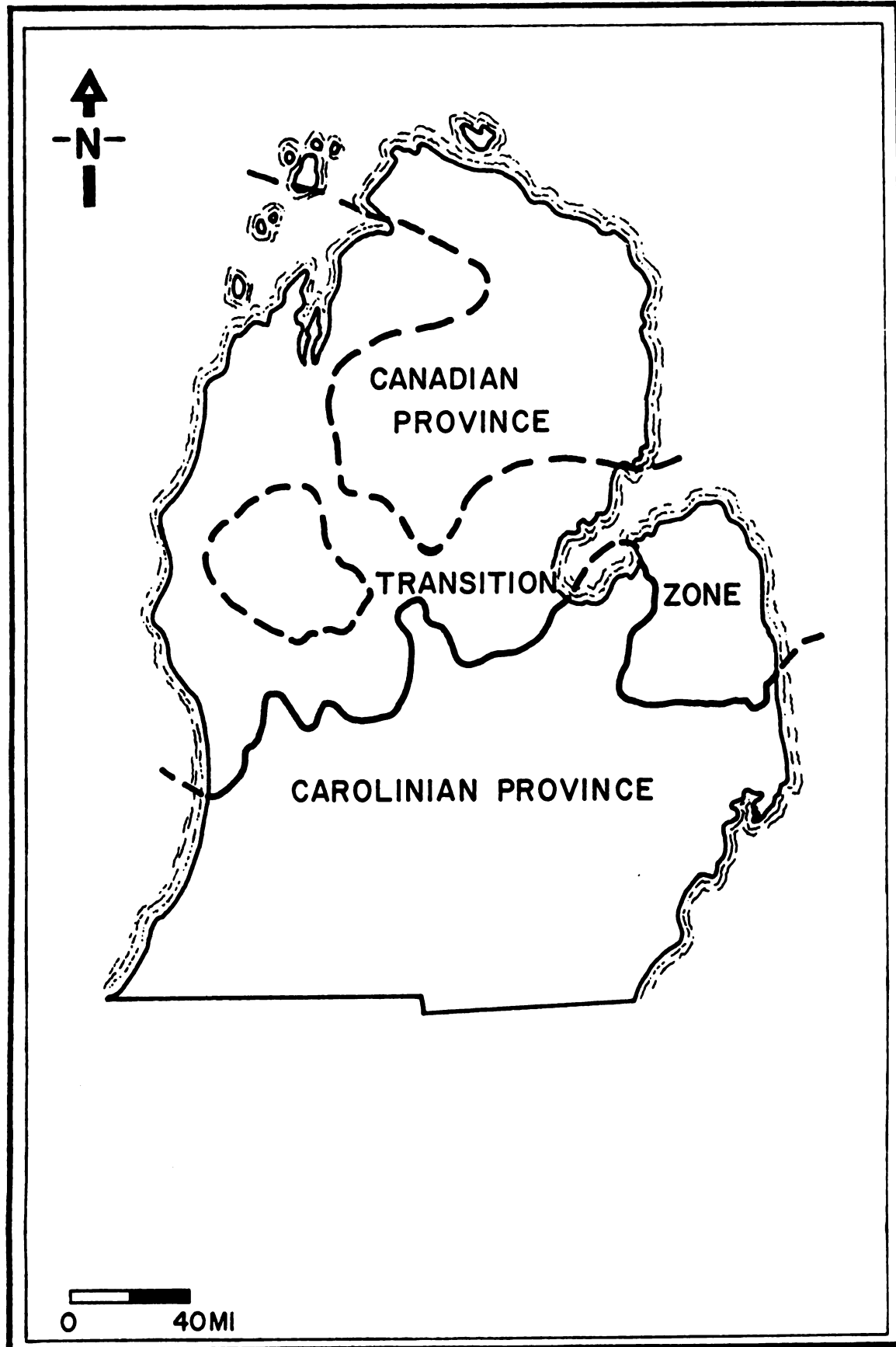
the Muskegon and Saginaw river drainage systems as Mackinac, Bois Blanc, Juntunen and other typically northern ceramic types become common.

The northern limit of the research area roughly corresponds to the boundary between the Carolinian biotic province and Canadian-Carolinian transition zone (Figure 2). This important ecological boundary is significant with respect to differences in presettlement forest type, fauna and land use pattern by both prehistoric and early historic Indian groups (Cleland, 1966).

The southern boundary of the research area is the most arbitrary of the four. Ceramic collections from northwestern Ohio (Stothers, personal communication) and northern Indiana (Bellis, personal communication) show that Wayne or very similar wares occur infrequently in otherwise non-Wayne cultural contexts. The southeastern portion of the research area was most likely bounded by the Black Swamp. At the least the pattern of human movement during early historic times was strongly affected when the "deep swamps and troublesome marshes" impeded early historic travel between northwest Ohio and southeast Michigan (Forsyth, 1966: 213). The Black Swamp almost certainly existed continuously in that area from the time of early Lake Erie at 11,500 B.C. until the swamp was drained and tilled by early settlers.

Within the area described above there are no significant physiographic barriers such as mountain ranges which might, on a simplistic level, signal the presence of cultural boundaries. Therefore ethnic or cultural boundaries which may have existed within the research area prehistorically cannot be directly or simply attributed to natural phenomena. Ethnic boundaries may have territorial limits but these are

Figure 2. -- Major Biotic Provinces in Michigan



not always signalled by dramatic changes in the physical environment, nor are ethnic boundaries based entirely on the notion of territorial ownership (Barth, 1969:15). Ethnic boundaries are in fact social boundaries which identify people as either members or non-members of a particular social group. The human groups ethnic boundaries enclose, however, share and transmit a culture which exists in response to constraints placed on it by its natural as well as social environment, i.e., neighboring groups. Therefore, even minor variations in the natural environment of the research area need to be examined because they may in part account for any cultural differences which may be defined.

Accordingly, to describe the environmental and adaptive variation that may exist, and to establish a workable design by which ceramics from sites can be compared, the research area will be divided according to river drainage basins and described in terms of potentially significant environmental and cultural parameters.

River drainage basins were selected as the primary means of partitioning the research area for several reasons. First, sites are without exception located on or within one-quarter mile of major rivers or their tributaries. Second, five different ceramic traditions have been defined in previous research which appear to be aligned along the major river systems. Moccasin Bluff Ware (Bettarel and Smith, 1973) has been proposed for the St. Joseph River; Allegan Ware (Rogers, 1972) has been proposed for the Kalamazoo; Crockery Ware (Flanders, 1965) has been identified in the Grand River drainage; Saginaw Thin has been proposed by Fisher (1972) for the Saginaw River drainage; and Wayne Ware (Fitting, 1965) has been defined for the Southeast part of Michigan

drained by numerous small rivers. Third, the river drainages of southern Michigan almost certainly were major transportation and communication routes in prehistoric times as they were for the early historic period (Hudgins, 1961: 2). Fourth, ethnographic data on northern Algonquin hunter-gatherer territories indicates a strong orientation on the part of bands or local groups to specific river basins (Rogers, 1969:44-46). Finally, river drainage systems are a convenient means of dividing a cumbersome body of data into more easily managed units.

The four areas to be considered within the research area are the St. Joseph and Kalamazoo drainages in the southwest; the Grand and Muskegon in the northwest; the Saginaw in the northeast; and the numerous small rivers draining the Erie-St. Clair plain in the southeast (Figure 3). Sites are not evenly dispersed throughout each drainage. Therefore, those areas of a drainage where sites are found will be emphasized in the discussion which follows. The natural and cultural factors of these areas which serve to differentiate each area will be stressed. Potentially important environmental factors to be considered include topography (Figure 4); soils (Figure 5); vegetation (Figure 6); growing season (Figure 7); mean annual, January and July mean temperature (Figures 8-10); and mean annual precipitation and snowfall (Figures 11-12). Of particular interest are the number of frost free days which determine whether corn (120 frost free days) or other crops can be successfully grown in an average year. Other criteria such as vegetation and soils also might influence the success of an agricultural as opposed to hunting and collecting adaptation. A discussion of each site in the area follows, giving location, history of excavation, occupational

Figure 3. -- River Drainages in the Research Area

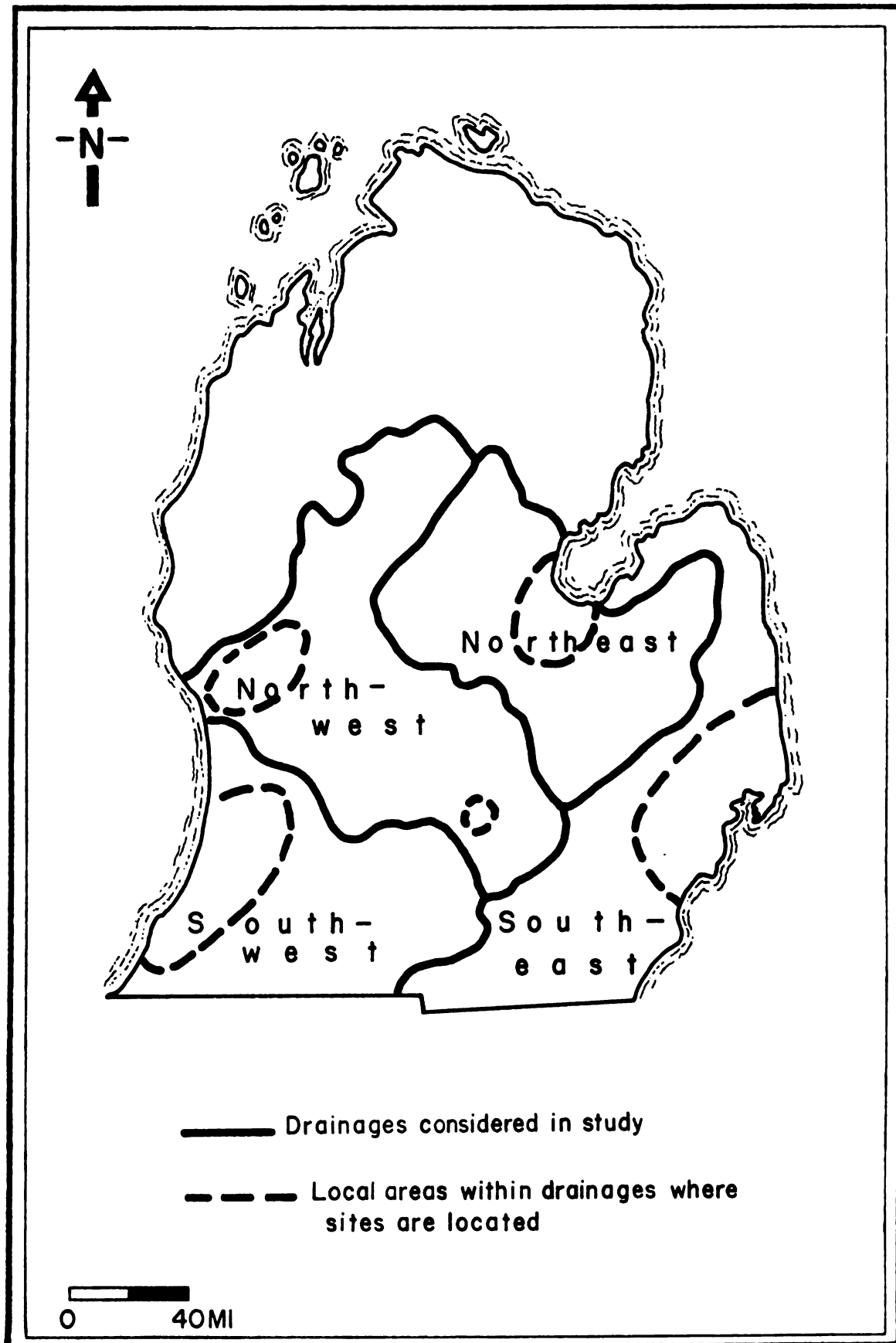


Figure 4. -- Topography of Southern Lower Michigan

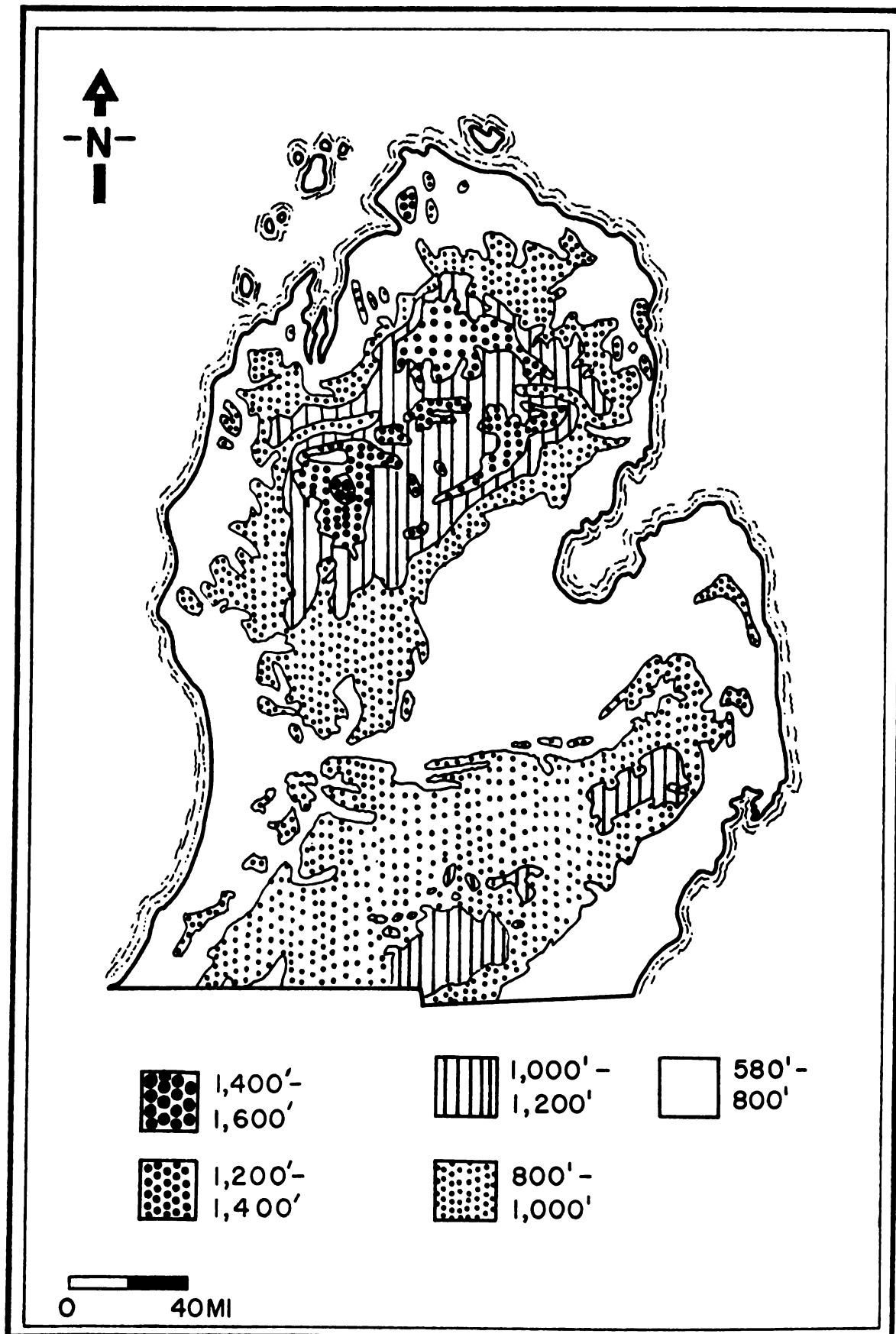


Figure 5. -- Soils of Southern Lower Michigan

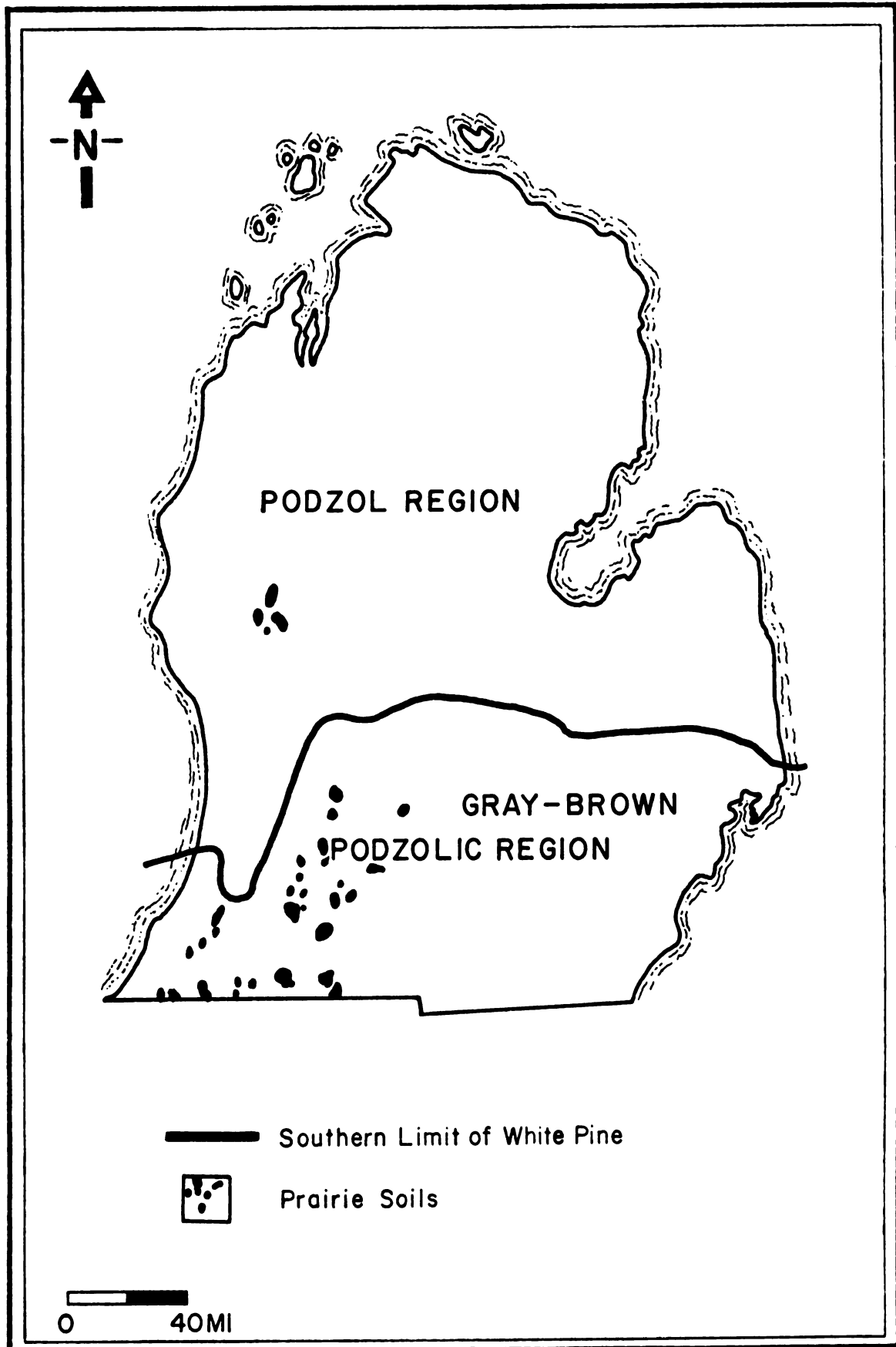
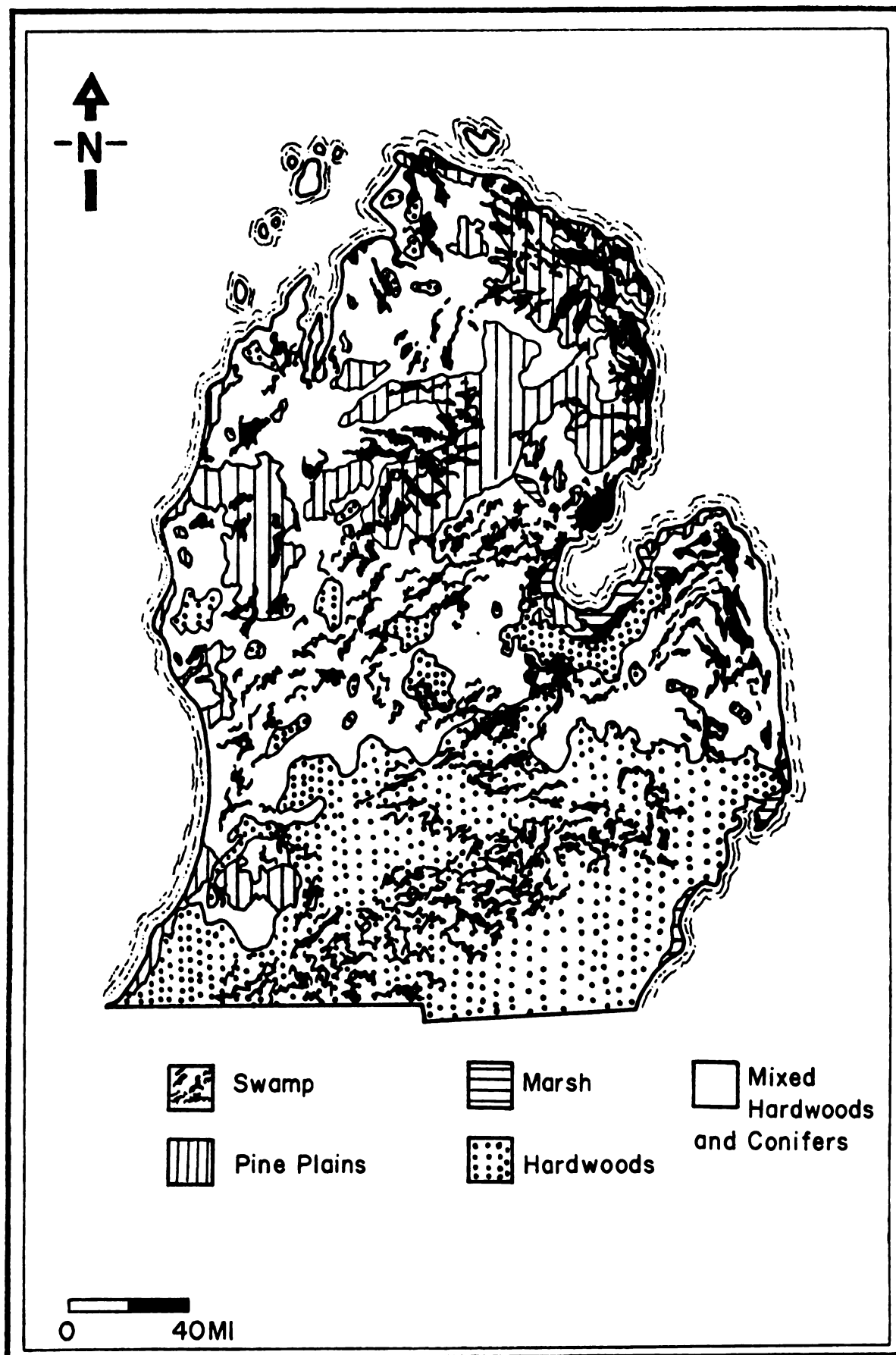


Figure 6. -- Vegetation of Southern Lower Michigan



history, ceramic sample size, and adaptation.

Southwest Area

Two major drainage systems dominate southwest Michigan (Figure 3). The Kalamazoo drainage, sixth largest in the state, is 150 miles long and drains 2000 square miles. Lying to the south of the Kalamazoo is the St. Joseph river. At 200 miles in length, the St. Joseph is the third largest drainage system in the state, draining 2800 square miles in Michigan and an additional 1400 square miles in Indiana (Hudgins, 1961: 28). The St. Joseph and Kalamazoo rivers and their tributaries course through an area of relatively low relief, between 580 and 1000 feet above sea level (Figure 4). All sites in the area however lie below 800 feet above sea level. Sites used in this study which are located in the western third of the southwest area, lie in the Michigan Lowland. The area is bounded by sand dunes at Lake Michigan's edge, but is typified by flat or gently rolling terrain eastward from the lake (Hudgins, 1961: 17).

The soils of the entire area are, with the exception of northern Allegan county, gray-brown podzolics (Figure 5). These soils are well drained and have clay enriched sub-soil horizons. The podzols, which lie to the north have concentrated amounts of humus and iron oxide in the sub-soils which have been leached from surface soils. The southern limits of white pine in Michigan roughly correspond to the limit between the gray-brown podzolics in the south and the podzol region to the north (Whiteside, Schneider and Cook, 1960: 8-9).

Presettlement vegetation in the southwest area was predominantly oak-hickory hardwood forest with the exception of Allegan county and northern Van Buren county which were dominated by mixed hardwood and

Figure 7. -- Growing Season of Southern Lower Michigan
(Average Number of Frost Free Days)

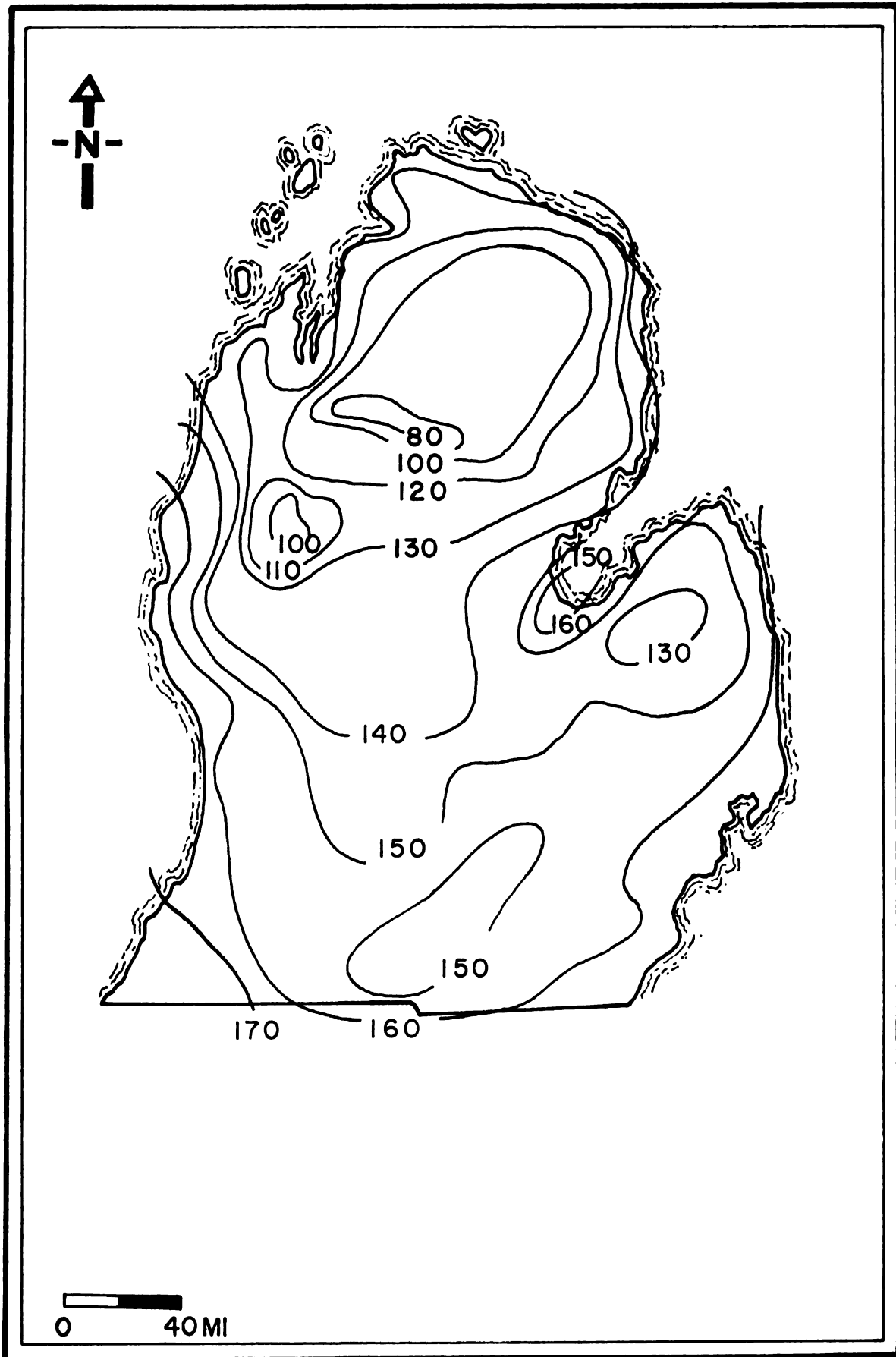


Figure 8.--Mean Annual Temperature in
Southern Lower Michigan

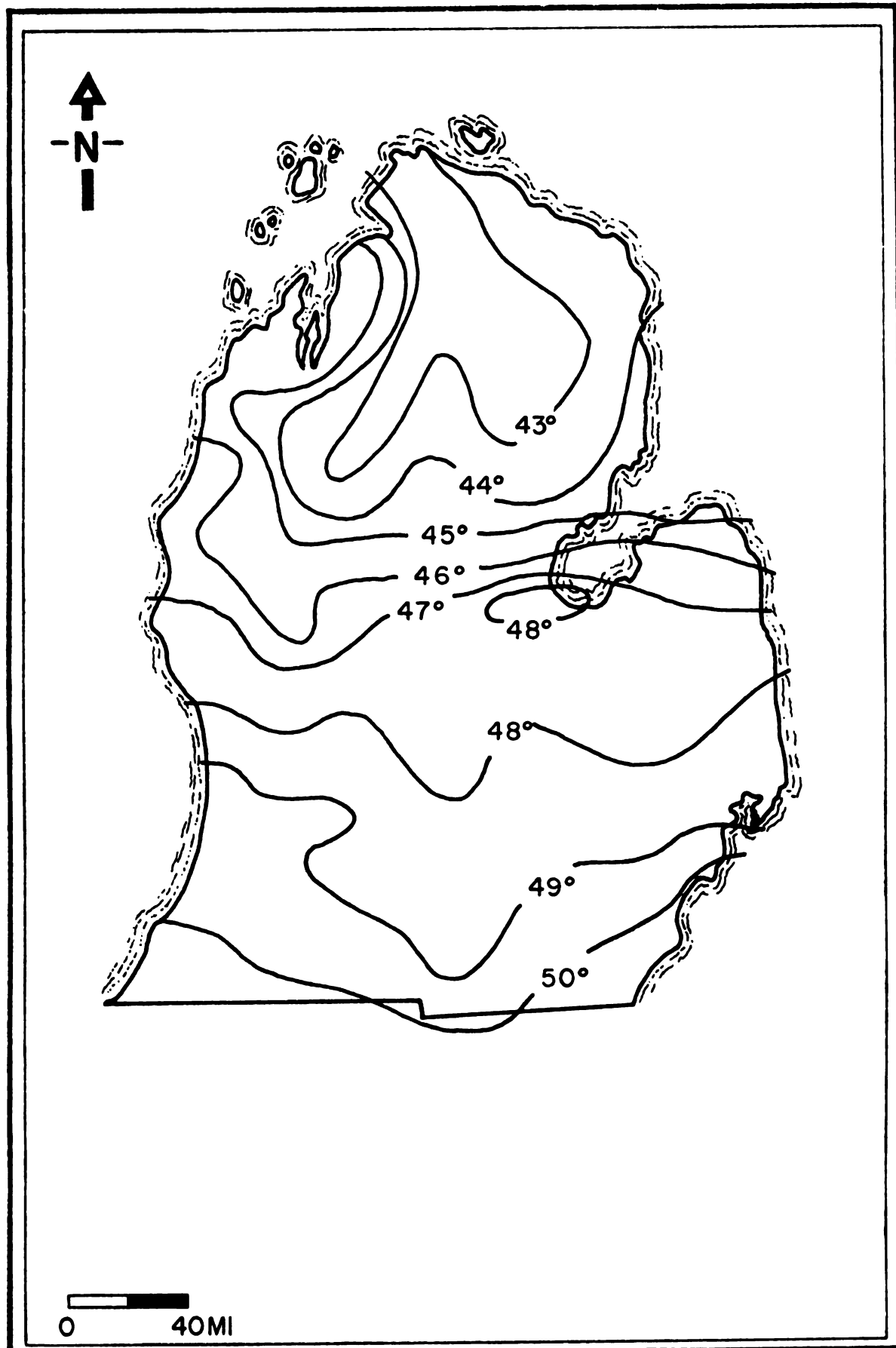


Figure 9. -- Average January Temperature in
Southern Lower Michigan

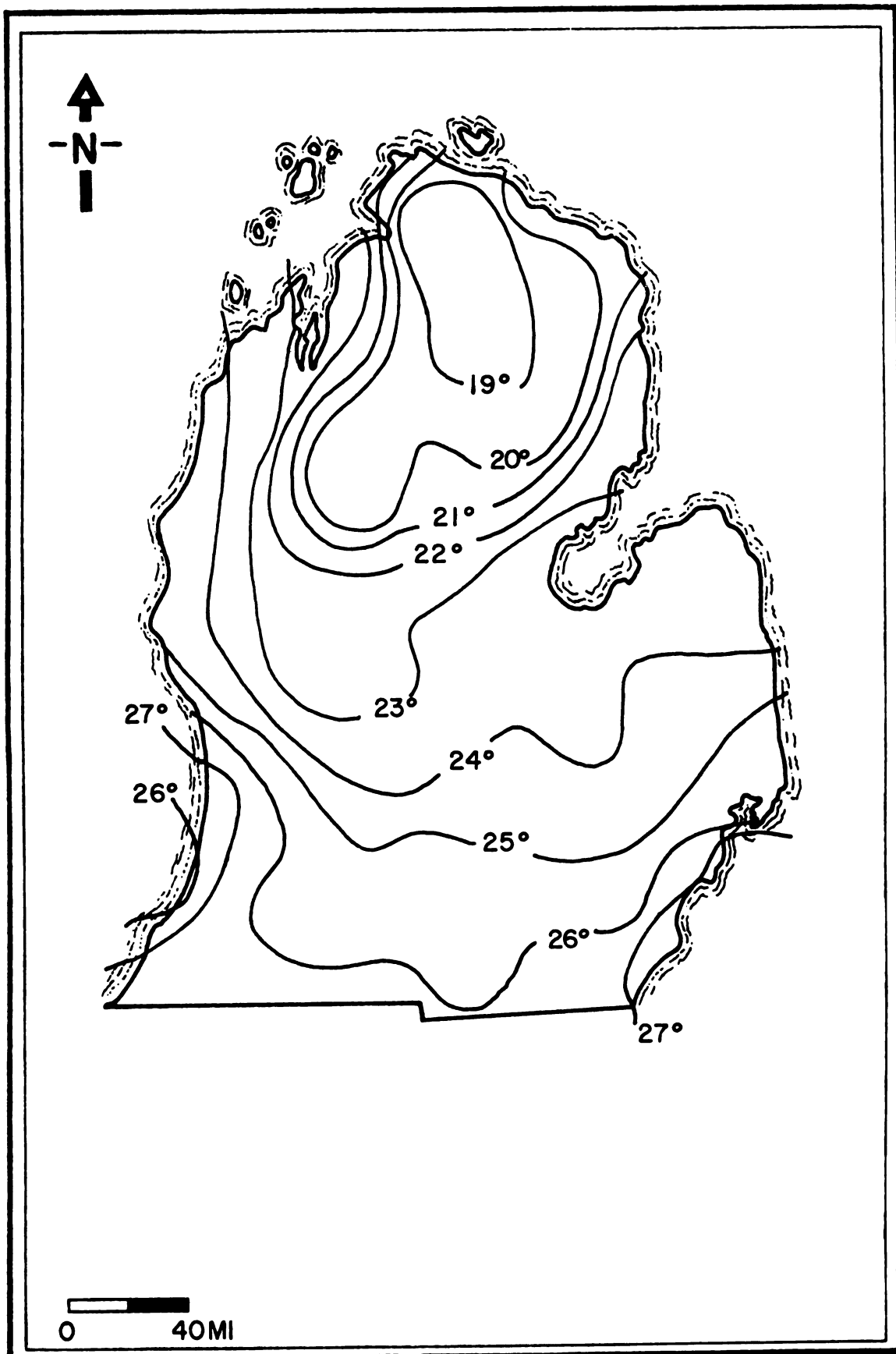


Figure 10. -- Average July Temperature in
Southern Lower Michigan

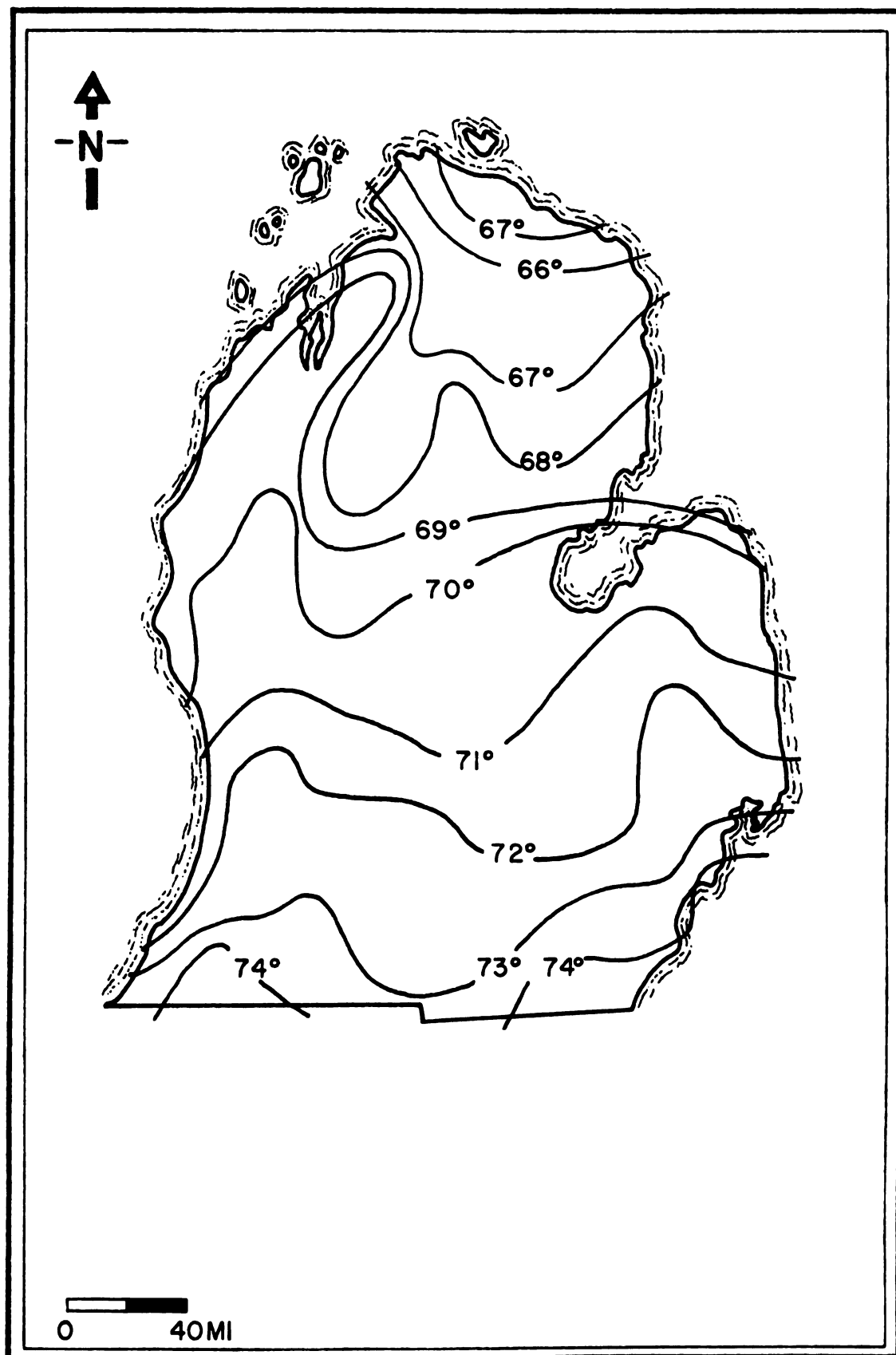


Figure 11. -- Mean Annual Precipitation in
Southern Lower Michigan

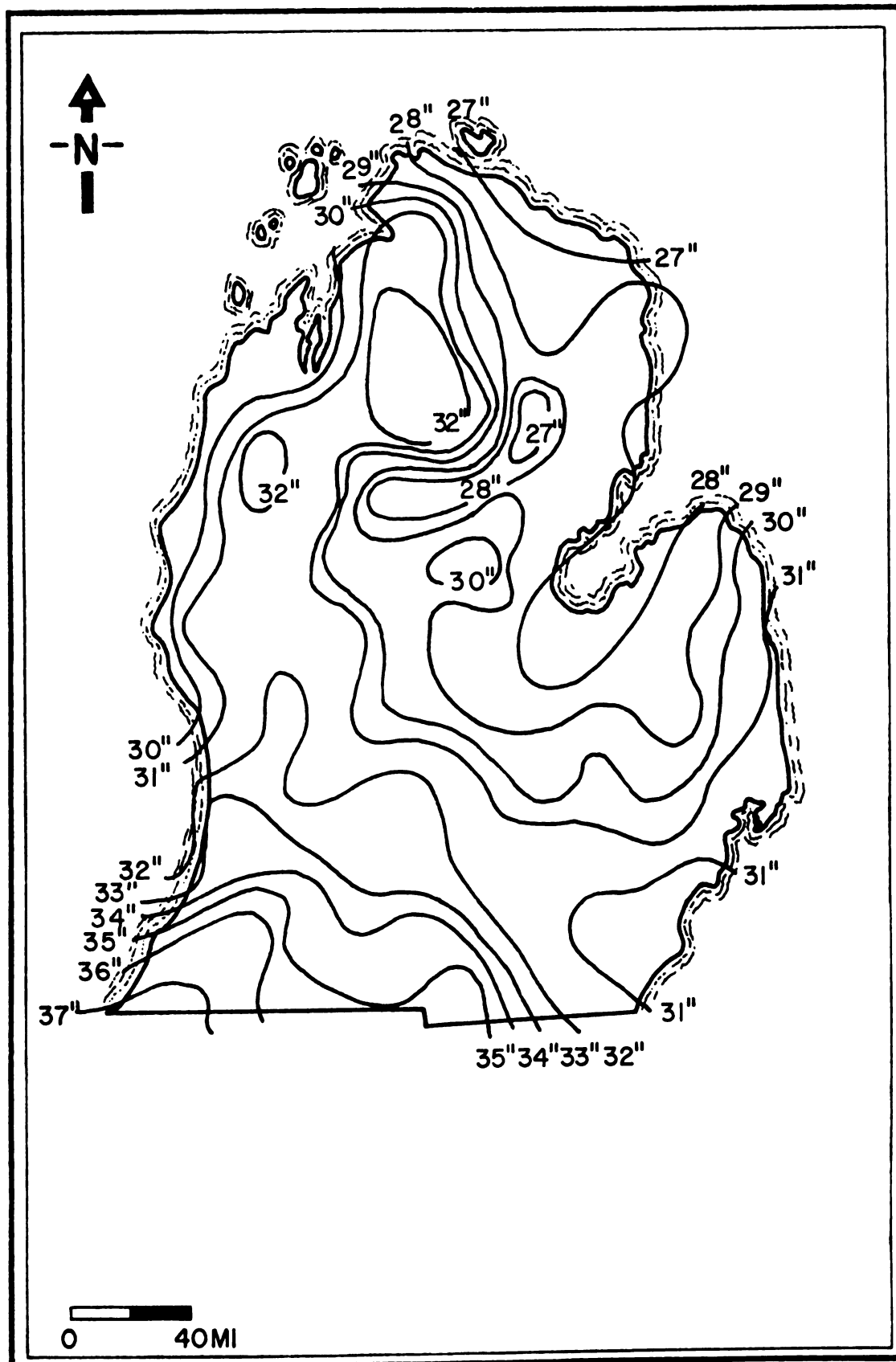
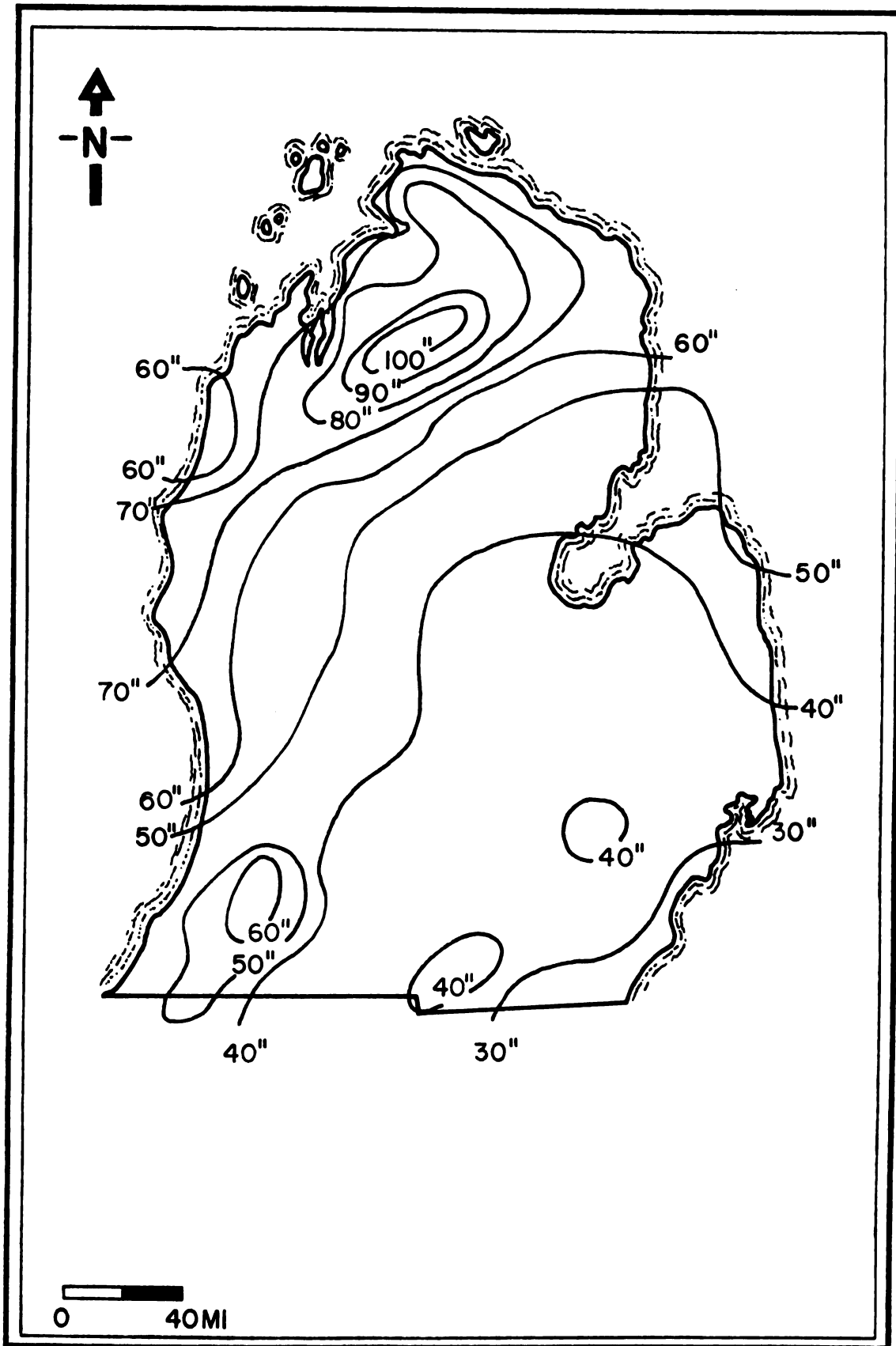


Figure 12. -- Mean Annual Snowfall in
Southern Lower Michigan



conifer forests and pine plains (Hudgins, 1961: 60). In addition, approximately 32 dry prairie areas (Figure 6) between 80 acres and 25 square miles in size have been located in the southwest. The dry prairies differed both in soil type and vegetation complex from the surrounding area. (Veatch, 1927: 269). The soils had generally darker, organically richer, surface horizons. Vegetation in dry prairies consisted of grasses, an occasional burr oak, and hazel brush on the perimeter. Dry prairie areas were among the first areas farmed by Michigan's earliest settlers because the soil was often richer and required less preparation than surrounding wooded areas.

At least 160 frost free days occur in an average year in the southwest area (Figure 7). The southwest also receives the highest amount of precipitation and snowfall, on the average, of any area in the research area (Figures 11 and 12). Average January temperatures are 25 degrees Fahrenheit and above, while average July temperatures vary between 71 and 74 degrees Fahrenheit (Figures 9 and 10). Relatively cooler summers and warmer winters are found along Lake Michigan due to the lakes ameliorating effect.

While there is no one environmental characteristic which distinguished the southwest area from other areas considered in this study the following factors taken together do set the area apart. The podzolic soils of the area differentiate it from the Northwest and northeast which have podzol soils. The dominance of hardwood forests also sets the area off from the northwest and northeast areas which have mixed hardwood conifer forests. The presence of dry prairies differentiates the southwest from both the northeast and southeast where dry prairies are not found. Growing season in the area of sites

from the southwest area is more favorable than in either the northeast or northwest but comparable to that in the southeast area. Both January and July temperature averages are slightly warmer than in either of the northern areas. During January, temperatures are slightly warmer in the southwest than they are in the southeast. The southwest, on the average, receives more rain than any of the other areas and more snow than the southeast and northeast. Taken together, all environmental factors described here suggest that the southwest may have been more suitable for agriculture than other areas.

Ethnohistoric evidence tends to support the suggestion that the southwest was especially well suited for agriculture. During the early historic period the area appears to have been primarily occupied by Miami and Potowatomi groups whose subsistence-settlement pattern included relatively larger summer agricultural villages and temporary winter hunting camps (Kinietz, 1940: 171, 313). Both Miami and Potowatomi were reported in a variety of locations according to early French records (Berthrong, 1974). Potowatomie in an early (1615-1616) reference were placed west of Lake Huron (Berthrong, 1974: 6). By 1642-43 however, reports indicate that the Potowatomi had dispersed to Wisconsin and Sault Ste. Marie because of raids on them by the Iroquois. They returned to southwest Michigan, specifically the St. Joseph River between 1680 and 1700, (Berthrong, 1974: 6-17). The Miami also left southwest Michigan in the mid-17th century with the onset of Iroquois attacks but appear to have returned to the area by 1681 (Berthrong, 1974: 25).

A final factor which sets the southwest apart from the other areas in the research area is the pattern of historic settlement. The

southwest was settled in part by people from the eastern U.S. following the Chicago Road (Fuller, 1916: 496). However, a larger percentage of the earliest settlers in southwest Michigan migrated from Indiana and Ohio and settled in the dry prairies which were similar to the area from which they had come (Fuller, 1916: 249). The first population movement into the southwest occurred between 1829-33. This movement followed settlement of the southeast portion of the research area, and preceded extensive settlement in both the northeast and northwest portions of the area (Fuller, 1916: 500).

Three sites lie within the southwest area. These are Moccasin Bluff, in the St. Joseph drainage; and Fennville and the Forty-sixth Street sites in the Kalamazoo drainage (Figure 1).

Moccasin Bluff. The Moccasin Bluff site, (20 BE 6) is a multi-component Archaic and Woodland site situated on a west terrace of the St. Joseph River in Berrien County (Figure 1). The University of Michigan excavated Moccasin Bluff in 1948, and those collections are supplemented by the Joseph Birdsell collection. Middle and Late Archaic; Early, Middle and Late Woodland; and Upper Mississippian components have been identified at the site. The site lacks stratification, and has radiocarbon dates which pertain to the later Late Woodland and Upper Mississippian components only.

Two ceramic wares, Moccasin Bluff Ware and Berrien Ware, have been identified for the Late Woodland occupation at the site. Within Moccasin Bluff Ware are two major groups of ceramics. The first group of 136 minimal vessels pre-date A.D. 1000. Bettarel and Smith (1973: 112) describe these as formally similar to Wayne Ware from southeastern Michigan. Moccasin Bluff ware vessels which post-date A.D. 1000 are

not similar to Wayne Ware, but are more closely associated to Upper Mississippian materials from northern Illinois and Indiana. Berrien ware ceramics are also related to upper Mississippian ceramics in Illinois (Bettarel and Smith, 1973: 114-115). Of the three groups of Late Woodland ceramics only the 136 Moccasin Bluff ware vessels which pre-date A.D. 1000 are used in this study. Radiocarbon dates from the later occupations at the site are A.D. 1060 $\pm$ 110 (M-1937), A.D. 1090 $\pm$ 110 (M-1938), A.D. 1150 $\pm$ 110 (M-1940), A.D. 1210 $\pm$ 110 (M-1939), and A.D. 1590 $\pm$ 100 (M-1936). Bettarel and Smith (1973: 114) suggest that by A.D. 1100 occupants of Moccasin Bluff were "heavily influenced" by groups from the south in Indiana and Illinois. Such influence is not evident in other contemporaneous ceramic assemblages in the southwest area. The Moccasin Bluff site has been suggested as a site which might have been a Miami or Pottowatomi summer village (Quimby, 1952; Fitting and Cleland, 1969:297).

Forty-sixth Street Site. The Forty-sixth Street site (20 AE 58) was excavated by Western Michigan University and members of the Kalamazoo Chapter of the Michigan Archaeological Society. The site is located on the south bank of the Kalamazoo River approximately twenty miles before its juncture with Lake Michigan in Allegan County. Forty-one minimal vessels from the Forty-sixth Street site were classified as Allegan Ware by Rogers (1972) which she believed to be similar to Wayne Ware in southeast Michigan. Thirty-eight vessels were complete enough to use in this study. Two adjusted radiocarbon dates from the site, A.D. 1180 $\pm$ 100 (M-2233) and A.D. 1230 $\pm$ 100 (M-2232), support the Late Woodland classification of the site. Forty-sixth Street was a fall-winter hunting camp which is in part supported by the lack of evidence

for agriculture. Remains of white-tailed deer killed in the fall or winter further support the possibility of a fall-winter occupation of the site (Rogers, 1972:73).

The Fennville Site. The Fennville site, (20 AE 54) excavated by Western Michigan University and members of the Kalamazoo Chapter of the Michigan Archaeological Society is located in Allegan county, within one-quarter mile of the Kalamazoo River. A total of 170 minimal vessels were recovered from the site, 115 of which are complete enough to use in this study. The majority of ceramic material is clearly Late Woodland Allegan Ware and Spring Creek Collared, comparable to ceramics from the Forty-sixth Street Site (Rogers, 1972). Approximately 25 decorated body sherds and four rims, however, possess attribute configurations (paste, temper and decorative motif) typical of Middle Woodland ceramic material in southwest Michigan. The possibility that the Fennville site was occupied during the earlier Late Woodland and that all ceramics pertain to a single occupation is suggested by Rogers (1972: 90). The presence of two groups of vessels with different paste and temper, however, argues for at least two occupations, one of which may be Middle Woodland and the other, Late Woodland. The possibility of a later Late Woodland occupation is supported by the strong similarity observed between ceramics from the Forty-sixth Street site, dated to the late 12th or early 13th century A.D., and most of the Fennville site ceramics (Rogers, 1972). Unfortunately, no radiocarbon dates are available from Fennville, nor are there floral or faunal data from which adaptation may be inferred.

Northwest Area

The Grand and Muskegon Rivers and their tributaries are the major drainage networks in the northwest portion of the study area (Figure 3). Several smaller rivers and creeks also drain a minor portion of the area to the north and south of the Grand River (Senninger, 1964: 4). The Grand River drains an area in excess of 5500 square miles making it the second largest drainage system in Michigan. As the longest river in the state, the Grand meanders over 300 miles from its headwaters in southern Jackson county to its juncture with Lake Michigan. Lying to the north of the Grand is the Muskegon drainage basin which includes over 2500 square miles, the river itself being approximately 190 miles in length (Hudgins, 1961: 28). Combined, the Grand and Muskegon drain over 8000 square miles. Three of the four sites in the area, however, are located within twenty miles of each other where the Muskegon and Grand Rivers flow close to each other before they empty into Lake Michigan.

The Muskegon and Grand Rivers both originate in portions of Michigan where elevation is in excess of 1000 feet above sea level (Figure 4). More than 75 percent of the two drainages lies below 1000 feet above sea level. The western third of the area lies within the Michigan Lowland where dunes ridge the beach of Lake Michigan and most terrain is flat. Three of the four sites in the area are located within the Lowland while the fourth site is located at a higher elevation near the headwaters of the Grand River. Soils in the area of the three northernmost sites are in the northern podzols class, but are sandy. The Root site, in the interior, is located to the south in the gray-brown podzolic region (Figure 5). Vegetation for sites in the northern

portion of the area is mixed hardwood conifers and pine plains while the southern site is located within the southern hardwoods (Figure 6). Large dry prairies are located within twenty miles of all four sites in the area (Veatch, 1927: 271).

The average annual growing season for sites in the northwest area is between 150 and 160 frost free days (Figure 7). Average January temperatures in the areas where sites are located vary between 25 and 27 degrees Fahrenheit while July averages are between 70 and 72 degrees (Figures 9 and 10). Temperatures tend to be milder in both winter and summer along the Lake Michigan shore because of the ameliorating affect of the Lake. Rainfall averages vary between 30 and 32 inches and average snowfalls of 50-70 inches per year are found in the portions of the drainages where sites are located (Figures 11-12).

As in the case of the southwest area, no single environmental factor distinguishes the northwest area. If, however, the three northern sites in the area are considered separately, the variability described above is much reduced. The southern Root site is, in terms of soil, vegetation growing season rainfall and temperatures more like sites from either the southwest or southeast areas and, in terms of spatial distance, is closer to sites in the northeast area. Several factors taken together do differentiate the northern portion of the area from the other areas. Of primary significance are the soil and vegetation. Soils are northern podzols which differentiate the area from the southeast and southwest. The vegetation is mixed hardwood-conifer forest and pine plains with interspersed large, dry prairies which differentiates the area from all others in the study. Growing season is on the average less than the other areas in the study but not

sufficiently low in the area of the sites to deter agriculture.

Ethnohistoric accounts describe the Muskegon and Grand Rivers as being used predominantly by Ottawa groups in addition to some occasional Chippewa and Potawatomi (Wheeler-Voegelin, 1974: 23-27; 50-57). The Ottawa practiced some agriculture though they were not as dependent on it as Potawatomi groups to the south, and lived in semi-sedentary villages from which hunting parties periodically left during all seasons (Kinietz, 1965: 236-38). Historic accounts indicate that the Ottawa seldom lived or traveled south of the Grand River, except to travel to Detroit after the fort was established in 1701 (Wheeler-Voegelin, 1974: 26). The Ottawa adaptation was primarily suited to the Carolinian-Canadian transition zone and many 18th and early 19th century accounts, place them in Saginaw where they lived with Chippewa people, and along the western shore of Lake Huron. No historic documentation is available concerning use of the area prior to the 18th century because of the frequent movement of groups in Michigan during the Iroquois wars. During that century and the first half of the 19th century evidence suggests that only the Lake Michigan coastal area may have been occupied during the summer by Ottawas while the interior remained vacant. (Wheeler-Voegelin, 1974: 51; 62).

The Ottawa were unfriendly with Potowatomis during the Iroquois wars and at the same time were related to Hurons through economic ties. Like other Michigan tribes the Ottawa fled Michigan to Wisconsin for a period of time during the mid-17th century (Hunt, 1940: 109-110).

The distinctive pattern of historic settlement in the Grand and Muskegon drainages proceeded from both the south and southeast and occurred slightly later than settlement of the southwest area. Between

1833 and 1837, however, population expanded rapidly in the northwest area (Fuller, 1916: 424). The quantity of both pine and hardwood forests for timber and the rich prairie soils were important factors drawing large numbers of settlers to the area (Fuller, 1916: 411; 415).

Four sites in this study lie within the northwest sub-area. The Spring Creek site lies near the mouth of the Muskegon River, while the Spoonville and Zemaitis sites are located near the mouth of the Grand River. The Root site is located less than forty miles from the headwaters of the Grand River (Figure 1).

Spring Creek. The Spring Creek site (20 MU 3) is located in Muskegon County on a south terrace of the Muskegon River approximately 10 miles from the river's juncture with Lake Michigan. Excavated in 1955-56 by George W. Davis and Edward Gillis of Grand Rapids and members of the Wright L. Coffinberry chapter of the Michigan Archaeological Society; and subsequently by Grand Valley State Colleges, the site has produced over 1000 minimal ceramic vessels. The present study uses only a total of 165 vessels from the Grand Valley State Colleges excavation. Fitting (1968) classifies the ceramics from Spring Creek as Wayne Ware and Spring Creek Collared. A radiocarbon date from the site of A.D. 960 $\pm$ 75 (M-512) dates what appears to be an intensive but perhaps short lived occupation of the site (Fitting, 1968: 10). The faunal assemblage from Spring Creek indicates that certain animals, predominantly large mammals, were selectively hunted. Cleland (1966) has suggested that such selective hunting patterns reflect a focal agricultural adaptation with meat as a diet supplement. No direct evidence for agricultural activities is present at the site.

Spoonville. The Spoonville site (20 OT 1) lies on a west terrace

of the Grand River overlooking the juncture of Crockery Creek with the river. A habitation area and one of three Middle Woodland mounds were tested by crews from the University of Michigan in 1961 and Grand Valley State Colleges subsequently. A total of 165 minimal vessels from the Grand Valley excavations are used in this study. While no stratigraphy was clearly visible in the site which was disturbed by modern agricultural activity, Early Woodland and Hopewellian Middle Woodland ceramics appear to be mixed with ceramics formally similar to Wayne Ware from southeast Michigan (Flanders, 1965: 352). Crockery Ware, as defined by Flanders (1965) seems to represent several different types, most of which are more similar to Late Woodland than Middle Woodland ceramics in southwest Michigan.

Radiocarbon dates of A.D. 110 ± 120 (M-1428) and A.D. 215 ± 110 (M-1427) clearly date the Middle Woodland material from the site. A single date of A.D. 1180 ± 100 (M-1648) may be an accurate date for the Late Woodland occupation at the site. Similar ceramics from the Forty-sixth Street site have been dated to the late 12th and early 13th centuries A.D. (two samples), which tends to support the somewhat later date for a portion of the Spoonville material. Faunal remains from the Spoonville site suggest a focal agricultural adaptation for at least one occupation of the site (Cleland, 1966: 66; Martin, 1975; 6-7).

Zemaitis. The Zemaitis Site is situated on the south bank of the Grand River approximately fifteen miles from the river's juncture with Lake Michigan (Figure 1). Excavations at Zemaitis are currently being conducted by Grand Valley State Colleges. Based on the presence of ceramics with Middle Woodland decorative motifs and ceramic material stylistically similar to ceramics from the Spring Creek and other sites

in southwestern Michigan, there appear to be two occupations at the site. Of the total ceramic collection, 269 minimal vessels are used in this study. Radiocarbon dates and information pertaining to human adaptation are not yet available.

Root. Located on the bank of the Grand River in western Ingham county, the Root site was excavated by Michigan State University from 1957 to 1961 and again in 1974 and 1975. A total of twenty minimal vessels from the 1974-1975 excavations were available for study. Ceramics from the Root site share similarities to Wayne, Allegan and Spring Creek ceramics. Faunal remains from the site suggest a fall and/or spring occupation of the site. In addition, Chartkoff (1974: 6-7) suggests that agriculture was not practiced at the site. The location of the site with respect to environmental factors described above indicates that it may be more appropriately considered within the northeast area. The Root site is also closer in miles to the northeast area than other areas in the study and subsequent analyses include Root in the northeast area.

Northeast Area

The northeast area is drained by the Saginaw River and its major tributaries. The Cass, Flint and Shiawasse drain the southern half of the area and the Tittabawassee drains from the northern half of the area (Figure 3). The Saginaw drainage is only 125 miles in length but drains over 6000 square miles, making it the largest drainage system in Michigan (Hudgins, 1961: 28). Much of the drainage lies within the Saginaw Lowland, where elevation above sea level is between 580 and 800 feet. Only on its southeast and northwest perimeter does the northeast sub-area vary between 800 and 1000 feet above sea level (Figure 4).

All sites are located below 800 feet above sea level.

Northern podzol soils are characteristic of all but the southern 20 percent of the area, but no sites lie in the gray-brown podzolic area (Figure 5). Many soils in the Saginaw drainage are poorly drained loams which have been made excellent for agriculture in historic times by tile drains. In prehistoric times the area was swampy and large portions would have been unsuitable for agriculture (Whiteside, Schneider and Cook, 1960: 37-39). Presettlement vegetation patterns reflect the low elevation and poorly drained soils. In higher areas to the north and east, mixed hardwood-conifer forests predominate. In low areas swamp vegetation of cedar, balsam and tamarack are found. Hardwood forests are found in the central and southern portions of the area and there are large areas of marsh and wet prairie along Saginaw Bay and the Saginaw River (Figure 6).

The average annual growing season in the northeast sub-area varies between 140 and 160 frost free days in the area sites are found (Figure 7). The areas of less than 140 frost free days are in the northwest and northeast parts of the area. Between 150 and 160 frost free days occur in a small area at the juncture of the Saginaw River with Saginaw Bay. Average January temperatures vary between 23 and 24 degrees Fahrenheit in the areas sites are located. July temperatures average between 70 and 71 degrees Fahrenheit (Figures 9 and 10). Average precipitation ranges between 28 and 29 inches while snowfall averages 30 and 40 inches where sites are located (Figures 11 and 12).

The northeast area is especially distinctive with respect to the diverse vegetation patterns present. The area lies at the edge of the Carolinian-Canadian transition zone which results in an increase in

both plant and animal species in the northern portion of the area. The area is also characterized by numerous marshes and wet prairies where water fowl abound. Finally, the extensive river network in the area provides excellent fishing. The growing season is relatively short compared to the two southern areas, but adequate for corn agriculture. Mean January and July temperatures and annual precipitation are the lowest of the four areas but only slightly lower than those in the northwest.

In addition to its ecological diversity, the northeast area was used by equally diverse Indian groups including the Sauk, Fox, Chippewa, Ottawa, Huron and occasionally Potawatomi. The Sauk and Fox, primarily known in Wisconsin and further west during the early historic period were alleged to have been driven from the Saginaw River by the Iroquois wars (Hunt, 1940: 112). The Chippewa were first reported in the Saginaw River Valley in 1723 having moved south and west from the eastern shore of Lake Huron into both the Upper and Lower Peninsulas of Michigan prior to 1640 (Kinietz, 1940: 317-318). Ottawa were also reported in the Saginaw drainage during the 18th century but by this time both Ottawa and Chippewa were traveling great distances over the Midwest as far south as the Ohio River to hunt (Stout, 1974: 14).

Huron groups, which were routed from their early location in eastern Ontario and Quebec (Kinietz, 1940: 1) by Iroquois, moved west to Georgian Bay and ultimately as far north and west as Northern Lake Michigan and Lake Superior during the mid-17th century (Hunt, 1940: 87-104). By 1703, Huron were hunting beaver in the Saginaw Valley on a regular basis (Kinietz, 1940: 23). Fitting (1969: 4) notes that the Saginaw Valley was relatively open in the 17th century to most Great

Lakes tribes, but that by the 18th and 19th centuries the Chippewa had asserted control over the area which they held until their lands were ceded to the U.S. in the 1819 Treaty of Saginaw. Land use by the diverse groups who temporarily exploited the Saginaw Valley included hunting, fishing, and collecting. Permanent village farmers supplemented agriculture with all of the above subsistence strategies (Cleland, 1966:78).

Significant early historic settlement of the Saginaw Valley occurred later than in any other portion of the research area. Michigan to some extent, and the Saginaw Valley in particular, were reported as "unhealthful" by early pioneers to the area (Fuller, 1916: 368). The unhealthy conditions greatly retarded the movement of significant numbers to the area until 1835, and as late as 1860 the Saginaw Valley was characterized as having agriculturally poor land, unreliable climate and heavy early frosts (Fuller, 1916: 373).

Six sites used in this study lie within 30 miles of each other in the Saginaw drainage; Fletcher, Schultz, Hodges, Fosters, Mahoney and Valley Sweets. The Butterfield site which is located on the Pinconning River twenty miles north of the Saginaw drainage is also included in the study area.

The Schultz Site. Located at Green Point, within the limits of the modern city of Saginaw, the Schultz site (20 SA 1) overlooks the juncture of the Tittabawassee and Shiawasee Rivers which form the Saginaw River. The site was excavated between 1962 to 1964 by field crews from the University of Michigan. Early, Middle and Late Woodland occupations have been identified at the site (Fitting, 1972). The Late Woodland occupation is the least dense in terms of ceramics and other cultural remains of the three, yielding 86 minimal vessels. Of these,

only 52 are complete enough to be used in this study. No radiocarbon dates have been recorded for the Late Woodland occupation. The faunal assemblage associated with the Late Woodland occupation provides seasonal and subsistence evidence for small spring and/or fall fishing camps and winter hunting camps within the large area of the site. There is no direct evidence supporting agricultural activity in association with Wayne Ware ceramics. Cleland (1966: 78-79) suggests that the slight increase of large herbivore remains, primarily deer, coupled with the decrease of fish remains in Late Woodland levels as compared to Middle Woodland levels, indicates a shift toward a reliance on crop plants. Schultz is the only site in the Saginaw drainage having evidence of a trend toward an agricultural adaptation.

The Fletcher Site. The Fletcher site (20 BY 28) lies on the northwest bank of the Saginaw River in Bay City, Michigan. In 1967, 1968 and 1970 excavations by field crews from Michigan State University produced 542 minimal vessels dating to a Late Woodland occupation of the site and 19 Early and Middle Woodland vessels. Only 279 of these were complete enough for use in this study and were formally similar to southeastern Wayne Ware (Brashler, 1973). A Younge Tradition (Fitting, 1965) component was also identified at the site. In addition to the prehistoric material from the site, over one hundred historic burials dating between 1740 and 1780 were recovered (Mainfort, 1977). Fletcher lacks clear stratification and radiocarbon dates. Preliminary faunal analysis of material indicates a mixed hunting-fishing adaptation for at least one prehistoric occupation (King, personal communication).

Butterfield. The Butterfield site (20 BY 29) is located on a small knoll overlooking the Pinconning River in Bay County. Butterfield

is the northernmost site in the research area. Tested in 1964 and 1965 by field crews from the University of Michigan, the site exhibits evidence of a non-ceramic, terminal Archaic-Early Woodland occupation and a Late Woodland occupation. Of 24 minimal ceramic vessels, 12 appear to be similar to Wayne Ware (Wobst, 1968) and are used in this study. The remaining vessels are formally similar to Mackinac Ware, and Late Woodland ceramic series from northwestern lower Michigan. Mackinac Ware and Wayne Ware occur in the same well defined Late Woodland stratum at the site (Wobst, 1968). Both wares appear to be locally made, not imported. Wobst (1968: 265) suggests that the mixture of ceramic wares at the Butterfield site reflects "hybridization" between northern and southern ceramic types, and lack of a clear cultural boundary between the areas. While no radiocarbon dates have been reported for the Butterfield site, Mackinac Ware has been securely dated to between A.D. 800 and A.D. 1000 in northwestern lower Michigan. No subsistence information is available from the site.

Mahoney. The Mahoney site (20 SA 193) lies between Bear Creek and the Shiawassee River in Saginaw County. The site, excavated in 1965 by a field crew from the University of Michigan, produced 26 ceramic vessels attributable to one or more Late Woodland occupations. Only 11 of the rims were complete enough to be included in this study and others were not identified as Wayne Ware (Bigony, 1970). A Middle Woodland occupation was indicated by Tittabawassee ceramics, and an Archaic occupation has been hypothesized based on the presence of a series of quartzite flakes and tools. The lack of stratigraphy at Mahoney however, does not support the certain presence of a late Archaic occupation. The quartzite flakes may therefore be part of the Woodland

occupation at the site. (Bigony, 1970). Floral (hickory and other nuts) and faunal (deer killed in the fall) remains from the site indicate a fall or winter hunting occupation.

Hodges. Situated in the southeast corner of Saginaw County, the Hodges site (20 SA 130) lies north of the Flint river, immediately before it joins the Shiawassee. The site was excavated in 1960 and 1961 by field crews from the University of Michigan. A Late Archaic burial has been reported on (Binford, 1963). The scant Late Woodland occupation at the site yielded 25 ceramic vessels (Fitting and Sassé, 1969:61) of which only 9 are complete enough for use in this study. While subsistence information is not available, Fitting and Sassé (1969: 74) suggest that the site may have been seasonally occupied as a fishing camp on the basis of flint biface ratios and ceramic density.

Fosters. The Fosters site (20 SA 74) is located on the northeast bank of the Flint River approximately ten miles before its juncture with the Shiawassee River in Saginaw County. Excavation was carried out by the University of Michigan in 1967. Sixteen rims representing 12 minimal vessels were recovered. A single vessel was shell tempered, typical of Upper Mississippian ceramics from southwest Michigan. Ten rims were classified as Wayne Ware and related to other ceramics from the Saginaw Valley (Bigony, 1970). Seven of these are used in this study, the remaining three being too small. Two vessels with scalloped lip profiles support the presence of a post A.D. 1000 occupation for the site, though the majority of the ceramics would appear to pre-date A.D. 1000. Sparse faunal evidence suggests that Fosters was occupied as a fall-winter hunting camp (Bigony, 1970: 209).

Valley Sweets. The Valley Sweets site (20 SA 24) was situated on

the bank of the Saginaw River within the city limits of Saginaw. The site was excavated in 1964 by members of the Saginaw Valley Chapter of the Michigan Archaeological Society (Brose, 1966). A total of 18 rims representing 14 minimal vessels were recovered in the excavations. Three vessels clearly were most similar to Younger Tradition ceramic materials (Brose, 1966). The remaining 11 vessels were most similar to Wayne Ware but only 5 were large enough to be included in this study. A late 18th century historic component was also present at the site.

Southeast Area

The southeast area lacks a single dominant river drainage network and is characterized by numerous small rivers and creeks which drain the southeastern portion of Michigan. The largest rivers draining this area from north to south are the Black, Belle, Clinton, Huron, and Raisin (Figure 3). The rivers drain the Erie-St. Clair Plain, a relic lake plain where elevation above sea level is less than 800 feet (Hudgins, 1961:21). On the western margin of the southeast area is the Thumb Upland where elevation rises to 1200 feet above sea level (Figure 4), and the topography is level to gently rolling. Sites in the southeast area are all located on the eastern margin of the Erie-St. Clair Plain. Soils of the Erie-St. Clair Plain are gray-brown podzolics and are poorly drained loams, silty and clay loams and sand (Figure 5). In the Thumb Upland, soils are limy and silty clay loams and clays derived from glacial till (Whiteside, Schneider and Cook, 1960: 44-51).

Hardwood forests in the southeast area are interspersed with marsh and wet prairies which also occur along Lakes Erie and St. Clair and the Detroit and St. Clair rivers (Figure 6). The northern end of the area in Michigan's Thumb is characterized by mixed hardwood conifer

forests and relatively large cedar-balsam-tamarack swamps. The average annual growing season is greater than 160 frost free days in areas where sites are located (Figure 7). Average July temperatures in the area range between 71 and 74 degrees Fahrenheit, while January averages vary between 25 and 27 degrees Fahrenheit along the last margin. Proximity to Lakes Erie, St. Clair and Huron accounts for somewhat milder winter and cooler summers along the coast (Figures 9 and 10). Most of the southeast area, including the areas where sites are located, receives an average of 30 to 31 inches of rain per year (Figures 11 and 12). The lightest average snowfalls in the state occur in this area ranging between 30 and 40 inches per year.

As mentioned above, the southeast area is set off from all other portions of the research area by its lack of a single dominant river drainage system. In terms of soils and vegetation, the southeast is most similar to the ecologically diverse northeast area with expanses of wet prairie, swamp, marsh, hardwood and mixed-hardwood conifer forests. The lack of dry prairies over the entire area and even oak openings along the eastern shore distinguish the area from both the northwest and southwest areas. The soils of the area are among the poorest drained in the state, having been derived from lake sediments. The southeast area receives approximately the same amount of rainfall as the northwest area, but average snowfall during the winters is less in the southeast than any other area.

Earliest ethnohistoric evidence identified the Tionontati or Tobacco Huron as residents of southeast Michigan and adjacent to Ontario. The Iroquois speaking Huron were distinct from other groups occupying the study area who were Algonquin speakers (Tanner, 1974:2-3).

By the mid-seventeenth century, the Tionontati and other Iroquois-Huron speaking groups such as the Erie and Neutrals were destroyed or fled to the northwestern shore of Lake Michigan to escape the Iroquois. In the voyage of the Griffin up the Detroit River, Lake St. Clair and Lake Huron, LaSalle encountered isolated Huron speaking people (Tanner, 1974: 5). The establishment of Fort Ponchartrain at Detroit during the first years of the 18th century, drew diverse groups, the earliest of them, Huron and Tionontati to the southeast area (Tanner, 1974: 7). Other groups including Ottawa, Potowatomi, and Salteur and Missisauigi Chippewa joined the groups at Detroit. By 1720 each group established its own hunting territory in the areas surrounding Detroit. Chippewa established themselves in an area north of Detroit into the Saginaw drainage, Potowatomi west of the Fort along the Upper Huron and Raisin rivers; a small Ottawa territory was located south of the Potowatomi along the Upper Maumee River which drains into Lake Erie; and Wyandots, formerly called the Tobacco Huron (Kinietz, 1940: 61), hunted the western and southwestern shore of Lake Erie (Tanner, 1974: 11-13; Stuart, 1926: 73). By the time the Treaty of 1817 was signed the Wyandot occupied the vicinity of Detroit and were surrounded by Potowatomi (Tanner, 1974: 46-47).

The Huron-Iroquoian speaking groups who occupied southeast Michigan were agricultural people who supplemented their diet by hunting, fishing and collecting (Kinietz, 1940: 16-29). Huron resided in relatively permanent villages which were moved every ten to twenty years. The causes for moves included threat of enemies, soil and firewood depletion (Kinietz, 1940: 15).

Historic settlement of the southeast followed a pattern distinct

from the other areas in the study. The four counties along the eastern boarder of the area were the first established in Michigan. Early French-Canadian settlers coming to the area were attracted to it because of its strategic location on key transport and communication routes. The earliest settlements were located as close as possible to the mouths of the rivers which drained into Lakes Huron and St. Clair and the Detroit and St. Clair Rivers (Fuller, 1916: 96-98).

Though Detroit was established in 1701 extensive settlement did not take place until after Michigan became a territory in 1805. Between 1818 and 1823 relatively large numbers of people from the east moved into the southeast to take up agricultural land. The southeast migration was a decade earlier than significant settlement of the southwest and two decades earlier than settlement in the northwest and northeast portions of the research area (Fuller, 1916: 489-500).

Three Late Woodland sites used in this study occur in the southeast sub-area: Draper Park, Riviere au Vase and The Fort Wayne Mound (Figure 1). All three sites are located on the Erie-St. Clair Plain.

Draper Park. The Draper Park Site (20 SC 40) is located within the city limits of Port Huron in St. Clair County. The site lies on the west bank of the St. Clair River less than one mile south of its juncture with Lake Huron. Excavated in 1974-75 by Oakland University and St. Clair Community College, Draper Park has produced rims representing 127 Wayne Ware vessels. In addition, Younger tradition (Fitting, 1965) ceramics and historic materials have been found at the site (Weston, personal communication). Three radiocarbon dates of 300 ± 155 BC (DIC 434), A.D. 1670 ± 55 (DIC 336), and A.D. 1720 ± 55 (DIC 433) do not appear to accurately date any of the occupations at the site and

new dates are forthcoming (Weston, personal communication).

Riviere au Vase. The Riviere au Vase site (20 MB 3) is located on Riviere au Vase approximately one half mile before its juncture with Lake St. Clair in Macomb county. The University of Michigan excavated the site in 1936 and 1937. In the type descriptions for southeast Michigan Late Woodland ceramics, Fitting (1965: 154-159) reports the presence of 275 vessels belonging to the Young Tradition and 53 Wayne Ware vessels. Only 32 minimal vessels from Riviere au Vase were included in the study because some Wayne vessels were missing from the University of Michigan collection and some were incomplete in terms of attributes. Many of the over 300 vessels from the site are complete and accompany burials. These materials suggest a prehistoric occupation or series of occupations between A.D. 600 and A.D. 1300 (Fitting, 1965). In addition a mid-19th century historic component is present at the site. Faunal remains from the site suggest a seasonal hunting pattern for one or more occupations (Fitting: 1965: 72).

The Fort Wayne Mound. Located at the site of Fort Wayne in Detroit, The Fort Wayne Mound (20 WN 1) was excavated in 1876 by the Detroit Scientific Association and again in 1944 by the Aboriginal Research Club of Detroit. A total of 29 Wayne Ware vessels were recovered from the 1944 excavations. Only 12 vessels were complete enough and present in the University of Michigan collection. In addition 24 sherds representing two Marion Thick vessels and 40 Young Tradition vessels were recovered from the Mound. The site was occupied at least twice, once during the Early Woodland and at least once during the Late Woodland. A radiocarbon date of A.D. 750 $\pm$ 120 (M-1843) dates a burial with a Wayne Ware pot in association (Halsey, 1968).

Summary and Evaluation

The preceding survey of ecological, cultural and historical factors indicate differences and similarities in the research area of potential significance.

Similarities. Precipitation and snowfall varies only slightly over the entire area and is adequate to ensure successful corn production in an average year. No areas exist where terrain is so rough that it inhibits travel, communication or subsistence activities. To the contrary, the river systems in, and Great Lakes surrounding Michigan furnished an effective natural network of transportation and communication between east and west, north and south, which had a significant effect on Michigan's historic development.

Differences. Important differences occur between the four areas in terms of soils, vegetation and growing season. The southwest is clearly the most suitable of the four areas for agriculture, having good soil drainage, more frost free days than necessary for a corn crop in an average year, and the added advantage of dry prairies which require less effort to prepare the land for agricultural purposes. Both the northeast and northwest areas, bordering on the Carolinian-Canadian transition zone have more varied vegetation patterns and fewer frost free days in an average year than the areas to the south. The northeast and northwest areas therefore appear to be more suitable for groups with a more mixed hunting-gathering and agricultural economy than either area in the south. Ethnohistoric evidence supports the above pattern with the southwest being primarily occupied by agriculturally dependent Potowatomi and Miami groups; the southeast occupied by sedentary agricultural Huron - Iroquois speaking peoples; the northwest occupied by Ottawas who shifted

their residences depending on the season to hunt, fish or grow crops; and the northeast occupied by numerous diverse groups, most of whom were not permanent residents but came into the area temporarily to hunt.

Archaeological data indicate an agricultural adaptation by groups in the southwest at Moccasin Bluff, in the northwest at Spoonville and Spring Creek, and in the northeast at the Schultz site. All other sites in the three areas provide evidence for fall and winter hunting occupations with mixed hunting, fishing and collecting by their inhabitants. The sites in the southeast area provide no evidence from which the economy of people in the area could be inferred.

Historic evidence on the settlement of Michigan also indicates the distinctiveness of the four areas, each of which was settled at different times, for different reasons, and by people from different areas of the U.S. and Canada. The two western areas in particular were settled by people from northern Indiana and Ohio while the two eastern areas were settled by people from Canada and the eastern United States.

In sum, the four areas described here appear to be distinct with respect to some ecological factor or factors, ethnohistoric land use patterns and patterns of historic settlement. The observed differences provide the background for a series of related testable hypotheses concerning Wayne related ceramics, ethnic groups and boundaries of the research area.

Hypotheses. The first general hypothesis states that ceramics from the research area were all produced by people belonging to a single cultural tradition. In this case, no statistically significant differences would be observable in ceramic groups from sites in the research area. Observed ecological, differences and differences in prehistoric

subsistence-settlement pattern in this case would reflect internal variation within a ethnically homogeneous cultural tradition. Observed ethnographic and historic patterns of difference would therefore not have been present in the early Late Woodland in the area.

At the other extreme, a hypothesis may be proposed which states that ceramics from each site in the research area were produced by members of separate and distinct cultural traditions. Upon testing this hypothesis, we would find that each site had its own set of ceramic groups or types, and that these are defined differently than ceramics from every other site in the study. Ecological, ethnographic and historic data cited in this study would therefore have been over generalized and would have to be re-evaluated for each specific site context to ascertain whether underlying factors exist which may, in part, account for ceramic and ethnic group difference.

The third general hypothesis takes a position between the first two hypotheses. Specifically, the hypothesis states that ceramic groups from something less than 17 but more than one site are identical and are the products of individuals belonging to between two and sixteen separate cultural traditions. The third hypothesis is, of course, the one favored given the ecological, ethnographic, historic, and archaeological documentation provided in this chapter. Statistically validated separate ceramic traditions should be identifiable for the four areas based on data given thus far. Should some other number than four ceramic traditions result from the following hypothesis tests, it will be necessary to consider what factors may account for the observed differences. That is, ethnographic, ethnohistoric and ecological data will need to be reinterpreted. If, on the other hand, four separate

ceramic traditions are statistically defined, the non-ceramic nature of those traditions, their relationships with each other and their articulation with neighboring cultural traditions will need to be considered.

CHAPTER III

METHOD AND TECHNIQUE OF CLASSIFICATION

Method

Two methods of classification, employed not only in archaeology but the natural sciences as well, will be used to generate explicit ceramic typologies. The application of the methods, monothetic subdivision and polythetic agglomeration, will allow testing of propositions concerning space and time variation in the research area.

Monothetic classes, whether they are composed of ceramic vessels or insects, are rigidly and logically defined by unique constellations of characteristics or attributes which are both necessary and sufficient for class membership. Monothetic classes developed by the process of subdivision are hierarchical in character and are formed by dividing a population into succeeding smaller units. The primary advantage of monothetic subdivision to archaeologists is that numerically derived, monothetic classes resemble types defined by the common typological method (Whallon, 1971). Types formed by the common typological method, however, are group defined by subjectively selected criteria and lack the statistical confidence available in numerical monothetic techniques.

Three aspects of monothetic subdivision reflect its similarity to the common typological method. The principle of shifting criteria allows the attributes defining types to change or shift between types. The principle of hierarchy of importance specifies that some attributes are more important than others in forming a classification. That is, the

order in which attributes are considered in the development of a classification is free to change at each step. The definability of types is the final and perhaps most important principle shared by the common typological method and monothetic subdivision. Both methods produce types which are clearly defined in that all members of the type possess all attributes used to define the type.

The primary disadvantage of monothetic subdivision, however, also pertains to the last principle. That is, monothetic classes by their definition force data to be dealt with as "...mutually discrete logical bricks" (Clare, 1968: 190). That archaeological data can be conceived in this fashion, has never been demonstrated (Clarke, 1968: 37).

In contrast to monothetic classes are polythetic classes, which are defined by three criteria. First, each item has a large but unspecified number of attributes which occur in its class. Second, each attribute found in a given class occurs on a high but again unspecified number of items. Finally, no single attribute occurs on every item in a class, or, no one attribute is both necessary and sufficient for membership in a class. A class is considered polythetic if the first two conditions are met and is considered fully polythetic if the third condition applies (Sneath and Sokal, 1973: 21). Polythetic classes are most often formed by agglomeration where individual items are joined with each other into larger and larger classes until all are incorporated into a single class.

The primary advantage of polythetic agglomeration as method for developing classifications is that resulting classes seem to reflect the variation that occurs within all archaeological and natural entities (Sneath and Sokal, 1973: 23). The most serious disadvantage of

polythetic classes, however, is that in allowing for flexibility in class membership, precise definability of types is sacrificed.

The contrast between purely monothetic and polythetic classes, however, is perhaps only significant on a theoretical level. Clarke (1968: 190) observes that in practice, archaeological and natural classes are infrequently fully polythetic. Some attributes may be found in all members of a class which suggests that archaeological data share attributes of both polythetic and monothetic classes.

For the present study, monothetic subdivision seems the most suitable of the two methods described above. In previous research resulting ceramic wares and types were all produced by the common typological method. If definable types derived by explicit numerical procedures are to be generated, then monothetic techniques should be used. Polythetic techniques, however, should produce classes similar to those derived monothetically for the same body of data (Doran and Hodson, 1975: 180). Consequently, both monothetic subdivisive and polythetic agglomerative techniques will be used in this study and their results will be compared.

Technique

Data preparation. An attribute list of 28 attribute classes having a cumulative total of 95 multi-state nominal scale attributes was developed. The attribute list accounted for observed variation in all Wayne related ceramics from the study area. Those cited in previous research as critical were noted and included in the list.

All ceramics from their respective sites in the study area were sorted into minimal vessels which were then coded according to the

attribute list. Each of the 1452 minimal vessels was coded with a vessel identification on two 80 column computer punch cards. One attribute state per column was coded for presence (1) or absence (0). Coded data were subsequently read into a file on the University of Michigan IBM 360 computer. A second file was created where the data format was altered to 28 column multi-state nominal scale format to accommodate a second computer routine.

The number of vessels from which data were collected in this study could not be accommodated by either of the two computer routines. Computer generated random samples were therefore drawn for hypothesis tests which required inclusion of ceramics from the entire research area. Other analyses, conducted on collections from each of the major areas in the study met the size restrictions of both computer programs.

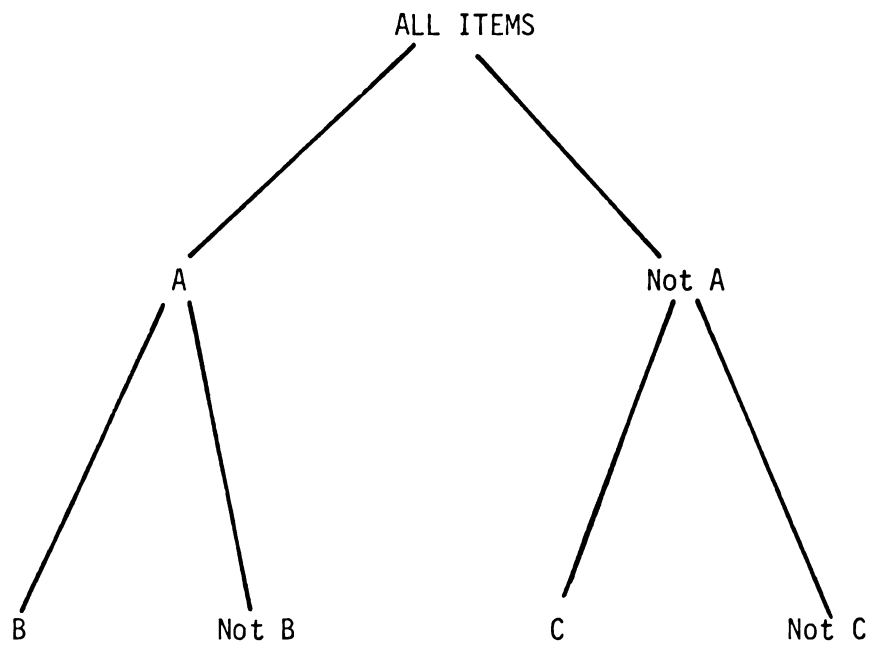
Statistical Techniques. Two computerized classification routines were used to generate ceramic classifications and test propositions. The first program, TYPE, is a monothetic subdivisive classification routine developed by Robert Whallon (1971, 1972) to analyze Owasco ceramics from New York. The maximum number of variables TYPE can accommodate is 40, while the maximum number of cases is 1000. TYPE uses the simple chi-square statistic as a measure of association between nominal scale variables to generate a three-type classification. Three chi-square functions, the sum of significant chi-squares, average chi-square and maximum individual chi-square are available to the user to identify most significant attributes as the hierarchical classification develops. At each state of the developing classification, chi-square values for each presence/absence attribute are calculated comparing that attribute to all others. The attribute having the highest specified

chi-square function becomes the variable which divides the population according to its presence or absence (Figure 13, A: not A). The next subdivision of the population takes all items possessing the attribute on which the first division was made (Figure 13, A), and calculates chi-squares for remaining attributes, determines which attribute is most significant, and divides that portion of the population accordingly (Figure 13, B: not B). The program then shifts to those items lacking the attribute used in the first major division (Figure 13, not A) and independently computes chi-squares and selects an attribute for division of that half of the population (Figure 13, C: not C). The independent calculation of chi-squares at each stage or node of the classification is an application of the monothetic principle of shifting criteria where attributes which define types are free to change throughout the classification.

Among the options available to the user are specification of smallest expected cell value, size of significant chi-squares and the minimal size of groups to be divided. Division continues until group size drops below that specified by the user, or until no significant chi-squares are calculated. The program automatically terminated at the end of 15 levels of subdivision.

The most important feature of TYPE given the multi-state nominal scale data used in this study is that mechanical redundancies may be masked such that the program will not attempt to calculate chi-square values for two attributes within the same attribute class. Such calculations obviously would result in significant but irrelevant chi-square values. Other available monothetic subdivisive classification routines such as the DIVIDE routine in CLUSTAN (Whisart, 1969) fail to

Figure 13. -- Monothetic Subdivisive Tree Diagram



accommodate the redundancies inherent in multi-state nominal (dependent) data.

The chi-square function selected to subdivide the ceramic sample in this study was the simple sum of chi-squares which has been most useful in previous experiments with ceramic classification (Whallon, 1971: 15). The smallest acceptable chi-square value was set at 3.84, the .05 level of significance of chi-square values having one degree of freedom. The lowest acceptable expected cell value was set at .05 for all TYPE analyses. While a lowest acceptable cell value of 3.0 is preferable, lowering the limit to 0.5 does not adversely affect the results (Whallon, 1971:18). Lowering the limit to allow infinitely small expected cell values does however result in superficial subdivisions where single items or pairs of items may be split from a large group (Whallon, 1971: 18). Minimal sub-group size was set at 2 which allowed for sub-division to take place in groups of three or more.

The second computerized classification routine used in this study is contained within the MIDAS system of the Statistical Research Laboratory at the University of Michigan. The CLUSTER command allows the execution of a variety of polythetic agglomerative clustering procedures. Hierarchical agglomerative clustering can form groups of either variables or cases (items). The number of items which can be handled by CLUSTER cannot greatly exceed 500 because the amount of computation time and storage within the computer required expands quickly as the number of items being clustered increases (Fox and Guire, 1974: 62). A series of keywords and their values determine the specific factors which control each CLUSTER run.

Agglomerative hierarchical clustering procedures start after a matrix of similarity or distance coefficients has been calculated. The matrix is constructed by computing the mathematical relationship or correlation between all pairs of items or variables being clustered. The CLUSTER command allows a choice of similarity or distance measures depending on the kind of data being analyzed.

Once the similarity matrix is calculated the program proceeds to link items or variables which are most similar to existing cluster units until all items or variables have merged into one. The structure of the merging clusters is represented as a dendrogram where clustering begins at the tips or ends of the diagram and continues until all branches are merged (Doran and Hodson, 1975: 175-176).

Two distance coefficients were used in this study. In all analyses except one, items, specifically vessels, were being clustered based on the observed similarity between their respective presence/absence attributes. The distance coefficient selected to cluster vessels was Jaccard's coefficient which in the format of Figure 14 is mathematically defined as:

$$S_j = a/(a + b + c).$$

Jaccard's coefficient varies between 0 and 1.0.

Jaccard's coefficient was preferred over other distance and similarity coefficients because it ignored negative agreements between attribute comparisons between paired vessels. An attribute which was absent on two vessels being compared (d in Figure 14) would not be included in the calculation of the coefficient. Only those attributes which were present on both vessels (a in Figure 14) were counted as

matched. The fact that Jaccard's coefficient ignored negative matches in both counting agreements and in counting comparisons for the divisor in the formula was important when dependent multi-state nominal scale data like those in this study were being analyzed (Hodson and Doran, 1975: 141).

The second distance coefficient used was Euclidean distance (D) which was used to cluster sites based on the difference between the percentages of ceramic groups or types present. The formal definition of Euclidean distance is:

$$D = \sqrt{\sum^n (x_1 - x_2)^2}$$

In this formula D is the mathematical distance between two sites where x_1 is the score or percentage of a type at one site and x_2 is the percentage of the same type at the site being compared to the first. All paired differences for n types are summed and the square root taken. (Clifford and Stephenson, 1975: 66). Euclidean distance has been used satisfactorily in examining the relationship between assemblages of types (Hodson and Doran, 1975:139).

The clustering procedure used in all analyses was Ward's method (Ward, 1963) which is also called minimum variance or incremental sum of squares. When the computer program scans the distance matrix for items to link together, it calculates a statistic which measures the desirability of the arrangement at each clustering step. The statistic which is calculated is the sum of within group sum of squares (Sneath and Sokal, 1973:241) or the error sum of squares (Ward, 1963:237).

Figure 14. -- Conventional Lettering Used
for Counting When Calculating Similarity
Between Two Vessels
(After Doran and Hodson, 1975:140)

Vessel 1

+

-

Vessel 2

+

a

b

-

c

d

Error sum of squares is formally defined as:

$$ESS = \sum_{i=1}^n x_i^2 - \frac{1}{n} \left(\sum x_i \right)^2$$

Where x_i equals the distance or similarity coefficients for one vessel or site (i) squared and summed. From this sum is subtracted the summed similarity or distance coefficients which have then been squared and divided by the number of vessels or sites being considered. The most desirable value for error sum of squares is 0.0 which would indicate that there is no difference between items being clustered. As the grouping procedure begins with n items or single member clusters, the program searches for the two clusters which have the lowest error sum of squares and merges them. The next step looks at the $n-1$ remaining clusters to see whether a third single member cluster should be joined to the original pair or whether a new pairing between two new clusters would yield the lowest incremental sum of squares for the $n-2$ cluster groups. The procedure continues until all groups are merged. (Ward, 1963:238).

Ward's method was initially designed and is most appropriately used with distances derived from metric data such as Euclidean distance (Fox and Guire, 1974:62). Clifford and Stephenson (1975:114) however, state that the method can be used with coefficients other than Euclidean and can be interpreted in the same fashion. Ward's method is potentially useful for classifications of ceramics because it is "intensely clustering". Intensely clustering procedures form groups which become increasingly difficult to join as group size gets larger. The strategy therefore may produce quite homogeneous groups of equal size. One or

more groups however may be formed consisting of items which share very weak similarities to the other cluster groups and which have rather large within group dissimilarity (Clifford and Stephenson, 1975:107). A cluster composed of rather dissimilar items might in fact be reflective of the "left-overs" or miscellaneous vessels category present in most ceramic typologies.

Seriation

Seriation is a method by which a chronology or relative ordering is achieved by "arranging local remains of the same cultural tradition in the order which produces the most consistent patterning of their cultural traits" (Rouse, 1967: 157).

Seriation is especially useful in studies where external dating of assemblages and artifacts is unavailable. For the results of seriation to be interpreted as a chronology however, the sites or types being seriated must come from a single locality or should be selected in such a way that spatial variation is controlled for. In addition, items being seriated should come from a single cultural tradition and should be defined by culturally and therefore possibly chronologically significant attributes (Doran and Hodson, 1975: 269). Hole and Shaw (1967: 5) state that types used in a seriation should be objectively defined by mutually exclusive clusters of attributes.

The monothetic subdivisive program TYPE used here produces ceramic groups defined in this way. Spaulding (1976: 67) however, notes that TYPE "is not relevant to the identification of artifact classes useful in frequency seriation." The ceramic groups generated by the polythetic CLUSTER command in this study are not defined by mutually exclusive combinations of attributes but nonetheless have been

objectively rather than subjectively defined and will be used in this discussion.

Two major groups of seriation techniques are available which include the relatively recent development of seriation by scaling, and seriation by permuting similarity matrices (Doran and Hodson, 1975). The latter collection of techniques, which are predicated on the assumption that style or type frequency changes in a lenticular fashion over time, are most familiar and most traditional in archaeology.

Permuting similarity matrices involves calculating the percentage of each pottery type in an assemblage and computing a similarity measure between assemblages or types depending on which is being ordered. The similarity measures are then arranged in a matrix where rows and columns are an arbitrary arrangement of the assemblages or types being ordered. Reordering the rows and columns such that the highest similarity measures are located at or near the main diagonal, results in an ordering of assemblages or types (Table 1).

Table 1. -- A Perfectly Ordered Brainerd-Robinson Similarity Matrix

Items	4	2	3	1	5
4	200	190	185	170	160
2	190	200	195	180	170
3	185	195	200	185	175
1	170	180	185	200	180
5	160	170	175	180	200

The resultant order, however, does not tell which end of the sequence is early or late. Computer and manual techniques available to permute matrices differ with respect to the similarity statistic used, the way in which the similarity matrix is ordered, and the rule for selecting the best order (Doran and Hodson, 1975: 272-273).

For this study the Brainerd-Robinson technique (Brainerd, 1951, Robinson, 1951) was used. A computerized application (Craytor and Johnson, 1968) was used to sort larger matrices while smaller orderings were achieved by hand sorting.

Hand sorted matrices used the Brainerd-Robinson agreement coefficient which is as follows:

$$X_{IJ} = 200.00 - \sum_{K=1}^T |A_{KI} - A_{KJ}|$$

where T represents the number of types, $A_{I,J}$ represents the percentage of site J composed of type I and X_{IJ} represents the correlation between sites (or types) I and J. Scores vary between 200 (perfect correlation) and 0 (no agreement) (Hole and Shaw, 1967: 8-9). The matrix is ordered by hand until the norm or Simple Sums of Errors is reduced as low as possible. The Norm is formally defined as follows:

$$\sum ERR = \sum_{I=1}^P \sum_{J=1}^{P-1} |X_{IJ} - X_{IJ+1}| \Delta(I,J).$$

The Craytor and Johnson program uses the Brainerd-Robinson agreement coefficient cited above and calculates matrix coefficient C to determine which matrix has the best order. The matrix coefficient C is computed by dividing coefficient H, the sum of all agreement coefficient

differences which are positive or equal to 0 or,

$$H = \sum_{j=2}^n \sum_{i=1}^{j-1} \sum_{k=1}^i \sum_{l=j}^n S_j^i - S_l^k$$

by the number of inequalities tested in the program, that is by,

$$(n^4 + 2n^3 - 13n^2 + 10n)$$

$$24$$

and then by dividing by the standard deviation of the $n(n-1)/2$ similarity scores (Craytor and Johnson, 1968:3). The matrix coefficient C is approximately equal to 0 for randomly ordered collections and increases as the matrix order becomes more perfect. A C value approaching 2 is considered near perfect.

The similarity matrix is ordered by searching for the order with the highest C value, using Kuzara's Criterion (Craytor and Johnson 1968: 4-5) to avoid the prohibitively large amount of computation required for calculating $n!/2$ different permutations of a large similarity matrix.

A final seriation technique for ordering assemblages or sites is the Meighan "3-pole" technique (Meighan, 1959). All but three major types are eliminated or types are combined into three categories which are treated as if they comprised the entire assemblage. The percentage of each type is then plotted on triangular graph paper. A straight line drawn through the plotted points determines the relative ordering of sites. The 3-pole plot technique, like the Brainerd-Robinson technique, assumes lenticular change in type frequency. The 3-pole method also assumes however, that three types can accurately reflect the changes in assemblages (Doran and Hodson, 1975: 280).

Discussion

The selection of methods and techniques is significant with respect to the distribution of sites in the study area. It has already been mentioned (Chapters I and II) that sites are not evenly distributed in the study area though all possible sites were included in the study. While some sampling bias may be reflected in the results because of the distribution of sites, the methods and techniques used here will not introduce new bias nor will they unduly emphasize any existing bias in the data. On the contrary, the two classification methods used here are very well suited to the unbiased structuring or ordering of data based on objective rather than subjective criteria. Any bias that is introduced into the analysis comes from the raw data selection and coding. The potential bias (bias of site location and bias of the investigator) has been controlled for by using as many sites as possible. In addition, all coding and data analysis was done by a single investigator. Therefore, as in any study, the possibility of sampling bias exists, but the likelihood has been reduced given the use of the methods and techniques described above and data manipulation presented in Chapter IV.

CHAPTER IV

RESEARCH DESIGN AND RESULTS

Tests of Spatial Propositions

The primary purpose of this study is the empirical validation of propositions concerning the spatial and temporal variation found within Late Woodland ceramics from Southern Michigan. Spatial variation in ceramics from the research area is considered first. Attempting to classify all ceramics from the research area with respect to temporal change before examining spatial variation would assume that a single ceramic tradition exists. Such an assumption violates the primary purpose of this study which is to ascertain whether several or a single ceramic tradition exists in the research area. Furthermore, the scarcity of radiocarbon dates makes it impossible to derive absolute chronological dates for ceramics. Only seriation or other relative dating techniques can achieve a relative ordering of sites in the area.

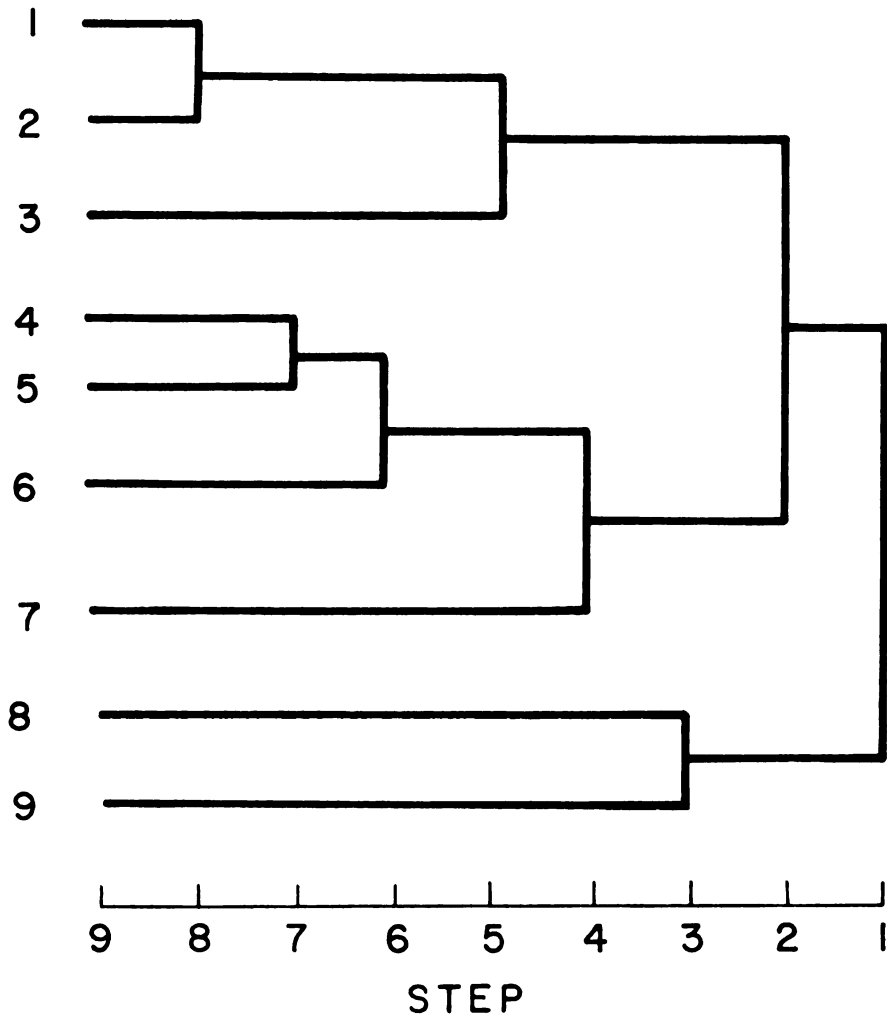
The fundamental spatial proposition (H_0 ;) states that ceramic types are distributed independent of location. This proposition holds that there are no significant differences between ceramic types as identified and their distribution in the research area. Its alternative (H_1 ;) states that ceramic types in the research area are dependent with respect to location. To initially test this proposition, a single polythetic agglomerative cluster analysis was performed on 300 randomly selected vessels from the total 1452 used in this study. All 95 equally weighted attributes were used. The monothetic sub-divisive program TYPE

was not used in this stage of the analysis because it limits the number of useable attributes to 40.

The first cluster run produced a cluster diagram assigning vessels to each cluster by number, and distance coefficients indicating the within and between group distances of each step in the diagram. The first point indicating significant within group similarity and between group distance occurred at clustering step nine (Figure 15). The descriptive characteristics (frequency and percent) of each attribute for each cluster was subsequently calculated (Appendix C). Initial inspection of clusters in the diagram suggested that the clusters varied according to whether member vessels came from the east or west portions of the research area as defined by river drainage basins. Eastern sites included Riviere Au Vase, Fort Wayne Mound, Draper Park, Schultz, Fletcher, Hodges, Mahoney, Fosters, Valley Sweets and Root. Western sites included Moccasin Bluff, Fennville, Forty-Sixth Street, Spring Creek, Zemaitis and Spoonville.

To empirically test the proposition, all of the randomly selected vessels were assigned to one of two groups depending on site location. A two by nine contingency table was constructed (Table 2) and the statistical model of chi-square with 8 degrees of freedom was employed to test for independence of ceramic clusters from location. The level of significance was set at 0.01. A computed chi-square value greater than or equal to 20.0902 would cause the null hypothesis of the independence of space and ceramic groups to be rejected. Figure 16 presents the results of the test indicating that the null hypothesis is rejected and the alternate hypothesis is favored. Therefore, it appears that ceramic groups appear to be related or dependent on location with

Figure 15. -- CLUSTER Diagram of Last Nine Steps
Based on a Random Sample of 300 Vessels from
All Sites



DISTANCES

2.6665

3.3930

3.7116

3.7475

4.4457

4.8619

5.9152

9.3744

17.152

Table 2. -- Chi-square Table Testing Independence
of Ceramic Clusters With Respect to Eastern and
Western Drainages

O_i	E_i	$(O_i - E_i)$	$(O_i - E_i)^2$	$\frac{(O_i - E_i)^2}{E_i}$
6	6.9	-.9	.81	0.1
14	13.1	.9	.81	0.1
8	13.0	5.0	25.0	1.9
30	25.0	-5.0	25.0	1.0
0	6.9	-6.9	47.6	6.9
19	12.1	6.9	47.6	3.9
5	10.6	-5.6	31.4	3.0
26	10.4	5.6	31.4	3.0
4	13.7	-9.7	94.1	6.9
36	26.3	9.7	94.1	3.6
9	7.8	1.8	3.2	0.4
14	15.2	-1.8	3.2	0.2
8	7.5	1.5	2.3	0.3
14	14.5	-1.5	2.3	0.1
23	19.2	4.2	17.6	0.9
33	36.8	-4.2	17.6	0.5
40	17.5	22.5	506.25	28.9
11	33.5	-22.5	506.25	15.1
				$\chi^2 = 76.8$

$df = 8; \chi^2_{0.01} = 20.0902$

respect to the eastern and western portions of the study area.

The identical procedure was followed to test the independence of the same 9 ceramic groups with respect to the northern and southern portions of the research area. Again the null hypothesis (H_0) of independence between space and ceramic group was rejected and the alternate proposition indicating dependence or relatedness within northern and southern portions of the research area and ceramic clusters is favored (Table 3).

The results of the above tests suggest that there may be four distinct ceramic traditions, aligned along river drainage basins in the research area. To support this proposition, two further CLUSTER analyses were performed. The first analysis was based on 300 randomly selected vessels from sites in the western portion of the research area and all 95 attributes. The cluster diagram is presented in Figure 16 and attribute frequency and percentages for eleven clusters in Appendix D. A chi-square analysis of the Northwest (Spoonville, Spring Creek and Zemaitis) and Southwest sites (Fennville, Forty-Sixth Street, and Moccasin Bluff) rejects the null hypothesis of no relationship between space and ceramic groups and favors the alternate hypothesis (Table 3). Ceramics from the Southwest and Northwest areas do appear to belong to separate traditions.

The second cluster analysis in this stage of the research was performed on 300 randomly selected vessels from sites in the eastern portion of the research area and all 95 attributes. The cluster diagram (Figure 17) and attribute frequency and percentages for eleven clusters (Appendix E) on inspection provide the least convincing evidence of two distinct ceramic traditions in the Northeast and Southeast. This

Figure 16. -- CLUSTER Diagram of Last Eleven Steps
Based on a Random Sample of 300 Vessels from
Sites in Western Drainages

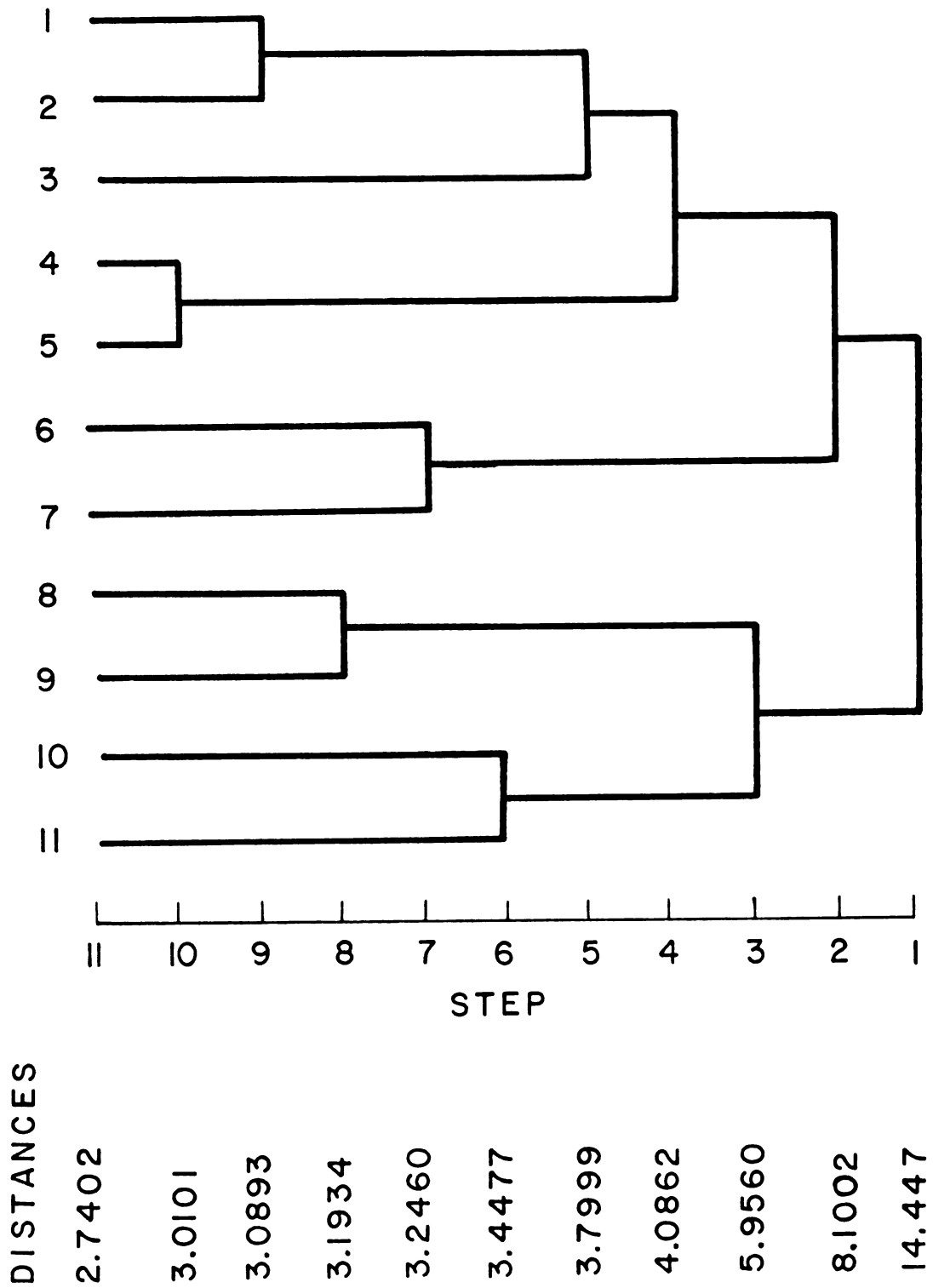


Table 3. -- Chi-square Table Testing Independence of
Ceramic Clusters With Respect to North and South
Drainages

O_i	E_i	$(O_i - E_i)$	$(O_i - E_i)^2$	$\frac{(O_i - E_i)^2}{E_i}$
13	12.6	0.4	.16	0.01
7	7.4	-0.4	.16	0.02
21	23.94	-2.94	8.64	0.36
17	14.06	2.94	8.64	0.61
5	11.97	-6.97	48.58	4.06
14	7.03	6.97	48.58	6.91
21	19.53	1.47	2.16	0.11
10	11.47	-1.47	2.16	0.19
30	25.2	4.8	23.04	0.91
10	14.8	-4.8	23.04	1.56
16	14.49	1.51	2.28	0.16
7	8.51	-1.51	2.28	0.26
18	13.86	4.14	17.14	1.24
4	8.14	-4.14	17.14	2.01
41	35.28	5.72	32.72	0.93
15	20.72	-5.72	32.72	1.58
24	32.13	-8.13	66.10	2.06
27	18.87	8.13	66.10	<u>3.50</u>
				$\chi^2 = 26.48$

df = 8; $\chi^2_{0.01} = 20.0902$

division is supported by the failure to reject the null hypothesis which states that ceramic clusters or types in the East are independent of location (Table 5). Failure to find a significant difference between ceramics in the southeast and northeast areas supports earlier research (Brashler, 1973; Wobst 1968; Fitting and Sassé 1969; Brose 1966) which extended the distribution of Wayne Ware defined in the southeast to the Saginaw Valley.

On the basis of the above chi-square tests, three distinct ceramic traditions can be identified for the study area, in the Northwest, Southwest and East. The nine polythetic clusters described in Appendix C do not necessarily correspond to identifiable ceramic wares or types. That fact that a statistically significant difference exists between ceramics from the Northwest, Southwest and East has been demonstrated. It would be inappropriate to attempt a simultaneous numerical classification of all Late Woodland ceramics from the research area given that significant differences do occur from region to region. The following stage of the analysis discusses the classifications generated for each area.

Ceramic Classification by Area

Two numerical classifications were generated for each ceramic tradition using the monothetic subdivisive computer program TYPE and the polythetic agglomerative CLUSTER command. All coded minimal vessels from each area were used in this stage of analysis. Fewer than 40 attributes were used in each analysis to meet the maximum attribute restriction of TYPE. The 40 attributes were selected because they occurred on over five percent of the vessels in the sample from the

Figure 17. -- CLUSTER Diagram of Last Eleven Steps Based on
a Random Sample of 300 Vessels from Sites in Eastern
Drainages

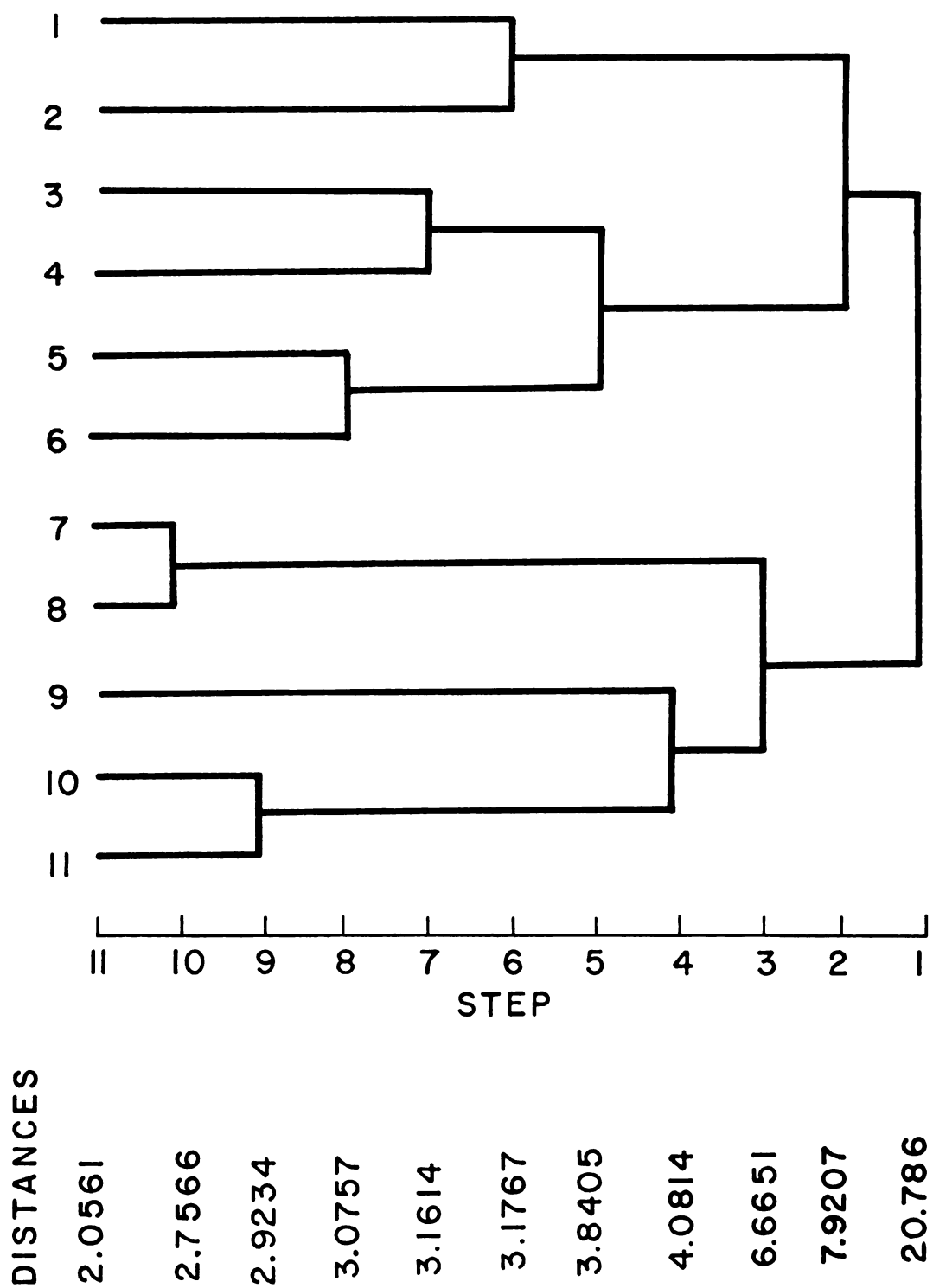


Table 4. -- Chi-square Table Testing Independence of
Ceramic Clusters With Respect to Northwest and
Southwest Drainages

O_i	E_i	$(O_i - E_i)$	$(O_i - E_i)^2$	$\frac{(O_i - E_i)^2}{E_i}$
10	3.74	6.26	39.188	10.478
1	7.26	-6.26	39.188	5.398
8	11.22	-3.22	10.368	0.924
25	21.78	3.22	10.368	0.476
14	6.8	7.2	51.84	7.624
6	13.2	-7.2	51.84	3.927
10	11.9	-1.9	3.61	0.303
25	23.1	1.9	3.61	0.171
0	6.46	-6.46	41.731	6.460
19	12.54	6.46	41.731	3.328
14	12.24	1.76	3.098	0.253
22	23.76	-1.76	3.098	0.130
2	8.5	-6.5	42.25	4.971
23	16.5	6.5	42.25	2.561
5	7.14	-2.14	4.58	0.641
16	13.86	2.14	4.58	0.330
11	11.9	-0.9	0.81	0.068
24	23.1	0.9	0.81	0.035
19	8.5	10.5	110.25	12.971
6	16.5	-10.5	110.25	6.682
9	13.6	-4.6	21.16	1.556
31	26.4	4.6	21.16	0.802
				$\chi^2 = 70.089$

$df = 11; \chi^2_{0.01} = 24.725$

Table 5. -- Chi-square Table Testing Independence of
Ceramic Clusters with Respect to Northeast and
Southeast Drainages

O_i	E_i	$(O_i - E_i)$	$(O_i - E_i)^2$	$\frac{(O_i - E_i)^2}{E_i}$
8	7.47	.53	0.281	.038
20	20.53	-.53	0.281	.014
10	10.93	-.93	0.865	.079
31	30.07	.93	0.865	.029
15	12	3.0	9.0	.750
30	33	-3.0	9.0	.272
0	2.93	-2.93	8.585	2.930
11	8.07	2.93	8.585	1.064
18	12.27	5.73	32.833	2.676
28	33.73	-5.73	32.833	.973
6	5.6	.4	0.16	.029
15	15.4	-.4	0.16	.010
5	6.67	-1.67	2.789	.418
20	18.33	1.67	2.789	.152
9	6.93	2.07	4.285	.618
17	19.07	-2.07	4.285	.225
6	5.33	.67	0.449	.084
14	14.67	-.67	0.449	.031
3	5.33	-2.33	5.429	1.019
17	14.67	2.33	5.429	.370
0	4.53	-4.53	20.52	4.530
17	12.47	4.53	20.52	1.646
				$\chi^2 = 17.957$

$df = 10; \chi^2_{0.01} = 23.2093$

sub-area. Attributes used for classification changed from area to area depending on the key attributes cited in previous research (Rogers, 1972; McPherron, 1967; Fitting, 1965, 1968; Flanders, 1965; Fischer, 1972). Selection of key attributes by the investigator from previous classifications causes the attributes used in both analyses to be weighted simply by their inclusion to the exclusion of others. Such attribute weighting should produce similar results in the polythetic as well as monothetic analyses since all possible attributes are not included. In both the TYPE and CLUSTER analyses of any one area the same attributes were used. For the TYPE analysis the results allowing the smallest acceptable cell value of .5 were deemed the most satisfactory. For each CLUSTER diagram only a portion is reproduced presenting the last major steps in the agglomerating hierarchy. The cut point was determined by the jump in distances printed at the bottom of the diagram indicating greater within group similarity and between group distance than in any previous step (Green, 1974:45).

Despite the fact that the collections being analyzed are from several sites rather than individual sites, the following general proposition is tested for each ceramic tradition: the structure of one or more previous ceramic classifications should resemble numerically derived classifications. In each area, at least one ceramic classification has been suggested by previous research.

After testing of the hypothesis by comparing the two numerically derived classifications to the intuitively based classification(s), appropriate revisions in ceramic classification are proposed and ceramic typologies for each tradition are discussed and compared.

Southwest Area

Three earlier classifications of Early Late Woodland ceramics from the Southwest area were constructed for collections from four sites. The first (Figure 18), based on collections from the Fennville and Forty-Sixth Street sites, proposes the types Allegan Cordmarked, Allegan Smoothed, Allegan Punctate, Allegan Corded Punctate, Allegan Crosshatched, Allegan Rocker-Stamped, Allegan Linear Cord-Imprinted and Spring Creek Collared (Rogers, 1972:96). A later classification of ceramics from the Moccasin Bluff site (Bettarel and Smith, 1973) is presented in Figure 19 and proposes the Early Late Woodland types Moccasin Bluff Cordmarked, Moccasin Bluff Collared and Moccasin Bluff Modified Lip. A recent classification of Early Late Woodland Ceramics from the Hacklander Site (Kingsley, 1977), different than either of the previous classifications, is presented in Figure 20. Hacklander is located near the juncture of the Kalamazoo River with Lake Michigan.

Comparison of the three classifications resulting from previous research with those generated here based on a pooled sample from three sites allows a proposition to be tested concerning the structure of ceramic relationships in the southwest area. The specific proposition states: The CLUSTER and TYPE analyses will group Southwest ceramics into groups comparable with one or more of the previously defined classifications.

TYPE and CLUSTER analyses of 289 vessels from the Southwest area generated classifications whose structures are not identical to those defined by Rogers (1972), Bettarel and Smith (1973) or Kingsley (1977). Figure 21 presents the results of the TYPE analysis. The first major division occurs on the presence or absence of exterior decoration.

Figure 18. -- Classification of Forty-Sixth Street and
Fennville Site Ceramics

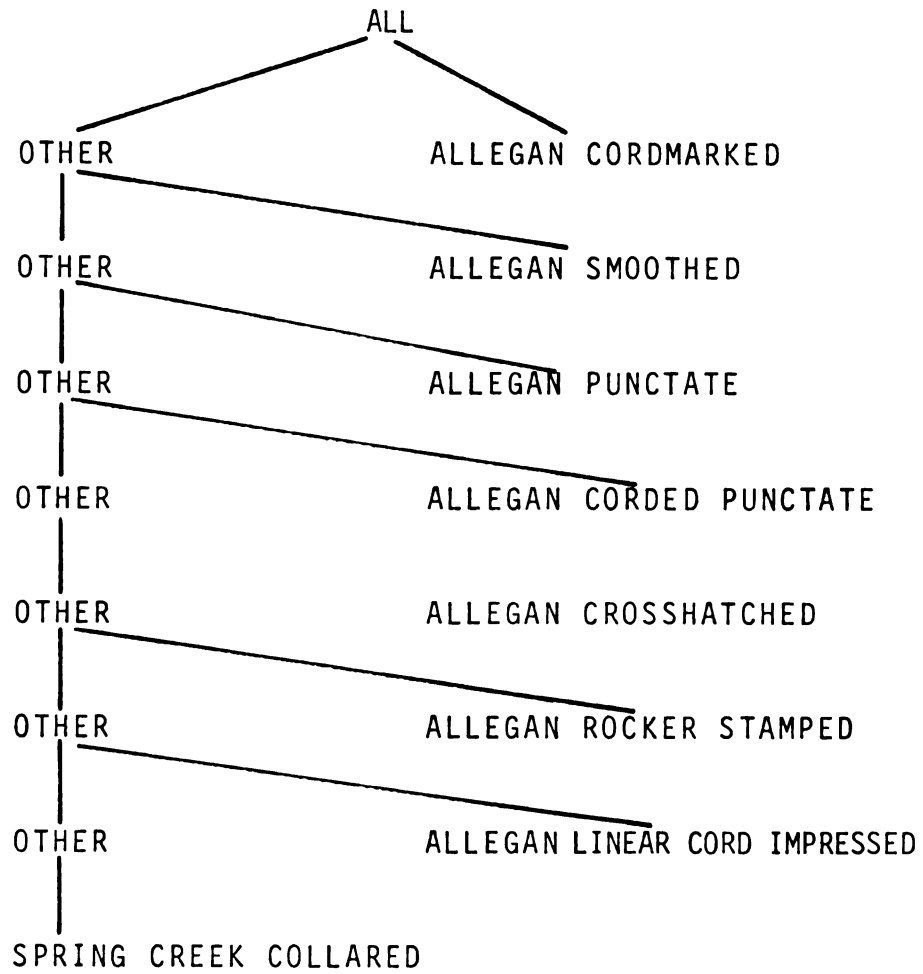


Figure 19. -- Classification of Ceramics from the Moccasin Bluff Site

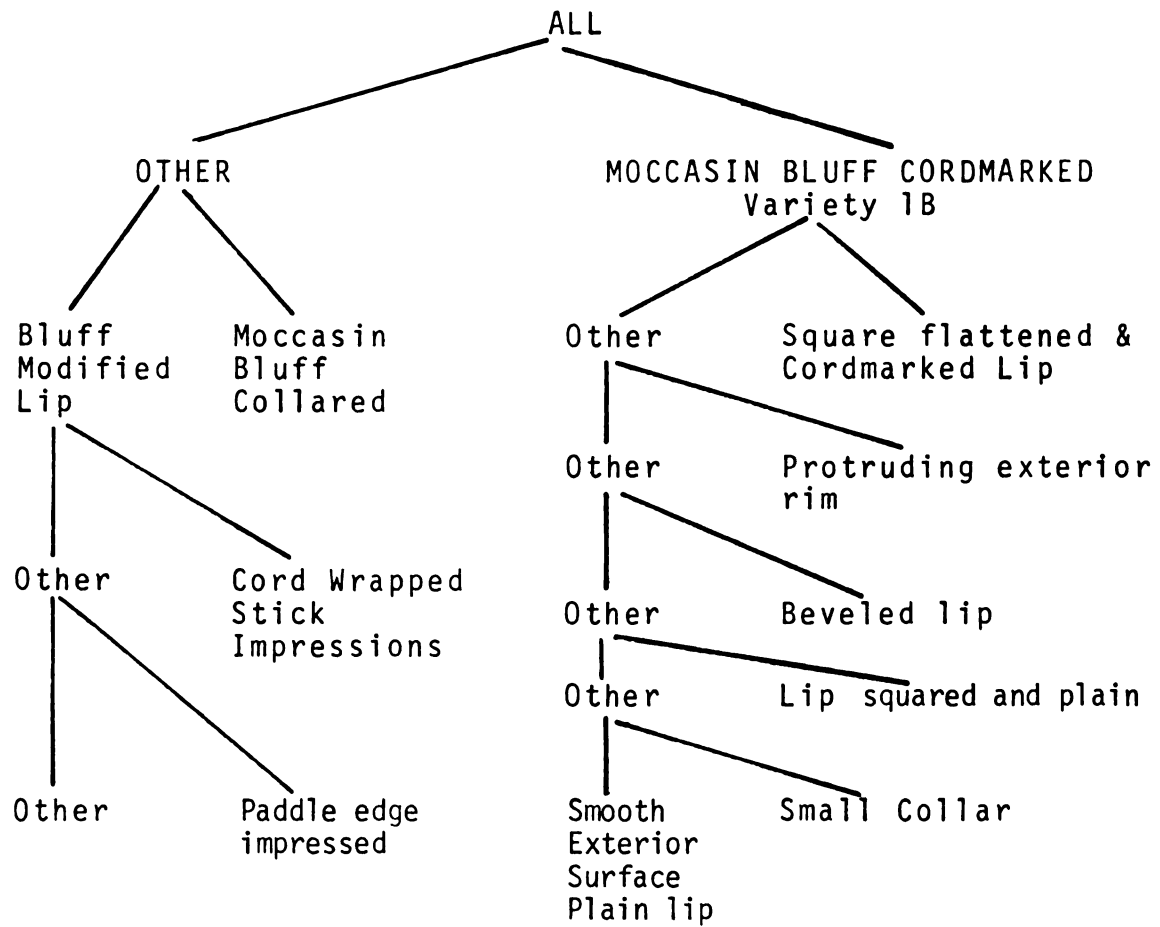


Figure 20. -- Classification of Hacklander Site Ceramics

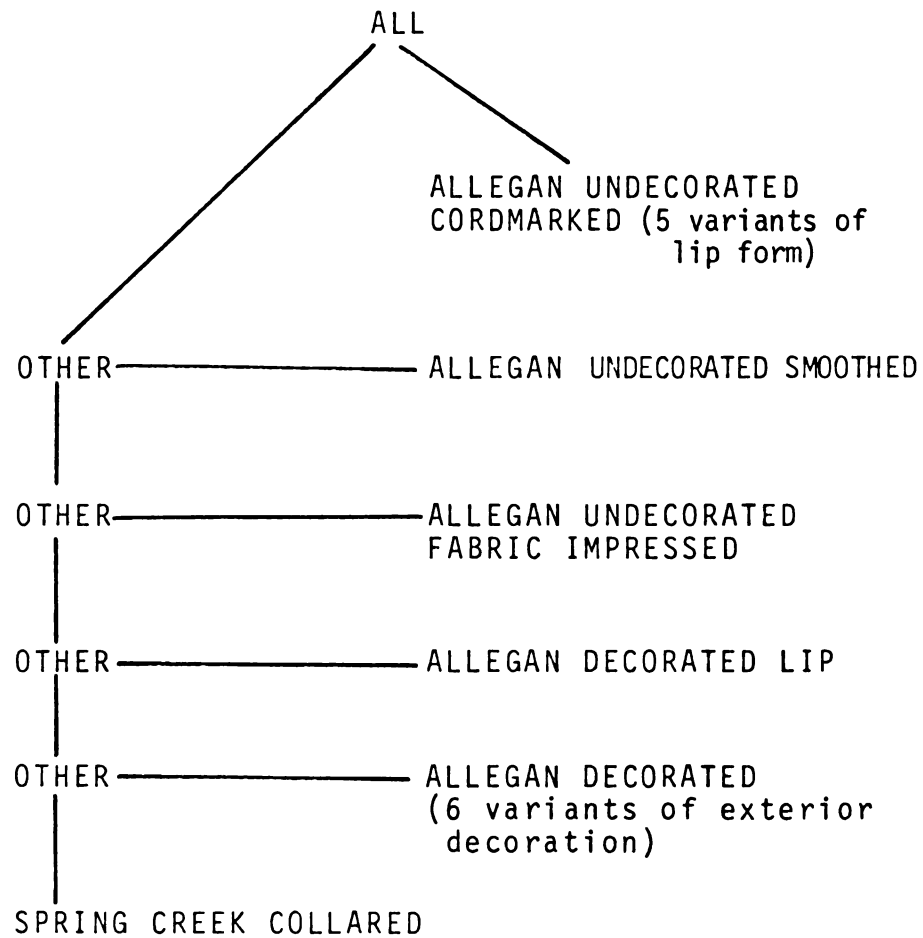
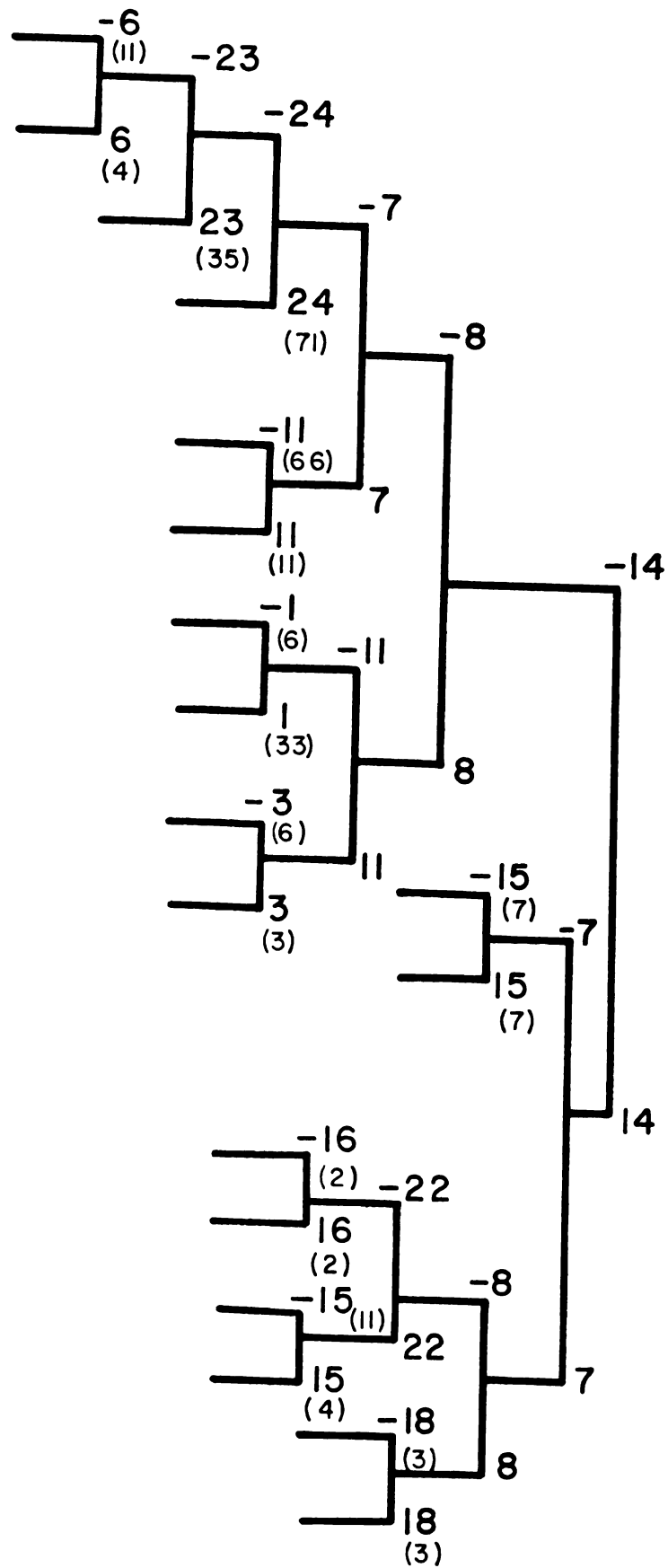


Figure 21. -- TYPE Diagram of Ceramics from Southwest Sites with Smallest Acceptable Cell Value Set at .05 (Numbers in parentheses are the number of vessels in a branch).

Attribute List

- | | |
|--------------------------------|-------------------------------|
| 1. Flat lip cross-section | 13. Brushed interior |
| 2. Round lip cross-section | 14. Exterior decoration |
| 3. Thickened lip cross-section | 15. Sharp exterior tool |
| 4. Flat lip planview | 16. Curvelinear exterior tool |
| 5. Rolled Rim | 17. Impressed exterior |
| 6. Collared Rim | 18. Incised exterior |
| 7. Lip preparation smoothed | 19. Punctate exterior |
| 8. Lip decoration | 20. Acute punctate exterior |
| 9. Incised lip | 21. Horizontal exterior |
| 10. Impressed lip | 22. Vertical exterior |
| 11. Everted rim | 23. Thickness: 2-5.9 mm. |
| 12. Smoothed interior | 24. Thickness: 6-8.9 mm. |



Division on this attribute would appear to be consistent with the implicit distinction made in the Kingsley (1977) and Rogers (1972) typologies between decorated and undecorated ceramics. Subsequent divisions, in the TYPE analysis, however, do not partition the exterior decorated ceramics according to type of exterior decoration which is clearly the defining series of attributes for both the Kingsley and Rogers classifications. Within the group of ceramics lacking exterior decoration the first major division is based on the presence or absence of lip decoration. Plain vessels having lip decoration are similar but not identical to the type Allegan Decorated Lip defined by Kingsley (1977) and the type Moccasin Bluff Modified Lip defined by Bettarel and Smith (1973) because the original type definitions fail to specify whether decorated lip vessels possess or lack exterior decoration. Later subdivisions of undecorated ceramics do not resemble any of the previously defined types. The attributes for collars and rolled rims defining the types Spring Creek Collared and Moccasin Bluff Collared appear in dispersed groups at lower levels of significance in the TYPE analysis.

The results of the CLUSTER analysis of vessels from the Southwest area are presented in Figure 22 and Table 6. The results of the CLUSTER analysis is similar to TYPE in the distinction between some but not all exterior decorated and plain ceramics at Step 4, and the identification of a cluster of plain ceramics, all with lip decoration, at Step 2. This group (cluster group 5) is the only cluster group similar to one defined by previous studies. As in the TYPE analysis, however, vessels with exterior decoration are not included. Cluster group 5 is most similar to previously defined Moccasin Bluff Modified Lip and Allegan Decorated Lip.

Figure 22. -- CLUSTER Diagram of Last Nine Steps
from Sites in the Southwest. (Figures in
parentlieses are the number of vessels in
that cluster)

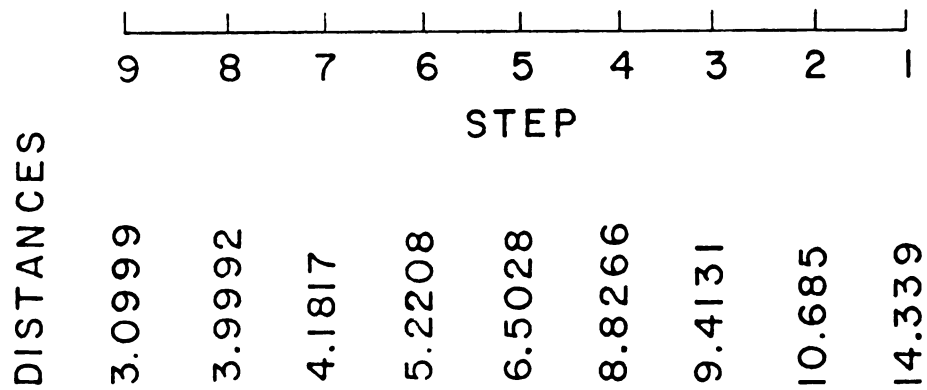
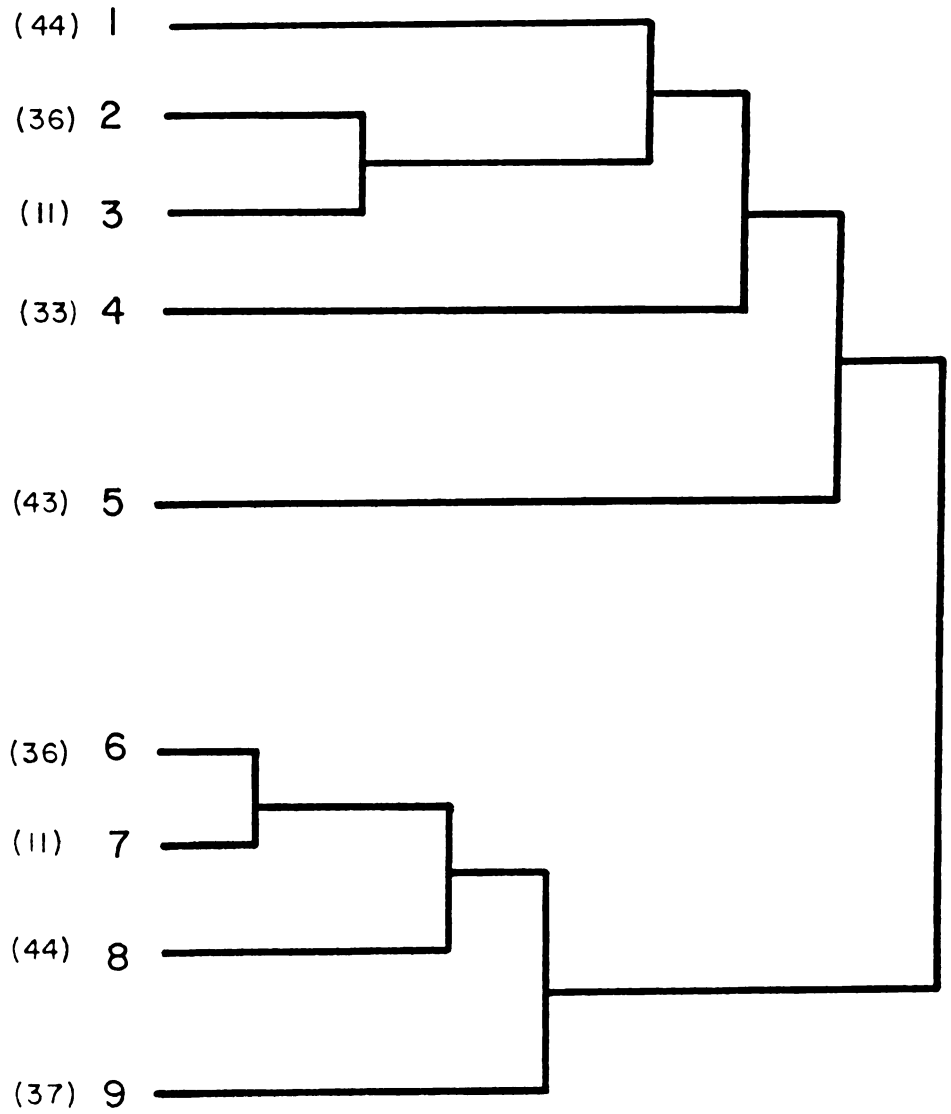


Table 6. -- Frequency and Percentages of Attributes
in Southwest Cluster Groups

Dimension	Attributes	1 N %	2 N %	3 N %	4 N %	5 N %	6 N %	7 N %	8 N %	9 N %
Lip cross-section	flat	32/84.	0/0	0/0	33/100	39/90.7	31/86.1	7/63.6	44/100	37/100
	round	2/ 5.2	16/44.4	0/0	0/0	4/9.3	0/0	2/18.1	0/0	0/0
	thickened	0/0	13/36.1	11/100	0/0	0/0	2/ 5.5	0/0	0/0	0/0
Lip planview	flat	37/97.4	36/100	11/100	33/100	43/100	36/100	11/100	43/97.7	33/89.2
Rim thickening	rolled	8/21.0	1/ 2.8	0/0	6/18.2	5/11.6	24/66.7	1/ 9.1	0/0	7/18.9
	collared	5/13.2	2/ 5.6	0/0	0/0	3/ 7.0	0/0	0/0	11/25.0	5/13.5
Lip preparation	smoothed	25/65.8	28/77.8	3/27.3	9/27.3	41/95.3	5/13.9	4/36.4	0/0	37/100
Lip decoration	present	6/15.8	5/13.9	0/0	0/0	43/100	0/0	0/0	0/0	0/0
Lip technique	incised	3/ 7.9	3/ 8.3	0/0	0/0	8/18.6	0/0	0/0	0/0	0/0
	impressed	3/ 7.9	2/ 5.6	0/0	0/0	34/79.1	0/0	0/0	0/0	0/0
Rim flare	everted	5/13.2	11/30.6	5/45.4	6/18.2	6/14.0	13/36.1	0/0	0/0	0/0
Interior pre-paration	smoothed	33/86.8	28/77.8	9/81.8	25/75.8	39/90.7	27/75.	0/0	44/100	37/100
	brushed	4/10.5	0/0	0/0	1/ 3.0	1/ 2.3	0/0	10/90.9	1/ 2.3	0/0
Exterior decoration	present	38/100	0/0	0/0	0/0	0/0	0/0	0/0	1/ 2.3	0/0
Exterior tool	pointed	15/39.5	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	curvilinear	16/42.1	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Exterior technique	impressed	13/34.2	0/0	0/0	0/0	0/0	0/0	0/0	1/ 2.3	0/0
	incised	8/21.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	90 degree									
	punctate	12/31.6	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	acute									
	punctate	4/10.5	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Exterior orientation	horizontal	16/42.1	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	vertical	18/47.4	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Thickness	2 - 5.9 mm.	11/28.9	4/11.1	11/100	29/87.9	8/18.6	0/0	0/0	2/ 4.5	0/0
	6 - 8.99mm.	24/63.2	24.66.7	0/0	0/0	29.67.4	26/72.2	10/90.9	38/86.4	36/97.3
TOTAL N		38	36	11	33	43	36	11	44	37

Fourteen out of a total of 78 vessels of Spring Creek Collared are isolated at step 20 and in cluster groups at earlier steps in the agglomeration. That is, vessels which would have been defined as Spring Creek or Moccasin Bluff Collared join non-collared cluster groups at early stages in the agglomerating hierarchy. Since 28 percent of the vessels in the southwest area are collared we would expect more than five percent of the collared vessels to occur at a relatively high level in the hierarchy (Green, 1974:48).

The hypothesis that TYPE and CLUSTER analyses will group Southwest area ceramic vessels into groups resembling those defined in previous classifications fails to be entirely supported. The types Moccasin Bluff Modified Lip and Allegan Decorated Lip appear to be supported but only for ceramics lacking exterior decoration. The implicit distinction in earlier intuitive classifications between exterior decorated ceramics and plain ceramics is demonstrated. A revision of ceramic classification for the southwest area is therefore proposed.

Allegan Ware is the general term encompassing the two groups and is chosen over Moccasin Bluff Ware because the term Allegan Ware has historical precedence. Two major ceramic groups exist within Allegan Ware which should be called Allegan Decorated (Figures 23, 25, 29) and Allegan Undecorated (Figures 23, 25, 27, 29). The group Allegan Undecorated Modified Lip is proposed as a variant of Allegan Undecorated. The groups formerly defined as Spring Creek Collared and Moccasin Bluff Collared might best be redefined as variants or sub-variants of Allegan Ware. Retaining the name Spring Creek Collared for collared ceramics from the Southwest area would erroneously imply that the Northwest and Southwest areas belong to the same ceramic traditions. These types are

Figure 23. -- Allegan Ware Ceramics from the
Forty-Sixth Street Site

- A-B Allegan Decorated
- C-E Allegan Undecorated, with Collars
- F-G Allegan Undecorated,
Undecorated Lip

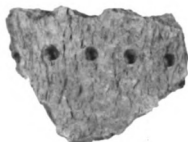
**A****B****C****D****E****F****G**

Figure 24. -- Allegan Ware Ceramic Profiles
from the Forty-Sixth Street Site

Profiles correspond to vessels
illustrated in Figure 23,
exteriors to the left.

Figure 25. -- Allegan Ware Ceramics
from the Fennville Site

- A-C Allegan Undecorated
- D-F Allegan Undecorated (with collar)
- G Allegan Decorated (crosshatched)
- H Allegan Decorated (collar, corded punctate)
- I Allegan Decorated (corded punctate)
- J Allegan Decorated (rocker stamped)
- K Allegan Decorated (punctate, collared)

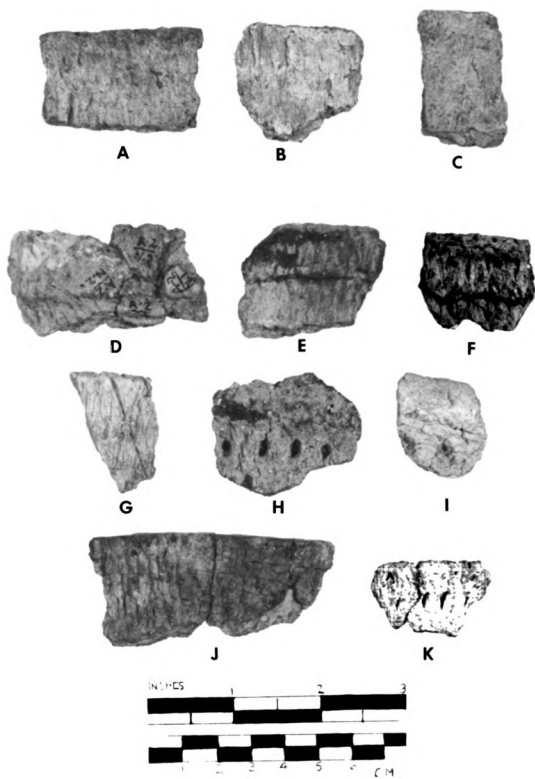


Figure 26. -- Allegan Ware Ceramic Profiles
from the Fennville Site

Profiles correspond to vessels
illustrated in Figure 25,
exteriors to the left

Figure 27. -- Allegan Ware Ceramics from
the Moccasin Bluff Site

A-G Allegan Undecorated, Plain Lip

H Allegan Undecorated, Decorated Lip

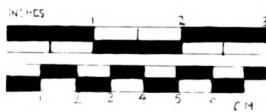
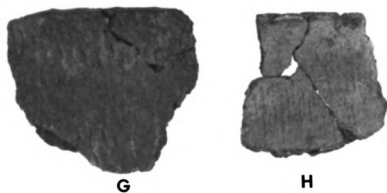
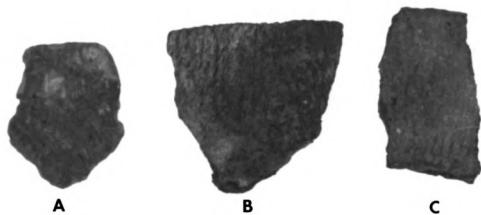


Figure 28. -- Allegan Ware Ceramic Profiles
from the Moccasin Bluff Site

Profiles correspond to Vessels
illustrated in Figure 27,
exteriors to the left

Figure 29. -- Allegan Ware Ceramics from
the Moccasin Bluff Site

- A Allegan Decorated
- B-E Allegan Undecorated, Decorated Lip
- F-H Allegan Undecorated, (collared)

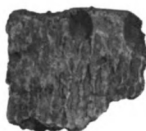
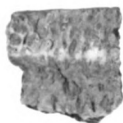
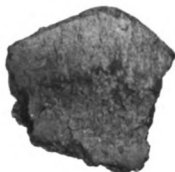
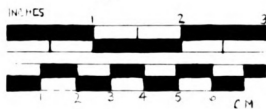
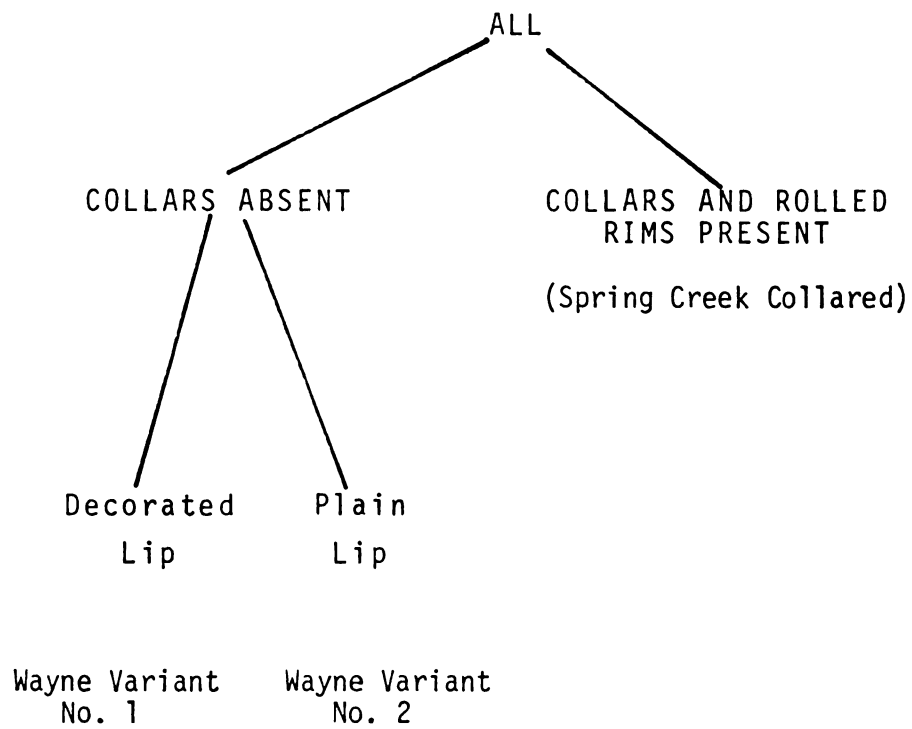
**A****B****C****D****E****F****G****H**

Figure 30. -- Allegan Ware Ceramic Profiles
from the Moccasin Bluff Site

Profiles correspond to Vessels
illustrated in Figure 29,
exteriors to the left

Figure 31. -- Fitting (1968) Typology of Spring Creek Site Ceramics



formally described in Appendix F.

Northwest Area

Previous research in the Northwest sub-area has resulted in two different ceramic typologies. The first, based on a large collection of ceramics from the Spring Creek Site, proposes three types, Spring Creek Collared, Wayne Cord Marked Variant No. 1 with lip decoration, and Wayne Cordmarked Variant No. 2 lacking lip decoration. (Fitting, 1968: 24-26). A schematic representation appears in Figure 31. An earlier classification of ceramics from the Spoonville Site proposes two groups of ceramics: Crockery Ware, and classic Hopewell and Goodall Focus Middle Woodland Ceramics. (Flanders, 1965: 341-350). Within Crockery Ware are the styles Crockery Flared rim and Crockery Cambered rim. Crockery Cambered is clearly a Middle Woodland rim form with smoothed exterior surface and Middle Woodland design motifs such as rocker stamping, straight dentate stamping and incising. Crockery Flared, however, is a type consistent with Fitting's (1968) definition of Wayne Ware from the Spring Creek Site. Crockery Flared Rim is not subdivided by Flanders, however, approximately 92% of the vessels are cordmarked or smoothed over cordmarked, 24% of the vessels had lip decoration and an unspecified number of vessels had rolled rims or thickened lips (Flanders, 1965: 345).

A comparison the Spring Creek typology developed by Fitting (1968) with those generated here permits the testing of the proposition concerning the structure of ceramic relationships in the northwest sub-area. The proposition states: the CLUSTER and TYPE analyses will group northwest area ceramics into groups which resemble the Fitting Spring Creek types.

The TYPE and CLUSTER analysis of 597 vessels show no major groupings of vessels analogous to those suggested by Fitting (1968).

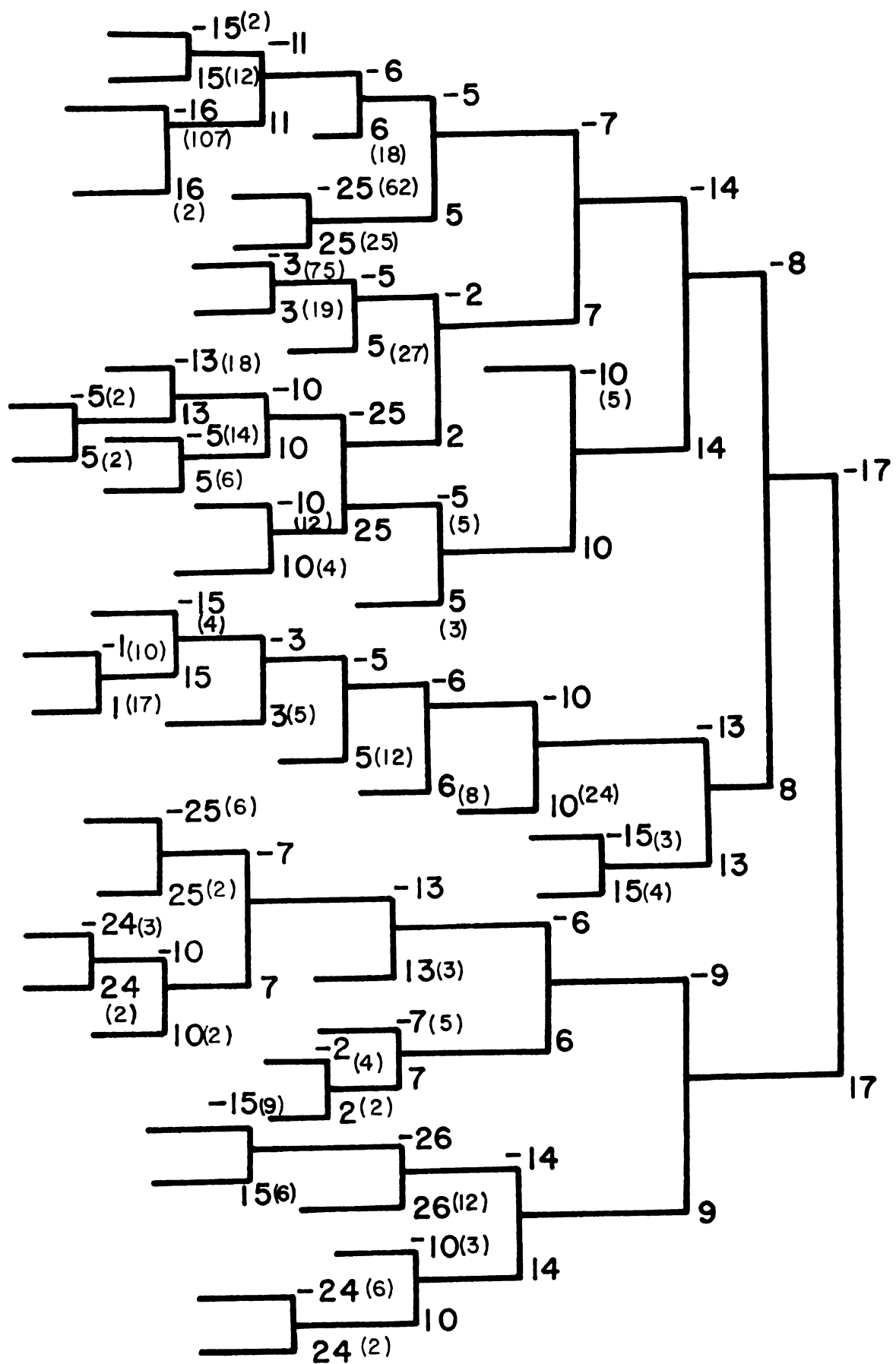
Figure 32 presents the results of the TYPE analysis with the smallest acceptable expected cell value set at .5. The first major division occurs not on the presence or absence of collars or rolled rims but on the presence or absence of exterior decoration. The attributes for collaring and rolled rims do occur in the hierarchy but in much lower levels having less statistical significance. The group defined by plain exterior and presence of lip decoration is similar to Fitting's Wayne Cordmarked Variant No. 1 but is not identical because a large number of exterior decorated vessels (37 or 6.2% of the sample) having decorated lips and cordmarked exteriors are found in the other major branch of the hierarchy.

The results of the CLUSTER analysis are presented in Figure 33 and Table 7. The results of the TYPE and CLUSTER analyses are similar to each other. None, however, of the CLUSTER groups in the analysis are identical to types suggested by the Fitting (1968) typology. Seventeen of a total 266 vessels of Spring Creek Collared are isolated in a cluster group defined at Step 20, and in clusters occurring at earlier steps in the agglomeration. The type Spring Creek Collared does not occur as a discrete cluster in any of the last 20 agglomerative steps. In other words, Spring Creek Collared vessels join a non-Spring Creek Collared cluster at relatively early stages in the development of the hierarchy. Because 44.6% of the vessels in the sample are Spring Creek Collared by Fitting's definition, we would expect a pure Spring Creek Collared cluster of more than 2.8% to occur at a relatively high level in the hierarchy even following the assumptions of polythetic clustering

Figure 32. -- TYPE Diagram of Ceramics from the Northwest with Smallest Acceptable Cell Value Set at .5. (Numbers in parentheses are the number in the group)

Attribute List

- | | |
|--------------------------------|-----------------------------|
| 1. Flat lip cross-section | 15. Cordmarked exterior |
| 2. Round lip cross-section | 16. Fabric marked exterior |
| 3. Thickened lip cross-section | 17. Exterior decoration |
| 4. Flat lip planview | 18. Impressed exterior |
| 5. Rolled rim | 19. Incised exterior |
| 6. Collared rim | 20. Punctate exterior |
| 7. Smoothed lip preparation | 21. Acute punctate exterior |
| 8. Lip decoration | 22. Horizontal exterior |
| 9. Impressed lip | 23. Vertical exterior |
| 10. Everted rim | 24. Oblique exterior |
| 11. Smoothed interior | 25. Thickness: 2-5.9 mm. |
| 12. Brushed interior | 26. Thickness: 6-8.9 mm. |
| 13. Interior decoration | 27. Paste: sandy |
| 14. Impressed interior | 28. Paste: silty |



(Green, 1974:48). At step 7 the largest group of vessels (N=79) with decorated lips corresponding to Wayne Cordmarked Variant No. 1 is joined to another cluster group of which only 66% have decorated lips. Of all the cluster groups this is most similar to any types proposed by Fitting (1968) but again lacks membership of other cordmarked decorated lip vessels which are joined to dissimilar clusters at early stages in development of the hierarchy.

The proposition that TYPE and CLUSTER analyses will group northwest area ceramics into groups resembling the Fitting types is not supported. The two classifications do indicate, however, some structural relationships in the ceramic assemblage with respect to attributes which are important in determining group or type composition. The following revisions are proposed for the northwest area. The term Crockery Ware, (Flanders, 1965) defined historically prior to Spring Creek Ceramics, (Fitting, 1968), would appear to take precedence over Spring Creek in the reclassification. The term Spring Creek Ware for northwest area ceramics is favored, however, over Crockery Ware because the latter appears to include both Middle and Early Late Woodland forms. Two ceramic groups or types exist which should be called Spring Creek Decorated (Figures 34-42, 46-48) and Spring Creek Undecorated (Figures 38, 44, 50). The type formerly defined as Spring Creek Collared should be redefined as a variety of Spring Creek Ware, depending on the presence or absence of exterior decoration. A new variety, decorated lip, also is defined for Spring Creek Undecorated. Formal type definitions for the Spring Creek Tradition are given in Appendix F.

Figure 33. -- CLUSTER Diagram of Last 13 Steps
from the Northwest Area. (Numbers in
parentheses are numbers of vessels
in the cluster)

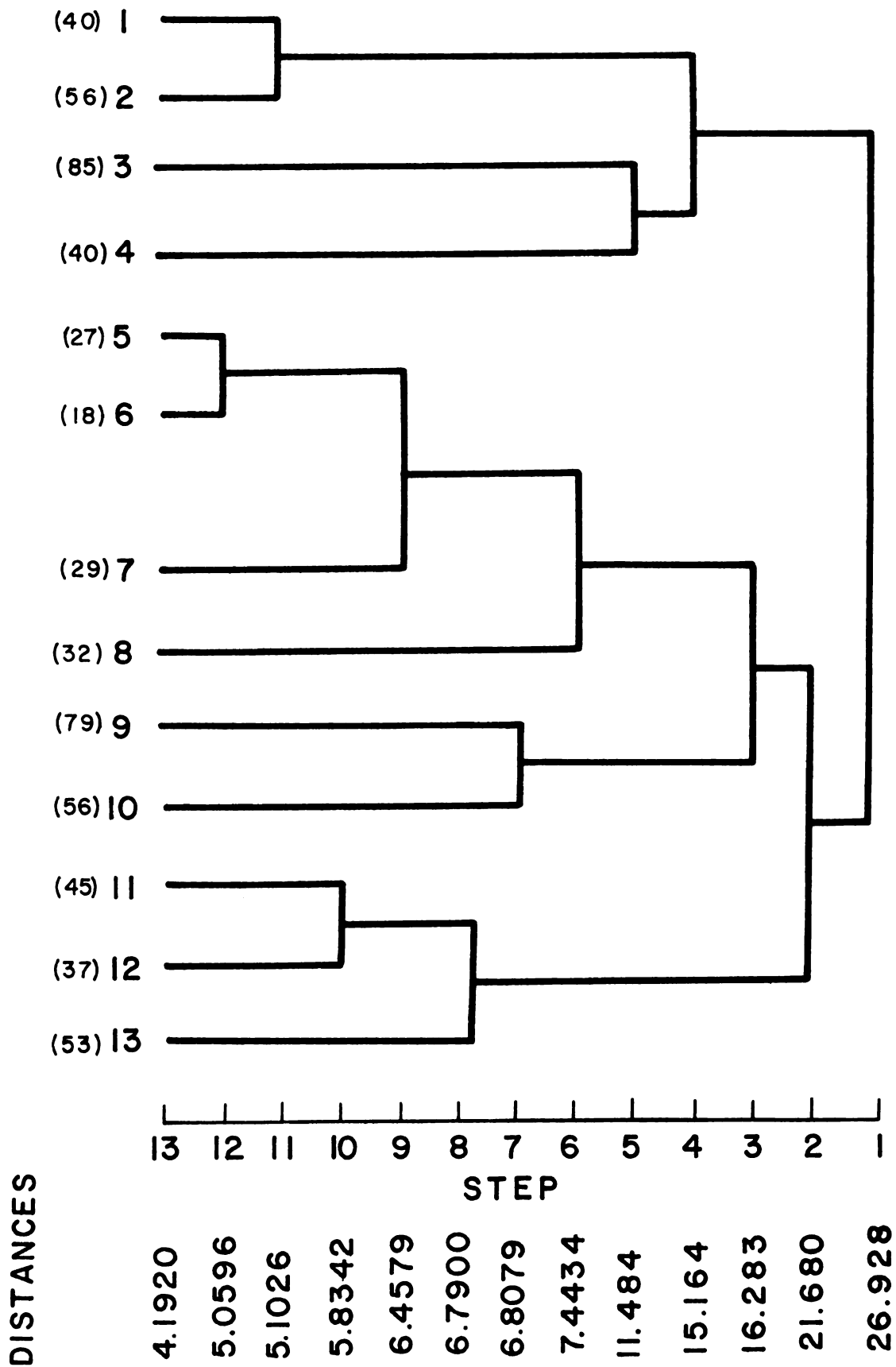


Table 7. -- Frequency and Percentages of Attributes
in Northwest Cluster Groups

Dimension	Attributes	1	2	3	4	5	6	7	8	9	10	11	12	13
		N %	N %	N %	N %	N %	N %	N %	N %	N %	N %	N %	N %	N %
Lip cross-section	flat	33/82.5	56/100	84/98.8	0/0	0/0	10/55.6	0/0	0/0	44/55.7	32/57.1	44/97.8	11/29.7	53/100
	round	0/0	0/0	1/ 1.2	0/0	26/96.3	7/38.9	28/96.6	30/93.8	22/27.8	16/28.6	0/0	1/ 2.7	0/0
	thickened	3/ 7.5	0/0	0/0	38/95.0	0/0	0/0	0/0	0/0	8/10.1	1/ 1.9	0/0	22/59.5	0/0
Lip planview	flat	39/97.5	56/100	85/100	40/100	27/100	17/94.4	29/100	32/100	79/100	56/100	45/100	37/100	53/100
Rim thickening	rolled	0/0	35/62.5	38/44.7	1/ 2.5	15/55.6	10/55.6	9/31.	9/28.1	26/32.9	11/19.6	13/28.9	7/18.9	18/34.0
	collared	9/22.5	0/0	7/ 8.2	1/ 2.5	1/ 3.7	0/0	4/13.8	3/ 9.4	9/11.4	25/44.6	12/26.7	1/ 2.7	2/ 3.8
Lip preparation	smoothed	19/47.5	15/26.8	32/37.6	14/35.	15/55.6	12/66.7	18/62.1	25/78.1	68/86.1	43/77.8	18/40.	10/27.0	26/49.1
Lip decoration	present	0/0	0/0	3/ 3.5	0/0	0/0	7/38.9	0/0	0/0	79/100	37/66.1	0/0	1/ 2.7	10/18.9
Lip technique	impressed	0/0	0/0	0/0	0/0	0/0	6/33.3	0/0	0/0	69/87.3	35/62.5	0/0	1/ 2.7	6/11.3
Rim flare	everted	2/ 5.0	43/76.8	29/34.1	17/42.5	16/59.3	6/33.3	10/34.5	15/46.9	25/31.6	20/35.7	19/42.2	19/51.4	19/35.8
Interior preparation	smoothed	39/97.5	48/87.5	78/91.8	36/90.	25/92.6	0/0	19/65.5	32/100	71/89.9	50/89.3	42/93.3	32/86.5	49/92.5
	brushed	0/0	1/ 1.8	5/ 5.9	2/ 5.0	1/ 3.7	18/100	7/24.1	0/0	3/ 3.8	3/ 5.4	0/0	0/0	4/ 7.5
Interior decoration	present	0/0	0/0	0/0	1/ 2.5	1/ 3.7	2/11.1	0/0	1/ 3.1	20/25.3	12/21.4	0/0	17/45.9	46/86.8
Interior technique	impressed	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	20/25.3	11/19.6	0/0	14/37.8	0/0
Exterior preparation	cord-marked	13/82.5	47/83.9	73/85.9	38/95.	25/92.6	11/61.1	22/75.9	22/68.8	65/82.3	37/66.1	42/93.3	35/94.6	0/0
	fabric	0/0	4/ 7.1	7/ 8.2	0/0	0/0	1/ 5.6	0/0	0/0	1/ 1.3	1/ 1.9	3/ 6.7	0/0	0/0
Exterior decoration	present	2/ 5.0	0/0	0/0	0/0	0/0	0/0	1/ 3.4	0/0	4/ 5.1	55/98.2	0/0	5/13.5	0/0
Exterior technique	impressed	0/0	0/0	0/0	0/0	0/0	0/0	1/ 3.4	0/0	0/0	9/16.1	0/0	0/0	0/0
	incised	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	1/ 1.3	12/21.4	0/0	4/10.8	0/0
	90 degree	2/ 5.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	1/ 1.3	4/ 7.1	0/0	0/0	0/0
	punctate	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	2/ 2.5	30/53.6	0/0	0/0	0/0
	acute-	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	18/32.1	0/0	3/ 8.1	0/0
	punctate	1/ 2.5	0/0	0/0	0/0	0/0	0/0	1/ 3.4	0/0	1/ 1.3	9/16.1	0/0	0/0	0/0
Exterior orientation	horizontal	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	3/ 3.8	25/44.6	0/0	2/ 5.4	0/0
	vertical	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	30/38.0	22/39.3	26/57.8	14/37.8	0/0
	oblique	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	38/48.1	27/48.2	3/ 6.7	19/51.4	53/100
Thickness	2 - 5.9 mm.	0/0	0/0	74/87.1	24/60.	0/0	0/0	29/100	0/0	20/25.3	15/26.8	45/100	29/78.4	53/100
	6 - 8.9 mm.	38/95.0	55/98.2	1/ 1.2	14/35.	24/88.9	17/94.4	0/0	26/81.3	59/74.7	41/73.2	0/0	8/21.6	0/0
Paste	sandy	0/0	0/0	1/ 1.2	0/0	0/0	1/ 5.6	13/44.8	32/100	20/25.3	15/26.8	45/100	29/78.4	53/100
	silty	40/100	56/100	84/98.8	40/100	27/100	17/94.4	16/55.2	0/0	59/74.7	41/73.2	0/0	8/21.6	0/0
Total N		40	56	85	40	27	18	29	32	79	56	45	37	53

Figure 34.-- Spring Creek Ware Ceramics
from the Zemaitis Site

A-F Spring Creek Undecorated,
Undecorated Lip

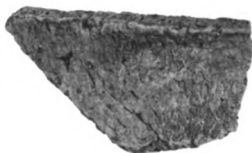
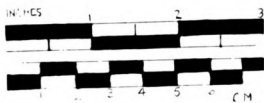
**A****B****C****D****E****F**

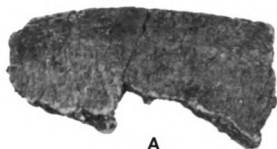
Figure 35. -- Spring Creek Ware Ceramic Profiles
from the Zemaitis Site

Profiles correspond to Vessels
illustrated in Figure 34,
exteriors to the left

**A****B****C****D****E****F**

Figure 36. -- Spring Creek Ware Ceramics
from the Zemaitis Site

- A Spring Creek Undecorated, Undecorated
Lip
- B-C Spring Creek Undecorated, Decorated
Lip



A



B



C

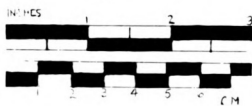


Figure 37. -- Spring Creek Ware Ceramic
Profiles from the Zemaitis
Site

Profiles correspond to vessels
illustrated in Figure 36,
exteriors to the left

Figure 38. -- Spring Creek Ware Ceramics
from the Zemaitis Site

- A Spring Creek Undecorated, Undecorated
Lip (collared)
- B Spring Creek Decorated

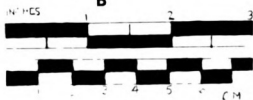
**A****B**

Figure 39. -- Spring Creek Ware Ceramic Profiles
from the Zemaitis Site

Profiles correspond to vessels
illustrated in Figure 38,
exteriors to the left.

Figure 40. -- Spring Creek Ware Ceramics
from the Spoonville Site

- A, C-G Spring Creek Undecorated
Undecorated Lip
- B Spring Creek Undecorated,
Decorated Lip

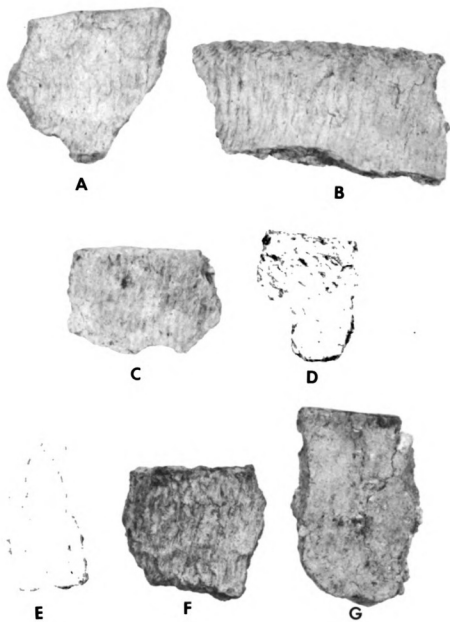


Figure 41. -- Spring Creek Ware Ceramic Profiles
from the Spoonville Site

Profiles correspond to vessels
illustrated in Figure 40,
exteriors to the left.

Figure 42. -- Spring Creek Ware Ceramics
from the Spoonville Site

A-F Spring Creek Undecorated,
Undecorated Lip (collared)

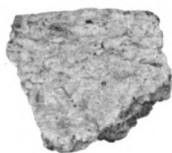
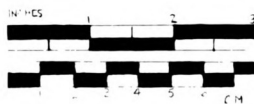
**A****B****C****D****E****F**

Figure 43. -- Spring Creek Ware Ceramic Profiles
from the Spoonville Sites

Profiles correspond to vessels
illustrated in Figure 42,
exteriors to the left



A



B



C



D



E



F

Figure 44. -- Spring Creek Ware Ceramics
from the Spoonville Site

- A-B Spring Creek Decorated
(incised)
- C Spring Creek Decorated
(cord impressed)
- D-E Spring Creek Decorated
(corded punctate)

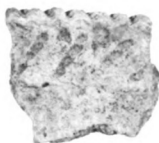
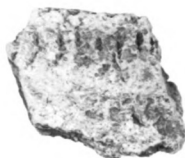
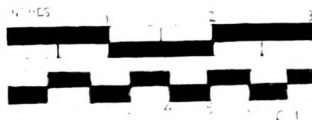
**A****B****C****D****E**

Figure 45. -- Spring Creek Ceramic Profiles
from the Spoonville Site

Profiles correspond to vessels
illustrated in Figure 44,
exteriors to the left.

Figure 46. -- Spring Creek Ware Ceramics
from the Spring Creek Site

A, C-G Spring Creek Undecorated,
Undecorated Lip

B, H Spring Creek Undecorated,
Decorated Lip

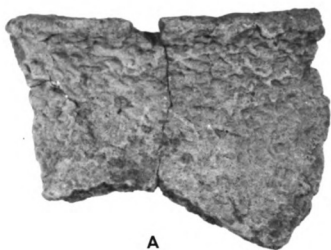
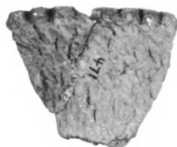
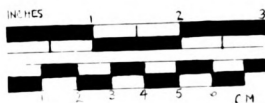
**A****B****C****D****E****F****G****H**

Figure 47. -- Spring Creek Ware Profiles
from the Spring Creek Site

Profiles correspond to vessels
illustrated in Figure 46,
exteriors to the left.

Figure 48. -- Spring Creek Ware Ceramics
from the Spring Creek Site

- A, C, D, F Spring Creek Undecorated,
Undecorated Lip (collared)
- B, E Spring Creek Undecorated
Decorated Lip (collared)

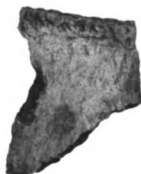
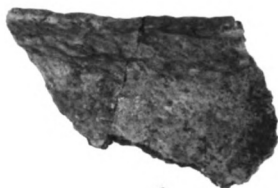
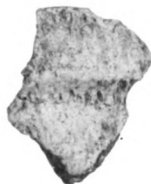
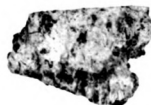
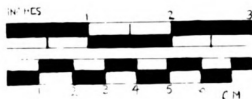
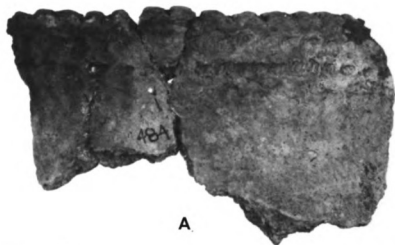
**A****B****C****D****E****F**

Figure 49. -- Spring Creek Ware Ceramic Profiles
from the Spring Creek Site

Profiles correspond to vessels
illustrated in Figure 48,
exteriors to the right.

Figure 50. -- Spring Creek Ware Ceramics
from the Spring Creek Site

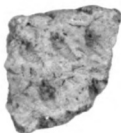
A-F Spring Creek Decorated
(collared, corded punctate)



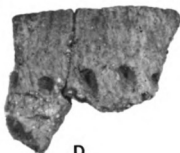
A



B



C



D



E



F

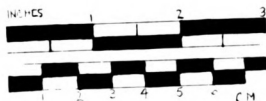


Figure 51. -- Spring Creek Ware Ceramic Profiles
from the Spring Creek Site

Profiles correspond to vessels
illustrated in Figure 50,
exteriors to the right.

Northeast Area

Though ceramics from the Northeast area were not shown to be statistically significant from Wayne Tradition ceramics in the southeast (See page 88), they were analyzed separately as a check on the validity of the hypothesis tests. Furthermore, previous studies (Fischer, 1972) had indicated that the Saginaw and Detroit Wayne Wares were different. Therefore, a more detailed knowledge of the kinds of ceramics from the two areas and their relationships was necessary. Several different classifications have been proposed for ceramics in the Northeast area. The earliest typology proposed by Brose (1966) for the Valley Sweets site, relied on the original typology of Wayne Ware by Fitting (1965) and cited the presence of Wayne Cordmarked and Wayne Punctate (Figure 52). An additional type, Wayne Textile Marked was added. Wobst (1968) described ceramics from the Butterfield Site as examples of Wayne Cordmarked Variants No. 1 and 2 after Fitting's (1968) classification of Spring Creek ceramics. Fitting and Sassé (1969) noted the presence of Wayne Cordmarked Ceramics, at the Hodges site in addition to Saginaw Thin, a type proposed by Fischer (1972) for the Schultz Site. Fischer (1972: 185) suggested that Saginaw Thin is a northern variant of Wayne Ware. Bigony (1970) suggested the cordmarked ceramics from the Fosters and Stadlemeyer sites were most similar to Mackinac Ware from the Juntunen site. Brashler (1973), working with a larger collection than any of the others, proposed a more complex statistically generated typology of ceramics from the Fletcher site (Figure 53). In that study the presence of Wayne Ware as defined by Fitting (1965) was validated for the Saginaw Valley. In the current study, the Root site was included in the Northeast rather than the

Figure 52. -- Fitting (1965) Classification of Wayne Ware

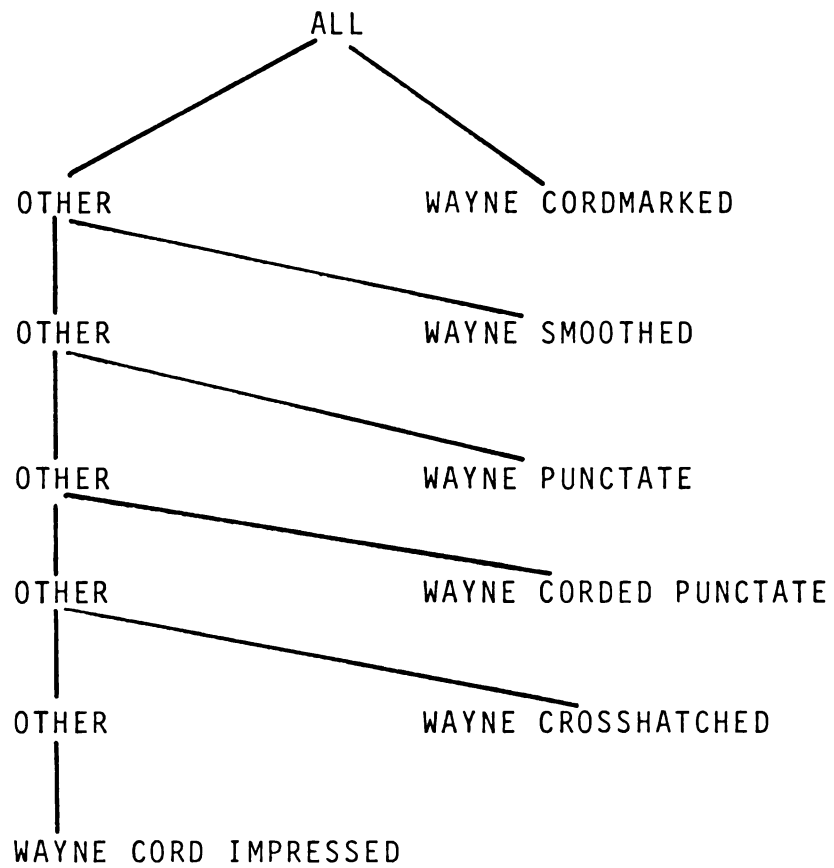
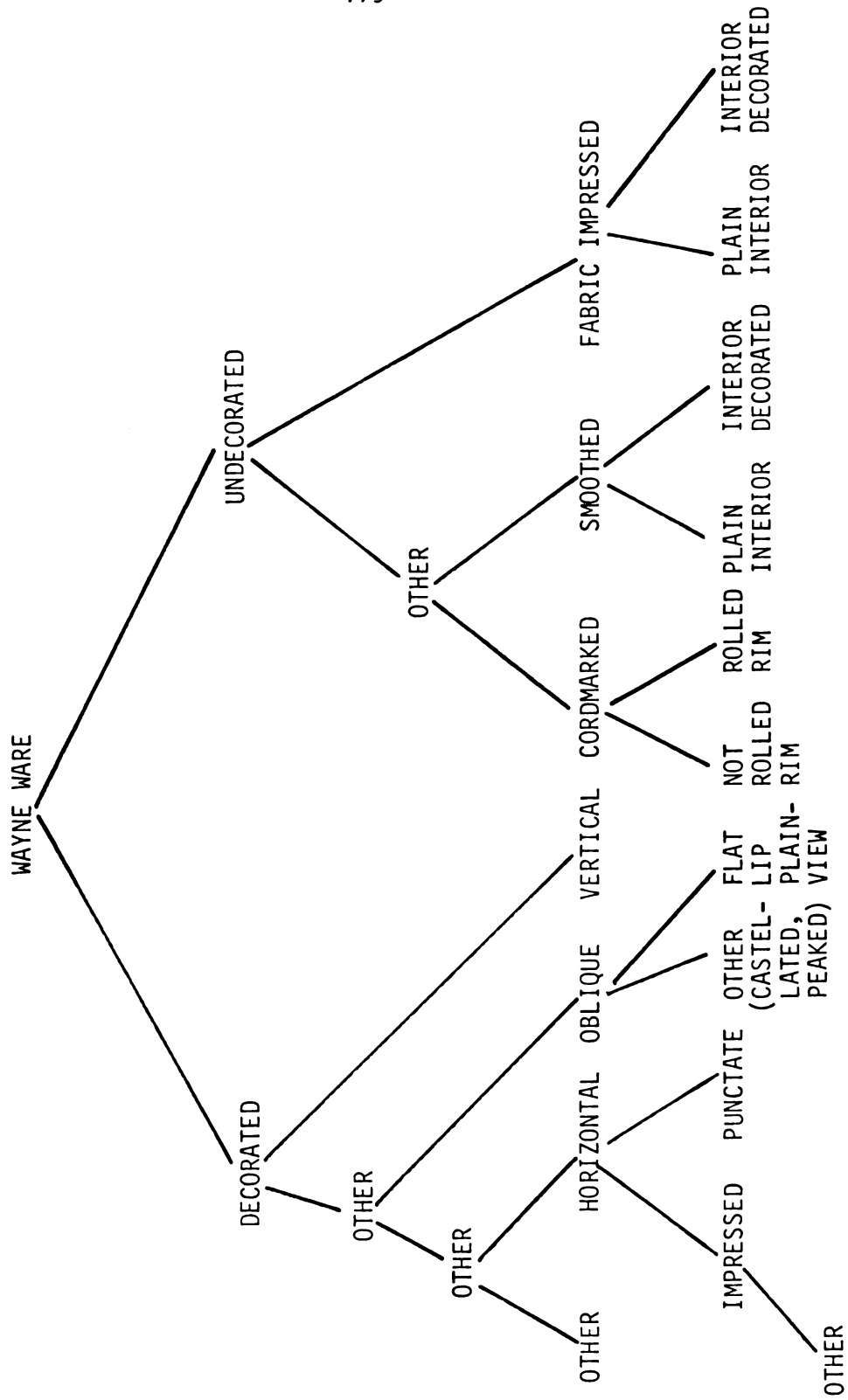


Figure 53. -- Brashler (1973)
Classification of Wayne Ware



Northwest area due to its proximity to the Northeast. The Root site has yielded ceramics identified as Allegan Ware and Mackinac Ware (M. Holman, personal communication).

In spite of the apparent diversity of ceramics from the northeast area the specific proposition to be tested states: ceramic groups formed by CLUSTER and TYPE analyses will resemble one or more of the classifications. Some or all of the types intuitively defined should be identified by TYPE and CLUSTER analyses of all ceramic material, and the relationships between the various types demonstrated.

The classification generated by TYPE is presented in Figure 54. As in the case of the Northwest and Southwest areas the initial division takes place between exterior decorated and plain ceramics. This primary distinction supports the initial intuitive separation of ceramics into decorated and plain groups in the Fletcher site analysis (Brashler, 1973). No other branches of exterior decorated ceramics from the Northeast area resemble previously defined types. Attributes defining orientation of exterior decoration which were significant at a relatively high level in the hierarchical Fletcher Site analysis are not significant in the pooled sample. Other attributes of exterior decoration appear, but at relatively low levels in the hierarchy. The most significant group of ceramics similar to any previously defined type, was isolated at a high level in the hierarchy but consisted of only nine punctate vessels. This group is similar to the group Wayne Punctate defined by Brose (1966). The remaining 15 punctate vessels however, are dispersed in three other branches of exterior decorated ceramics two of which are not identified as significant in the analysis. The attribute defining the type Saginaw Thin was not significant at high levels in

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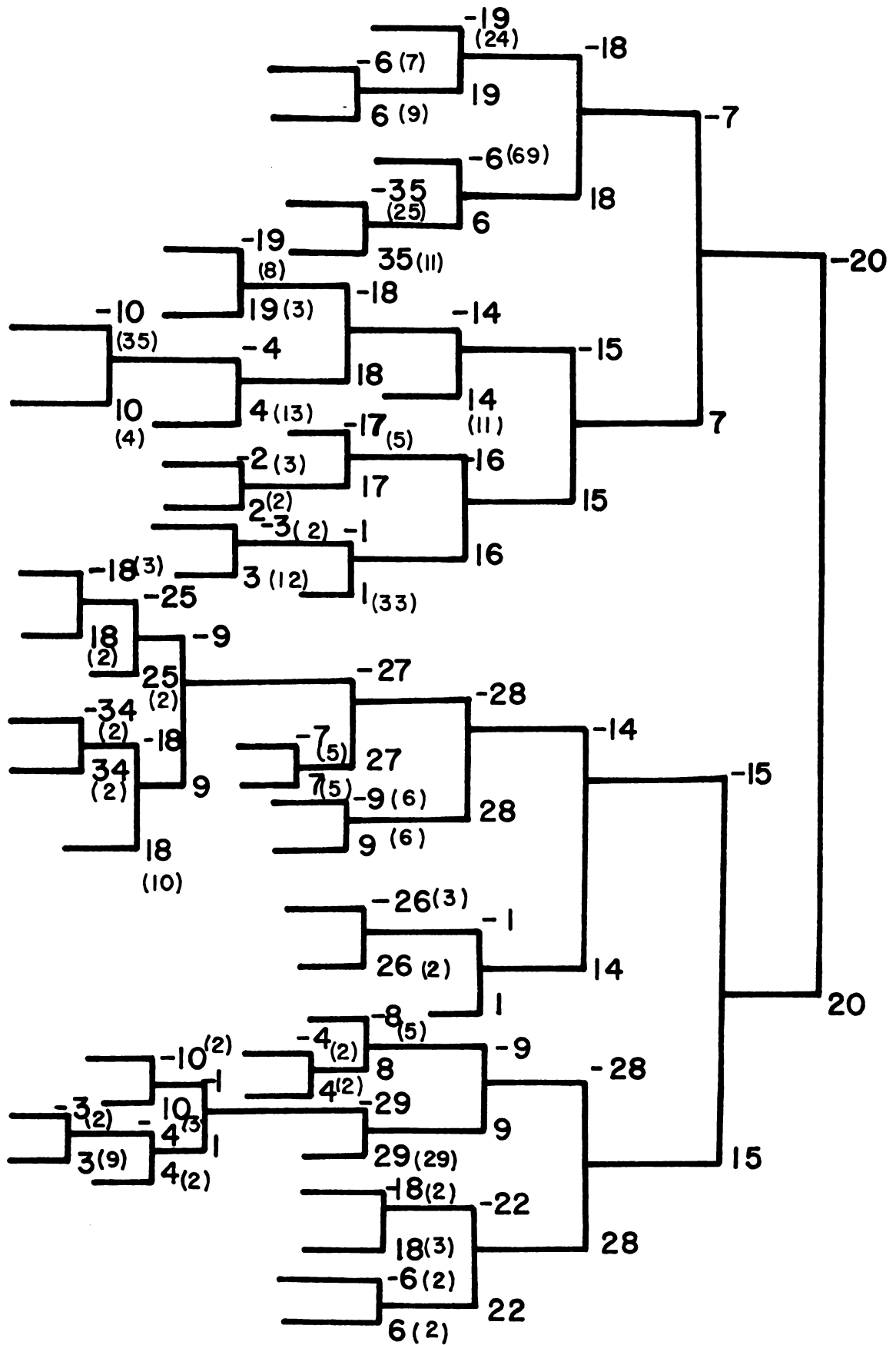
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Figure 54. -- TYPE Diagram of Northeast
Ceramics with Smallest Acceptable Cell Value Set
at .5. (Circled numbers are number
of vessels in each end group)

Attribute List

- | | |
|-------------------------------|-------------------------------------|
| 1. Flat lip cross-section | 19. Oblique cord marking |
| 2. Round lip cross-section | 20. Decorated exterior |
| 3. Flat lip planview | 21. Pointed exterior tool |
| 4. Rolled rim | 22. Curvilinear exterior tool |
| 5. Collared rim | 23. Cordwrapped stick exterior tool |
| 6. Smoothed lip | 24. Cordwrapped paddle edge |
| 7. Decorated lip | 25. Cordwrapped cord exterior tool |
| 8. Incised lip | 26. Impressed exterior |
| 9. Impressed lip | 27. Incised exterior |
| 10. Everted rim | 28. Punctate exterior |
| 11. Smoothed interior | 29. Acute punctate exterior |
| 12. Brushed interior | 30. Horizontal exterior |
| 13. Decorated interior | 31. Vertical exterior |
| 14. Incised interior | 32. Oblique exterior |
| 15. Impressed interior | 33. Cross-hatched exterior |
| 16. Cordmarked exterior | 34. Secondary exterior motif |
| 17. Fabric impressed exterior | 35. Thickness: 2-5.9 mm. |
| 18. Vertical cordmarking | 36. Thickness: 2-5.9 mm. |

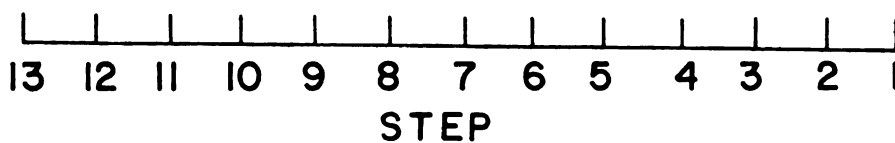
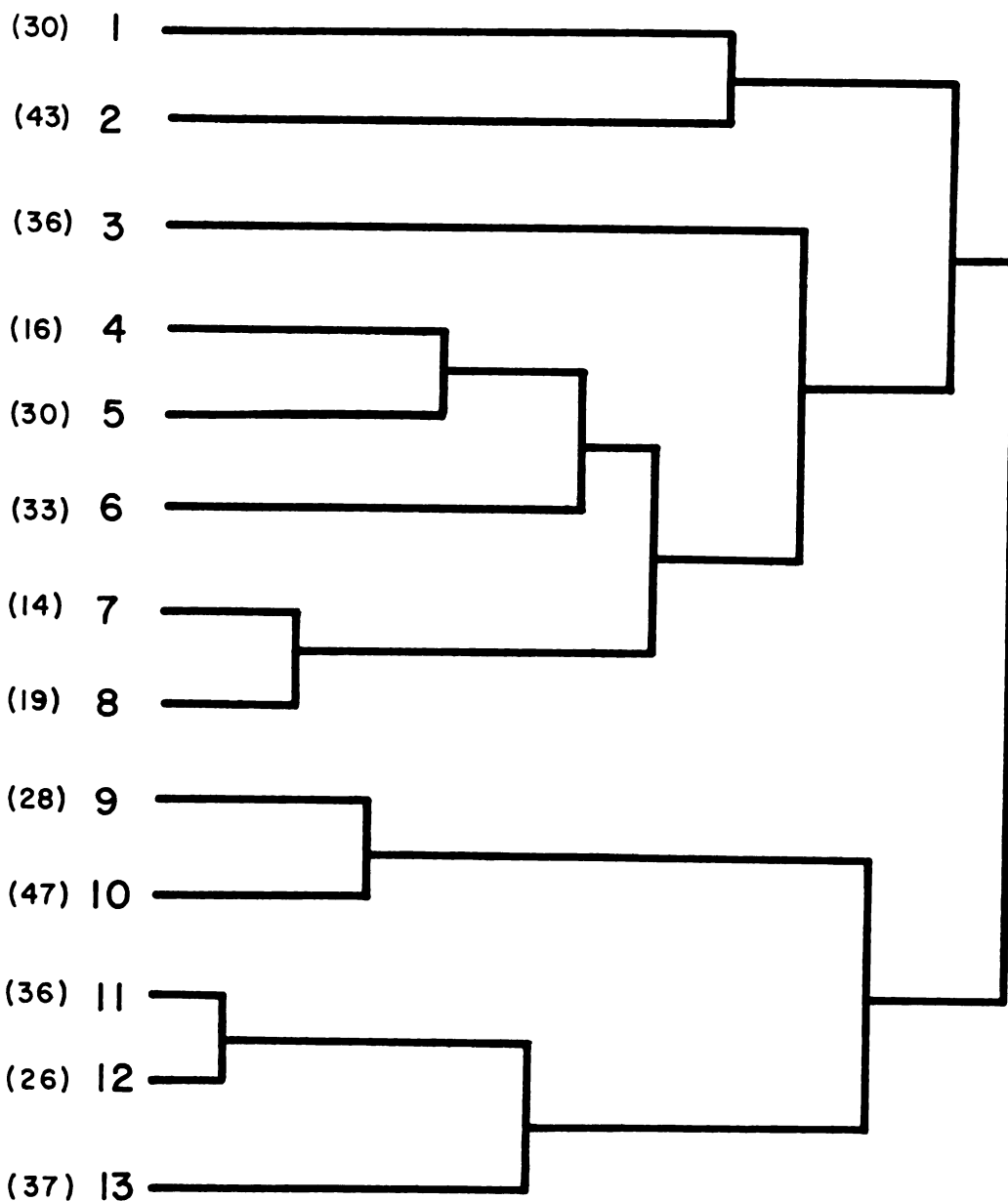


the hierarchy. The attribute which would define Mackinac Ware, rim flare, failed to be selected for any in the sub-division.

Within undecorated ceramics the first division is based on the presence or absence of lip decoration. Vessels with lip decoration are similar to Fitting's Wayne Cordmarked Variant No. 1 identified at the Spring Creek Site while those lacking lip decoration are similar to Wayne Variant No. 2. Because these groups lack exterior decorated vessels with lip modification, a pattern observed in both the Northwest and Southwest area, they are not identical to Fitting's (1968) Spring Creek types. Attributes of exterior surface preparation which were important at relatively high levels within the hierarchical typology of undecorated ceramics in the Fletcher Site analysis do not occur until relatively low (statistically less significant) points in the TYPE hierarchy of the pooled sample. The attributes which defined a possible relationship to Spring Creek Collared in the Fletcher site analysis, collar and rolled rim, do not occur at statistically significant higher levels of the hierarchy. A group of 36 vessels lacking exterior decoration defined by the presence of vertical cordmaking and cordmarked lips are similar to the definition for Allegan Cordmarked, a Southwest Michigan type. Not all vessels possessing these two attributes are included in this group, however. If all of the vessels having vertical cordmarking and cordmarked lips occurred in a single group, the distinction between the Allegan tradition and Saginaw Wayne Tradition would be less clear.

The results of the CLUSTER analysis presented in Figure 55 and Table 8 are quite different than the results of the TYPE analysis and indicate ceramic clusters surprisingly similar to the various types previously defined.

Figure 55. -- CLUSTER Diagram of Last 13
Steps on Ceramics from Northeast Area
(Figures in parentheses are the number
of vessels in each group)



DISTANCES

2.9006
3.5871
3.6803
3.7482
4.9798
5.0306
6.0877
7.1458
8.0057
9.3749
9.4481
12.139
22.837

Three clusters (11, 12 and 13) with 82% of the exterior decorated ceramics are defined at steps 26, 22 and 23 respectively and are not joined with undecorated ceramics until step 3. The remaining 22 exterior decorated vessels are distributed throughout five other cluster groups. The largest number occurs in cluster group 6 (n=12) making up 40% of the group. Cluster group 11 is dominated by impressed decorative techniques (cord wrapped stick, cord-wrapped cord, cord wrapped paddle edge); Cluster group 12 is dominated by punctate and incised vessels; and cluster 13 is characterized by corded punctate exteriors. These clusters are similar to the decorated Wayne Ware types defined by Fitting (1965).

Cluster groups 6 and 10 lack exterior decoration with the exception of one incised vessel and both clusters have decorated lips, similar to the Wayne Cordmarked Variant No. 1 defined for the Spring Creek site. There are several cluster groups, however, where the number of vessels with lip decoration approaches 100% which also possess exterior decoration. Clusters 1-3, lacking lip decoration, are all similar to Wayne Cordmarked variant No. 2. The type Wayne Cordmarked (Brashler, 1973) with no exterior decoration is described in cluster groups 1-6 while clusters 7 and 8 clearly lack cordmarked vessels and are a mixture of fabric impressed and smoothed vessels. Brose's (1966) type Wayne Textile Marked does not appear to be isolated at a significantly high point in the agglomerating hierarchy.

A final similarity between the CLUSTER analysis and previously defined types is the isolation of two groups of thin vessels, cluster groups 1 and 7 which appear to be similar to the type Saginaw Thin. The failure of all thin vessels to be defined in late clusters,

Table 8. -- Frequency and Percentages of Attributes
in Northeast Cluster Groups

Dimension	Attributes	1 N %	2 N %	3 N %	4 N %	5 N %	6 N %	7 N %
Lip cross-section	flat	30/100	43/100	3/ 8.3	12/75.	20/66.7	30/90.9	12/85.7
	round	0/0	0/0	33/91.7	3/18.8	5/16.7	1/ 3.0	2/14.3
Lip planview	flat	29/96.7	42/97.7	35/97.2	16/100	28/93.3	30/90.9	14/100
Rim thickening	rolled	9/30	8/18.6	5/13.9	4/25.	12/40.	7/21.2	3/21.4
	collared	0/0	2/ 4.7	0/0	1/ 6.3	0/0	0/0	1/ 7.1
Lip preparation	smoothed	7/23.3	14/32.6	30/83.3	7/43.8	28/93.3	31/93.9	11/78.6
Lip decoration	present	0/0	1/ 2.3	1/ 2.8	5/31.3	28/93.3	33/100	2/14.3
Lip technique	incised	0/0	0/0	0/0	0/0	26/86.7	0/0	0/0
	impressed	0/0	0/0	0/0	4/25.	1/ 3.3	33/100	2/14.3
Rim flare	everted	2/ 6.7	2/ 4.7	3/ 8.3	2/12.5	3/10.	5/15.2	0/0
Interior preparation	smoothed	30/100	43/100	34/94.4	0/0	29/96.7	33/100	10/71.4
	brushed	0/0	0/0	0/0	15/93.8	0/0	0/0	4/28.6
Interior decoration	present	0/0	0/0	1/ 2.8	0/0	20.66.7	0/0	0/0
Interior technique	incised	0/0	0/0	0/0	0/0	16.53.3	0/0	0/0
	impressed	0/0	0/0	0/0	0/0	3/10.	0/0	0/0
Exterior preparation	cordmarked	30/100	43/100	28/77.8	16/100	30/100	33/100	1/ 7.1
	fabric	0/0	0/0	0/0	0/0	0/0	0/0	7/50.
Exterior preparation orientation	vertical	28/93.3	43/100	17/47.2	15/93.8	28.93.3	30/90.9	4/28.6
	oblique	2/ 6.7	0/0	9/25.0	1/ 6.3	0/0	3/ 9.1	4/28.6
Exterior decoration	present	0/0	0/0	0/0	4/25.	12/40.	1/ 3.0	2/14.3
Exterior tool	pointed	0/0	0/0	0/0	2/12.5	7/23.3	1/ 3.0	0/0
	curvilinear	0/0	0/0	0/0	1/ 6.3	0/0	0/0	0/0
	cordwrapped	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	stick	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	cordwrapped	0/0	0/0	0/0	0/0	2/ 6.7	0/0	1/ 7.1
	paddle edge	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	cordwrapped	0/0	0/0	0/0	1/ 6.3	0/0	0/0	0/0
Exterior technique	impressed	0/0	0/0	0/0	1/ 6.3	0/0	0/0	0/0
	incised	0/0	0/0	0/0	3/18.8	4/13.3	1/ 3.0	0/0
	90 degree	0/0	0/0	0/0	0/0	1/ 3.3	0/0	0/0
	punctate	0/0	0/0	0/0	0/0	7/23.3	0/0	2/14.3
	acute-	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	punctate	0/0	0/0	0/0	1/ 6.3	0/0	1/ 3.0	1/ 7.1
Exterior orientation	horizontal	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	vertical	0/0	0/0	0/0	3/18.8	11/36.7	0/0	1/ 7.1
	oblique	0/0	0/0	0/0	0/0	1/ 3.3	0/0	0/0
	crosshatched	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Exterior sec. motif	present	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Thickness	2 - 5.9 mm	29/96.7	0/0	8/22.2	5/31.3	21/70.	11/33.3	14/100
	6 - 8.9 mm	0/0	43/100	24/66.7	11/68.8	9/30.	20/60.6	0/0
Total N		30	43	36	16	30	33	14

Dimension	Attribute	8		9		10		11		12		13	
		N	%	N	%	N	%	N	%	N	%	N	%
Lip cross-section	flat	19/100		18/64.3		30/63.8		28/77.8		25/96.2		20/54.1	
	round	0/0		4/14.3		10/21.3		4/11.1		0/0		11/29.7	
Lip planview	flat	17/89.5		25/89.3		37/78.7		34/94.4		23/88.5		35/94.6	
Rim thickening	rolled	1/ 5.3		13/46.4		19/40.4		8/22.2		8/30.8		14/37.8	
	collared	0/0		0/0		0/0		3/ 8.3		1/ 3.8		0/0	
Lip preparation	smoothed	14/73.7		23/82.1		46/97.9		32/88.9		17/65.4		36/97.3	
Lip decoration	present	8/42.1		18/64.3		47/100		31/86.1		17/65.4		35/94.6	
Lip technique	incised	4/21.1		0/0		1/ 2.1		3/ 8.3		5/19.2		1/ 2.7	
	impressed	3/15.8		18/64.3		45/95.7		29/80.6		10/38.5		34/91.9	
Rim flare	everted	3/15.8		6/21.4		14/29.8		6/16.7		1/ 3.8		16/43.2	
Interior preparation	smoothed	19/100		28/100		46/97.9		35/97.2		25/96.2		36/97.3	
	brushed	0/0		0/0		1/ 2.1		0/0		1/ 3.8		1/ 2.7	
Interior decoration	present	0/0		28/100		43/91.5		24/66.7		13/50.		29/78.4	
Interior technique	incised	0/0		0/0		1/ 2.1		2/ 5.6		3/11.5		0/0	
	impressed	0/0		28/100		40/85.1		22/61.1		8/30.8		29/78.4	
Exterior preparation	cordmarked fabric	0/0		25/89.3		35/74.5		27/75.		17/65.4		34/91.9	
		5/26.3		2/ 7.1		7/14.9		2/ 5.6		4/15.4		1/ 2.7	
Exterior preparation orientation	vertical	2/10.5		25/89.3		38/80.9		26/72.2		19/73.1		34/91.9	
	oblique	1/ 5.3		1/ 3.6		4/ 8.5		3/ 8.3		1/ 3.8		1/ 2.7	
Exterior decoration	present	0/0		3/10.7		0/0		34/94.4		26/100		37/100	
Exterior tool	pointed	0/0		0/0		0/0		4/11.1		9/34.6		1/ 2.7	
	curvilinear	0/0		0/0		0/0		0/0		12/46.2		0/0	
	cordwrapped stick	0/0		0/0		0/0		1/ 2.8		1/ 3.8		10/27.0	
	cordwrapped paddle edge	0/0		3/10.7		0/0		14/38.9		0/0		24/64.9	
	cordwrapped cord	0/0		0/0		0/0		14/38.9		0/0		0/0	
Exterior technique	impressed	0/0		3/10.7		0/0		31/86.1		0/0		0/0	
	incised	0/0		0/0		0/0		1/ 2.8		4/15.4		0/0	
	90 degree punctate acute -	0/0		0/0		0/0		3/ 8.3		20/76.9		0/0	
	punctate horizontal	0/0		0/0		0/0		1/ 2.8		2/ 7.7		37/100	
Exterior orientation	vertical	0/0		0/0		0/0		14/38.9		0/0		3/ 8.1	
	oblique	0/0		2/ 7.1		0/0		1/ 2.8		15/57.7		2/ 5.4	
	crosshatched	0/0		1/ 3.6		0/0		19/52.8		9/34.5		32/86.5	
		0/0		0/0		0/0		0/0		1/ 3.8		0/0	
Exterior sec. motif	present	0/0		1/ 3.6		0/0		7/19.4		3/11.5		1/ 2.7	
Thickness	2 - 5.9 mm	0/0		23/82.1		0/0		6/16.7		5/19.2		11/29.7	
	6 - 8.9 mm	19/100		5/17.9		46/97.9		28/77.8		19/73.1		26/70.3	
Total N		19		28		47		36		26		37	

however, suggests that Saginaw Thin is not significantly different from Wayne Ware vessels in the northeast area. That is, the fact that thin vessels are joined in clusters with thicker vessels at early steps in the agglomerating hierarchy suggests that Saginaw Thin does not exist as a separate ware or type within other Wayne ceramics.

The specific proposition tested for this area is in part rejected in the case of the TYPE analysis but is largely supported by the CLUSTER analysis. Relationships between ceramics have been defined by CLUSTER which allow a systematic redefinition of ceramics from the northeast area. The identification of ceramics from the area as Wayne Ware is upheld by the preceeding analysis and the failure in an earlier test (See page 92) to find a significant difference between ceramics in the Northeast and Southeast areas. The failure of either TYPE or CLUSTER to isolate vessels with everted rims (Mackinac Ware) in the analysis suggests that the ceramic vessels from Mahoney and Fosters are more closely aligned to Wayne Tradition ceramics than Mackinac Ware. This does not exclude the presence of Mackinac Ware from the area, however, as there are clearly identifiable Mackinac Ware vessels in the Butterfield Site collection which were not used in the study because they come from a distinct ceramic tradition (Wobst, 1968). Furthermore, the initial division of Wayne Ware into two major groups or types Wayne Decorated and Wayne Undecorated proposed by Brashler for the Fletcher Site (1973) is supported by this analysis. Varieties of Wayne Decorated and Wayne Undecorated might best be defined within individual ceramic collections, however, some suggestions are indicated by the results. A variety of Wayne Undecorated includes Wayne Undecorated Cordmarked variety with sub-varieties decorated lip and undecorated lip (Figures 56-70,

Figure 56. -- Wayne Ware Ceramics from the
Butterfield, Foster's and Valley Sweets Sites

- A, D Wayne Undecorated, Decorated Lip
from the Butterfield Site (punctate variety)
- B Wayne Decorated
from the Butterfield Site
- C Wayne Undecorated, Undecorated Lip
from the Butterfield Site
- E, F Wayne Undecorated, Undecorated Lip
from the Foster's Site
- G, H Wayne Undecorated, Undecorated Lip
from the Valley Sweets Site

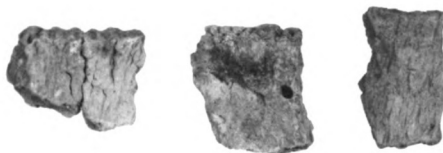
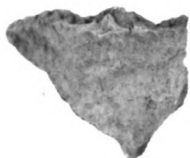
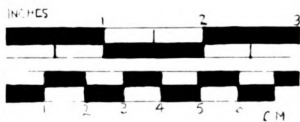
**A****B****C****D****E****F****G****H**

Figure 57. -- Wayne Ware Ceramic Profiles
from the Butterfield, Foster's and Valley Sweets Sites

Profiles correspond to vessels
illustrated in Figure 56,
exteriors to the right.

Figure 58. -- Wayne Ware Ceramics from the
Mahoney and Hodges Sites

- A Wayne Undecorated, Undecorated Lip (collared)
from the Mahoney Site
- B-D Wayne Undecorated, Undecorated Lip
from the Mahoney Site
- E,G Wayne Undecorated, Undecorated Lip
from the Hodges Site
- F Wayne Decorated, punctate variety
from the Hodges Site

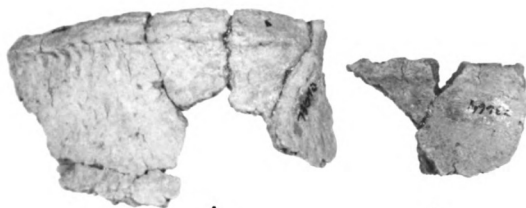
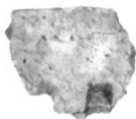
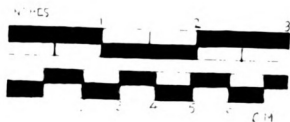
**A****B****C****D****E****F****G**

Figure 59. -- Wayne Ware Ceramic Profiles
from the Mahoney and Hodges Sites

Profiles correspond to vessels
illustrated in Figure 58,
exteriors to the left.

Figure 60. -- Wayne Ware Ceramics from
the Schultz Site

- A, C-G Wayne Undecorated, Undecorated Lip
- B Wayne Undecorated, Undecorated Lip
(collared)
- H Wayne Undecorated, Decorated Lip

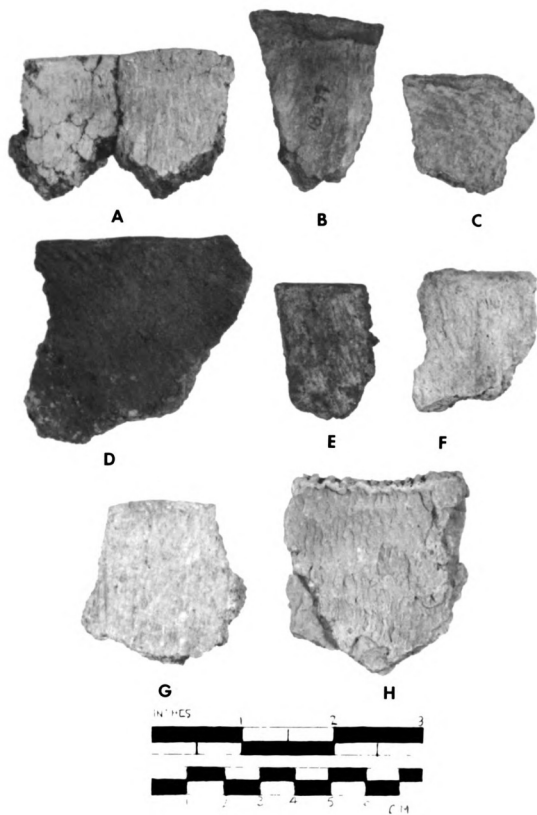


Figure 61. -- Wayne Ware Ceramic Profiles
from the Schultz Site

Profiles correspond to vessels
illustrated in Figure 60,
exterior to the right.

Figure 62. -- Wayne Ware Ceramics
from the Schultz Site

- A-F Wayne Undecorated, Undecorated Lip
(formerly Saginaw Thin)
- G-H Wayne Decorated, Incised Variety
- I Wayne Decorated, Corded Punctate Variety

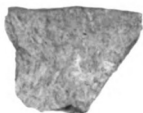
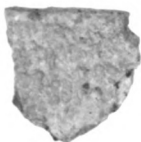
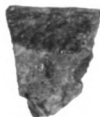
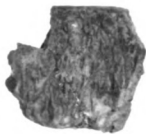
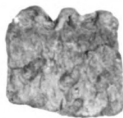
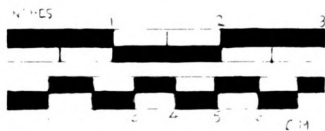
**A****B****C****D****E****F****G****H****I**

Figure 63. -- Wayne Ware Ceramic Profiles
from the Schultz Site

Profiles correspond to vessels
illustrated in Figure 62,
exterior to the left.

Figure 64. -- Wayne Ware Ceramics from
the Root Site

- A-E Wayne Undecorated
- F Wayne Decorated, Cord Impressed Variety
(collared)
- G Wayne Decorated, Incised Variety
- H Wayne Undecorated (collared)

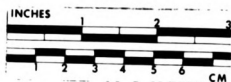
**A****B****C****D****E****F****G****H**

Figure 65. -- Wayne Ware Ceramic Profiles
from the Root Site

Profiles correspond to vessels
illustrated in Figure 64,
exterior to the right.

Figure 66. -- Wayne Undecorated Ceramics
from the Fletcher Site

- A, B, D Wayne Undecorated, Decorated Lip
(fabric impressed)
- C Wayne Undecorated, Decorated Lip
(fabric impressed and collared)
- E Wayne Undecorated, Undecorated Lip
(Smoothed)
- G Wayne Undecorated, Undecorated Lip
(Smoothed and castellated)



Figure 67. -- Wayne Undecorated Ceramic Profiles
from the Fletcher Site

Profiles correspond to vessels
illustrated in Figure 66,
exteriors to the right.

**A****B****C****D****E****F****G**

Figure 68. -- Cordmarked Wayne Undecorated Ceramics
from the Fletcher Site

- A, D Wayne Undecorated, Decorated Lip
(collared)
- B, C, E-G, I Wayne Undecorated, Decorated Lip
- H Wayne Undecorated, Decorated Lip
(collared and castellated)

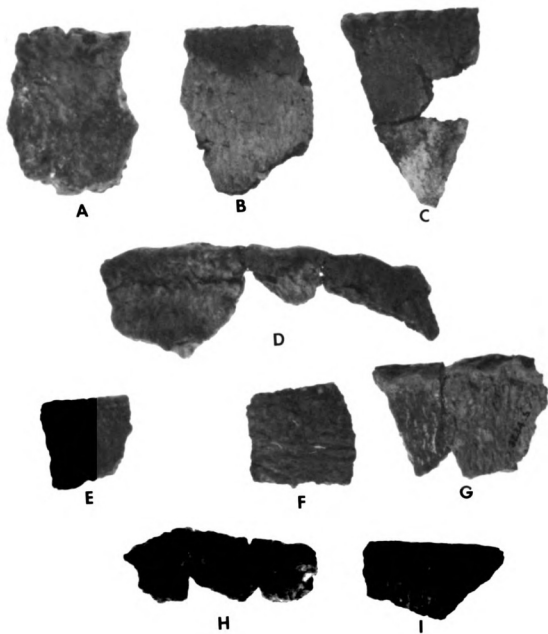


Figure 69. -- Wayne Undecorated Ceramic Profiles
from the Fletcher Site

Profiles correspond to vessels
illustrated in Figure 68,
exteriors to the right.

Figure 70. -- Cordmarked Wayne Undecorated Ceramics
from the Fletcher Site

A-D, F, G Wayne Undecorated,
Undecorated Lip

E, J, K Wayne Undecorated,
Undecorated Lip (collared)

H, I Wayne Undecorated,
Decorated Lip

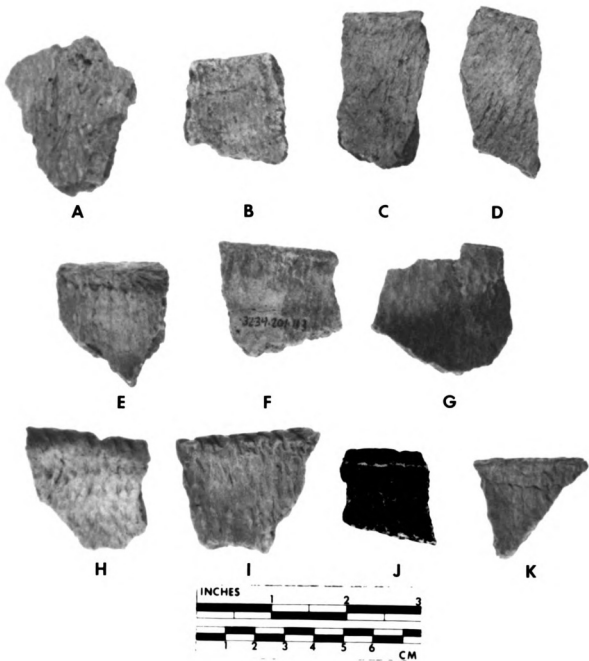


Figure 71. -- Wayne Undecorated Ceramic Profiles
from the Fletcher Site

Profiles correspond to vessels
illustrated in Figure 70,
exteriors to the right.

Figure 72. Wayne Decorated Ceramics
from the Fletcher Site

A, F Wayne Decorated, Punctate Variety

B-C Wayne Decorated, Incised Variety

D, E, G Wayne Decorated, Cord Impressed Variety

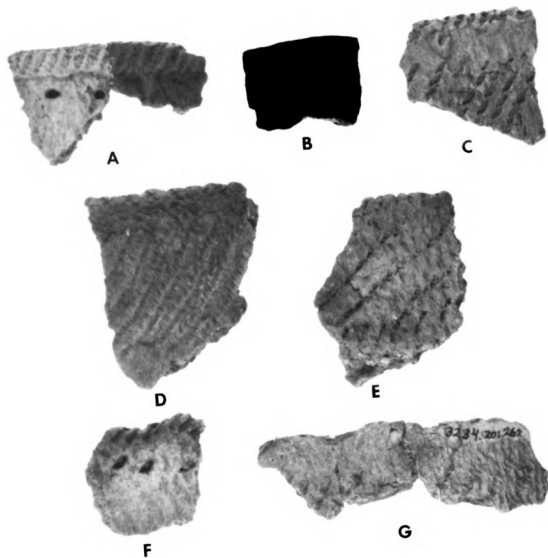


Figure 73. Wayne Decorated Ceramic Profiles
from the Fletcher Site

Profiles correspond to vessels
illustrated in Figure 72,
exteriors to the right.

Figure 74. -- Wayne Decorated Ceramics
from the Fletcher Site

- A - E Wayne Decorated, Punctate Variety
- F Wayne Decorated, Impressed Variety

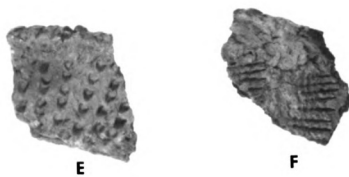
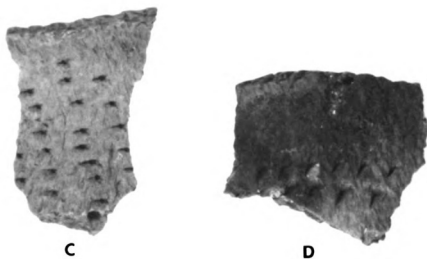
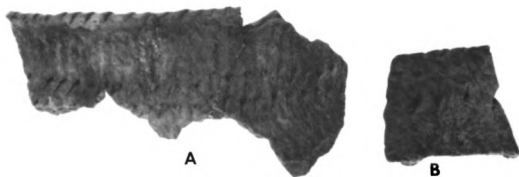


Figure 75. -- Wayne Decorated Ceramic Profiles
from the Fletcher Site

Profiles correspond to vessels
illustrated in Figure 74,
exteriors to the right.

Figure 76. -- Wayne Decorated Ceramics
from the Fletcher Site

A, C-F Wayne Decorated, Corded Punctate
Variety

B, G Wayne Decorated, Corded Punctate
Variety (castellated)

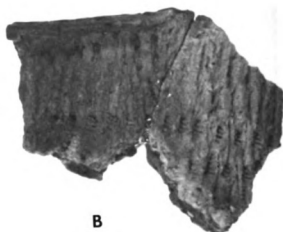
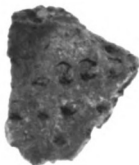
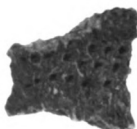
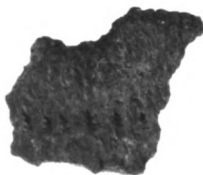
**A****B****C****D****E****F****G**

Figure 77. -- Wayne Decorated Ceramic Profiles
from the Fletcher Site

Profiles correspond to vessels
illustrated in Figure 76,
exteriors to the right.

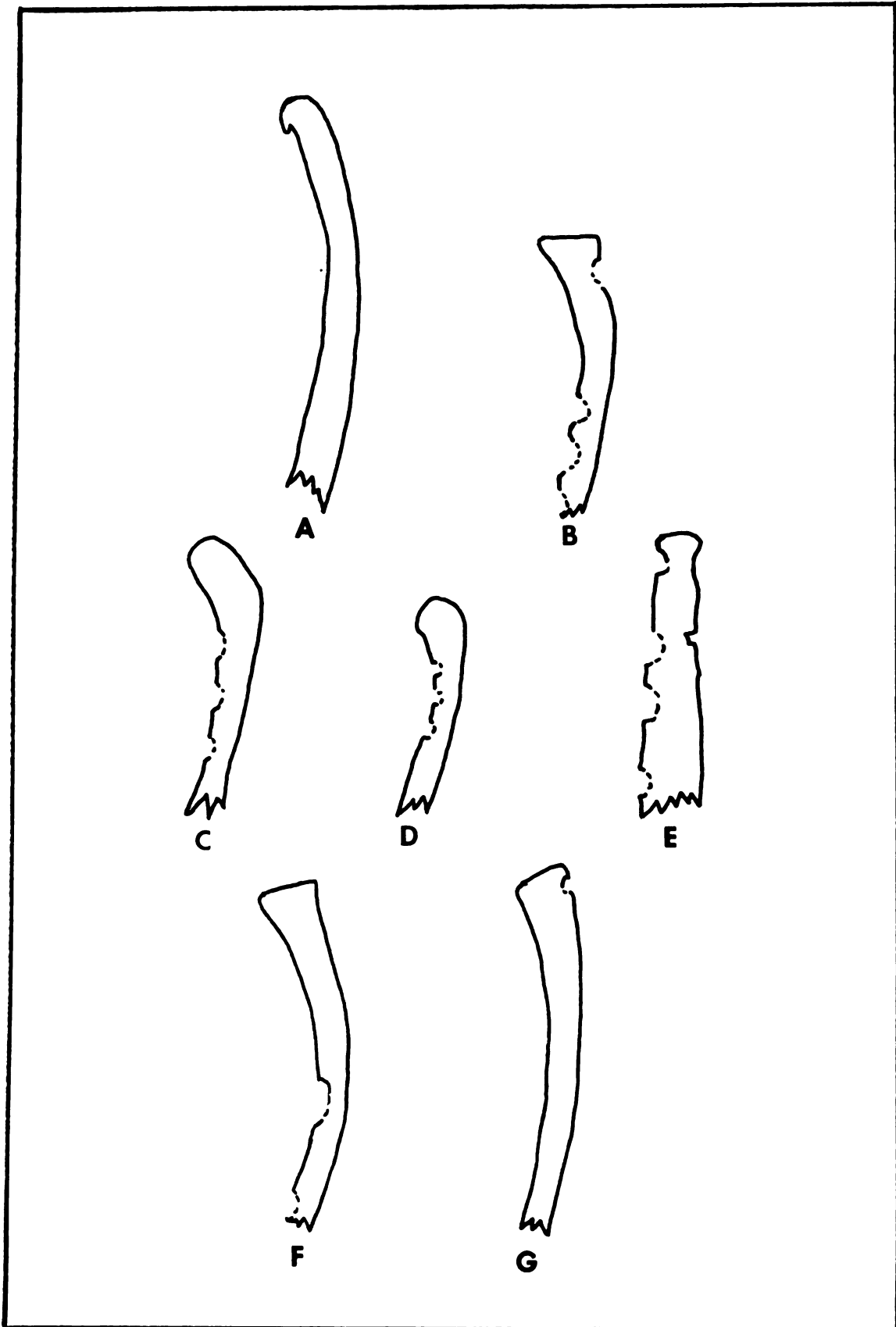
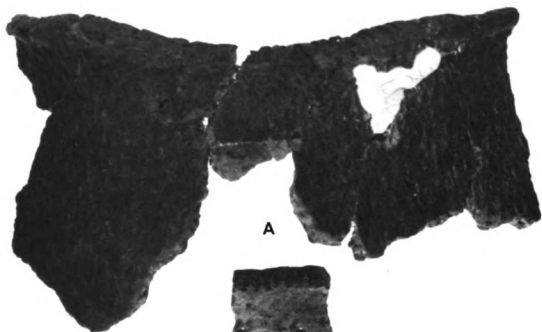


Figure 78. -- Partially Reconstructed Wayne Ware
Ceramic Vessels from the Fletcher Site

- A Wayne Undecorated, Decorated Lip (castellated)
- B Wayne Decorated, Punctate Variety



A



B

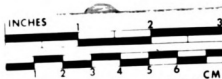


Figure 79. -- Wayne Ware Ceramic Profiles
from the Fletcher Site

Profiles correspond to vessels
illustrated in Figure 78,
exteriors to the left.

Figure 80. -- Partially Reconstructed
Wayne Decorated Corded Punctate Variety Vessel
from the Fletcher Site

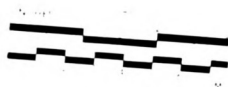


Figure 81. -- Wayne Ware Ceramic Profile
from the Fletcher Site

Profile corresponds to vessel
illustrated in Figure 80,
exterior to the left.

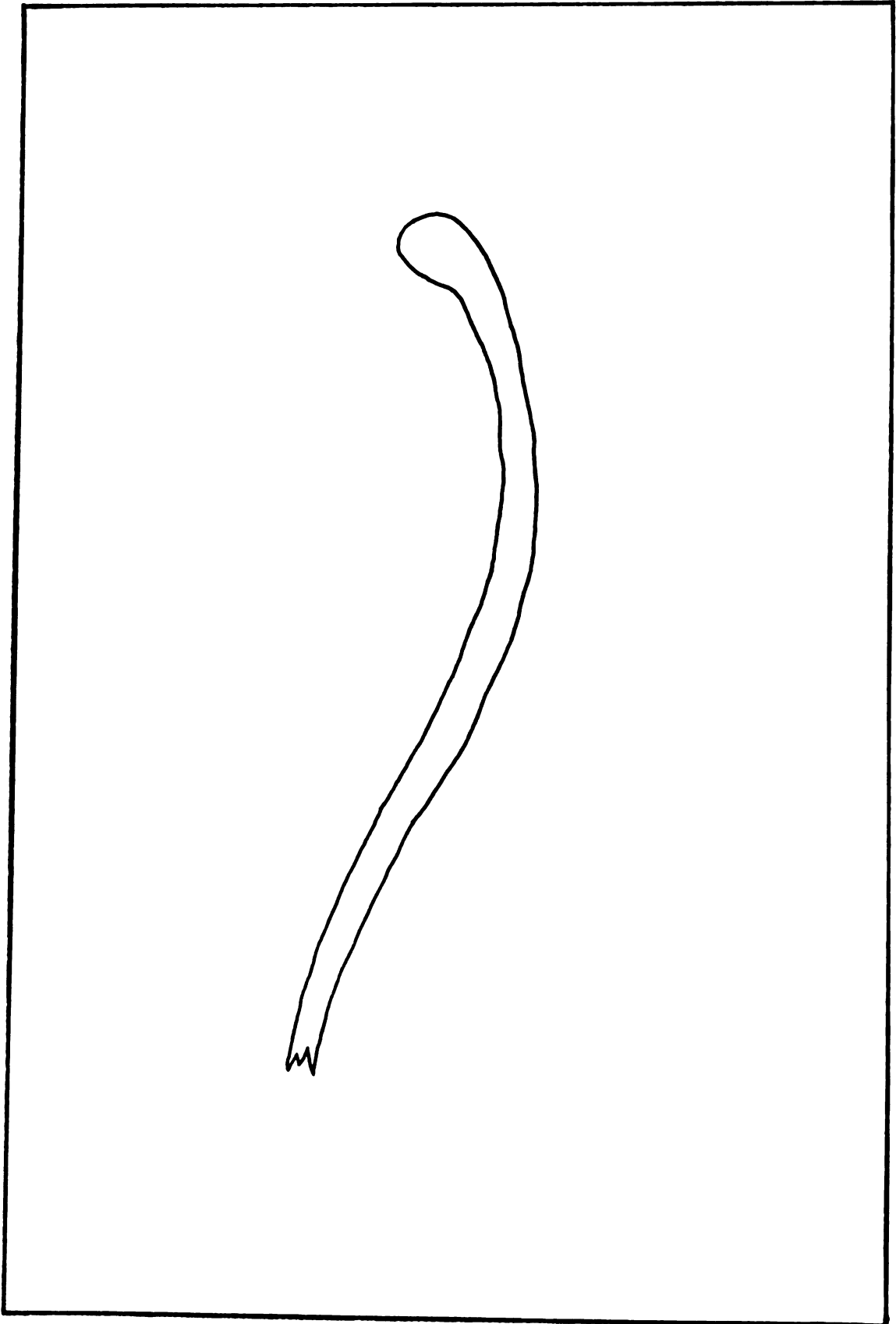


Figure 82. -- Partially Reconstructed
Wayne Decorated, Punctate Variety Vessel
from the Fletcher Site



Figure 83. -- Wayne Ware Ceramic Profile
from the Fletcher Site

Profile corresponds to vessel
illustrated in Figure 82,
exterior to the left.



78). Varieties of Wayne Decorated appear to be determined by type of exterior decoration such as Wayne Decorated Punctate, Corded Punctate, Impressed and Incised varieties (Figures 56, 58, 72-82). Formal definitions of these types are presented in Appendix F.

Southeast Area

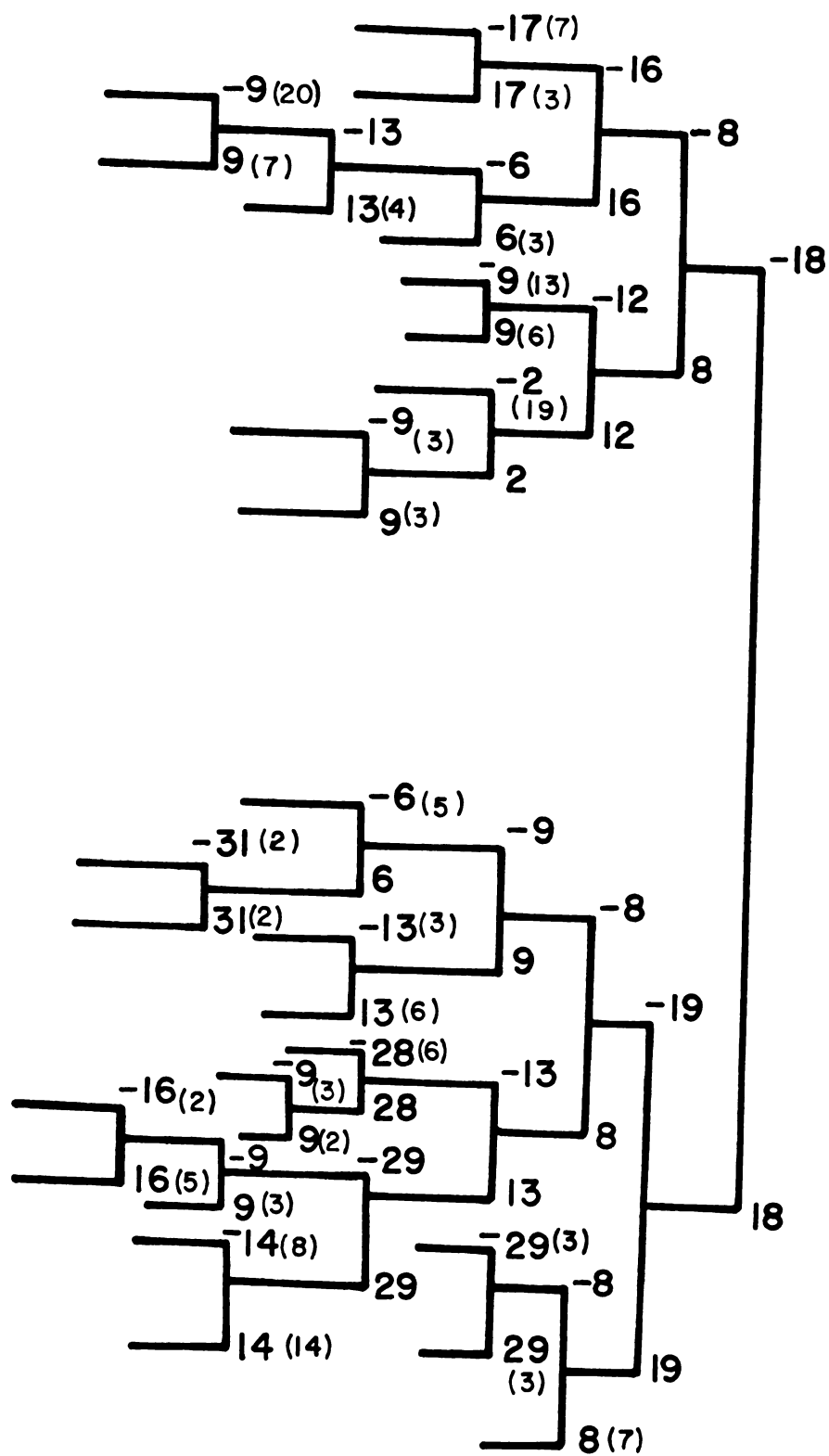
The original typology proposed for Wayne Ware by Fitting (1965) is the only published ceramic classification for Wayne Tradition Sites from the Southeast area. Wayne Ware was originally defined as a Late Middle Woodland Ceramic complex which was part of the Riviere Au Vase Phase of the Younger Tradition (Fitting, 1965). The Early Late Woodland (A.D. 500-A.D. 1200) status of Wayne Ware is now accepted and the Wayne Tradition is proposed as separate from the Younger Tradition. The classification of Wayne Ware, (Fitting, 1965), presented in Figure 52, is based on 91 vessels from the Riviere Au Vase site, the Fort Wayne Mound and Gibraltar Sites. A total of 171 vessels from the Fort Wayne Mound, Riviere Au Vase and Draper Park sites are used in this study. The specific proposition tested here states that TYPE and CLUSTER analyses will group ceramics from the Southeast into groups comparable to the Fitting (1965) typology.

The results of TYPE analysis (Figure 84) supports the hypothesis in the initial implicit distinction made between decorated and undecorated ceramics. The Fitting (1965) typology makes the implicit intuitive distinction between undecorated and decorated ceramics by identifying Wayne Cordmarked and Wayne Smoothed separate from Wayne punctate, corded punctate, cord impressed, and cross hatched. The next division of exterior decorated ceramics produced a group similar but

Figure 84. -- TYPE Diagram of Ceramics from the
 Southeast with Smallest Acceptable Cell Value Set at .5.
 (Numbers in circles are the number of vessels in each end group)

Attribute List

- | | |
|-------------------------------|-------------------------------------|
| 1. Flat lip cross-section | 18. Decorated exterior |
| 2. Round lip cross-section | 19. Pointed exterior tool |
| 3. Flat lip planview | 20. Curvelinear exterior tool |
| 4. Rolled rim | 21. Cordwrapped stick exterior tool |
| 5. Smoothed lip | 22. Cordwrapped paddle edge |
| 6. Decorated lip | 23. Impressed exterior |
| 7. Incised lip | 24. Incised exterior |
| 8. Impressed lip | 25. Punctate exterior |
| 9. Everted rim | 26. Acuted punctate exterior |
| 10. Smoothed interior | 27. Horizontal exterior |
| 11. Brushed interior | 28. Vertical exterior |
| 12. Decorated interior | 29. Oblique exterior |
| 13. Impressed interior | 30. Cross-hatched exterior |
| 14. Cordmarked exterior | 31. Secondary exterior motif |
| 15. Fabric impressed exterior | 32. Thickness: 2-5.9 mm. |
| 16. Vertical cordmarking | 33. Thickness: 6-8.9 mm. |
| 17. Oblique cordmarking | |



not identical to the type Wayne Cross-hatched. Of the thirteen vessels in the Southeast area decorated by pointed implements, all are incised but only five are crosshatched. That is, Wayne crosshatched vessels are included with other incised vessels and division never takes place on the attribute for crosshatching. Other attributes defining types in the Fitting typology (impressed, punctate, acute punctate) fail to be chosen for sub-division. Within undecorated ceramics the TYPE analysis does not sub-divide and form any groups similar to the Fitting types Wayne Cordmarked or Wayne Smoothed.

The CLUSTER analysis (Figure 85 and Table 9) confirms portions of the TYPE analysis and identifies several groups similar to those defined by Fitting (1965). Cluster groups 1 and 2 both are composed of exterior decorated ceramics. Cluster group 2 defined at Step 23 includes 11 of the 13 incised vessels from the area and all of the crosshatched vessels. Cluster group 1 defined at Step 10 contains all but 5 (18%) of the corded punctate vessels and all but three (16.7%) of the cord impressed vessels. Two other clusters, groups 3 and 4, possess all but three of the remaining exterior decorated vessels.

Cluster groups 6 and 9 are similar to the type Wayne Cordmarked and Cluster 10 is composed of all Wayne Smoothed vessels. The eight vessels in this group, however, are only 29.6 percent of the smoothed vessels from the Southeast area. The remaining smoothed vessels were joined with cordmarked or fabric impressed clusters much earlier in the agglomerating hierarchy such that they occur within six of the remaining 9 clusters.

Two clusters, groups 5 and 8, both contain vessels which would qualify as Saginaw Thin. The presence of thin ceramics in the Southeast

Figure 85. -- CLUSTER Diagram of Last Ten Steps
on Ceramics from the Southeast.

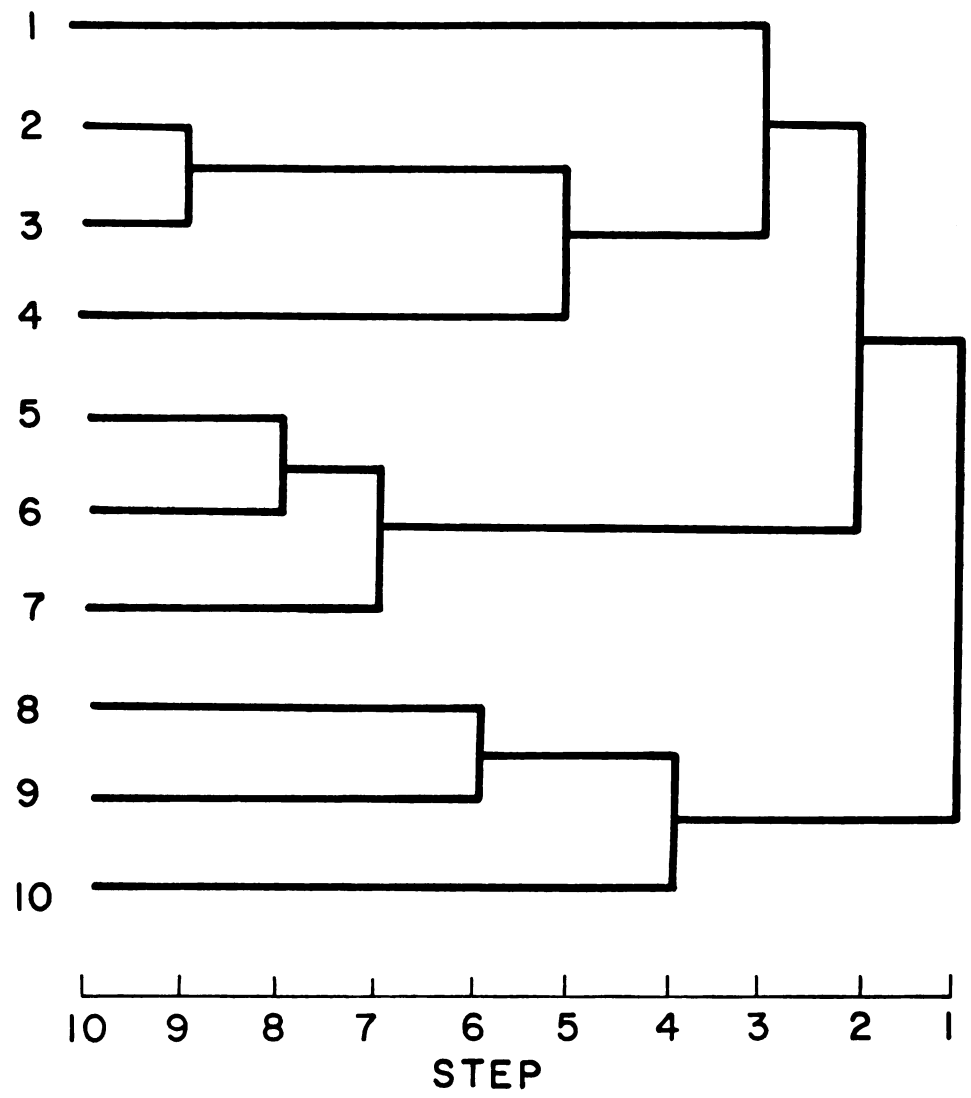


Table 9. -- Frequency and Percentages of Attributes
in Southeast Cluster Groups

Dimension	Attribute	1 N %	2 N %	3 N %	4 N %	5 N %	6 N %	7 N %	Dimension	Attribute	8 N %	9 N %	10 N %
Lip cross-section	flat	34/87.2	6/54.5	10/100	20/87	12/100	6/35.3	19/82.6	Lip cross-section	flat	10/83.3	14/87.5	5/62.5
	round	2/ 5.1	4/36.4	0/0	2/ 8.7	0/0	10/58.8	1/ 4.3		round	1/83.3	1/ 6.3	3/37.5
Lip planview	flat	37/94.9	9/90.9	10/100	22/95.7	9/75.0	17/100	22/95.7	Lip planview	flat	12/100	16/100	8/100
Rim thickening	rolled	14/35.9	1/ 9.1	0/0	17/73.9	4/33.3	10/58.8	9/39.1	Rim thickening	rolled	4/33.3	4/25	0/0
Lip preparation	smoothed	39/100	11/100	9/90	5/21.7	7/58.3	16/94.1	20/87.0	Lip preparation	smoothed	5/41.7	2/12.5	5/62.5
Lip decoration	present	36/92.3	11/100	6/60	5/21.7	12/100	15/88.2	23/100	Lip decoration	present	0/0	0/0	0/0
Lip technique	incised	0/0	4/36.4	0/0	1/ 4.3	0/0	0/0	4/17.4	Lip technique	incised	0/0	0/0	0/0
	impressed	36/92.3	7/63.6	4/40	2/ 8.7	12/100	15/88.2	18/78.3		impressed	0/0	0/0	0/0
	everted	8/20.5	5/45.5	1/10	15/65.2	1/ 8.3	8/47.1	8/34.8	Rim flare	everted	0/0	5/31.3	0/0
Rim flare									Interior pre-paration	smoothed	12/100	15/93.8	8/100
Interior pre-paration	smoothed	32/82.1	8/72.7	4/40	17/73.9	12/100	14/82.4	23/100		brushed	0/0	0/0	0/0
	brushed	2/ 5.1	3/27.3	5/50	0/0	0/0	3/17.6	0/0	Interior decoration	present	0/0	0/0	0/0
Interior decoration	present	32/82.1	3/27.3	2/20	15/65.2	12/100	14/82.4	2/ 8.7	Interior technique	impressed	0/0	0/0	0/0
Interior technique	impressed	32/82.1	2/18.2	0/0	15/65.2	12/100	14/82.4	1/ 4.3	Exterior pre-paration	cordmarked fabric	10.83/3	16/100	0/0
Exterior pre-paration	cordmarked fabric	27/69.2	10/90.9	4/40	20/87	11/91.7	17/100	21/91.3			0/0	0/0	0/0
		0/0	0/0	0/0	2/ 8.7	1/ 8.3	0/0	1/ 4.3	Exterior preparation orientation	vertical	9/75.	16/100	0/0
Exterior preparation orientation	vertical	24/61.5	9/81.8	3/30	18/78.3	11/91.7	15/88.2	19/82.6		oblique	0/0	0/0	0/0
	oblique	3/ 7.7	1/ 9.1	1/10	3/13.0	1/ 8.3	2/11.8	3/13.0	Exterior decoration	present	0/0	0/0	0/0
Exterior decoration	present	39/100	11/100	5/50	16/69.6	0/0	2/11.8	1/ 4.3	Exterior tool	pointed	0/0	0/0	0/0
Exterior tool	pointed	0/0	11/100	1/10	1/ 4.3	0/0	0/0	0/0		curvilinear	0/0	0/0	0/0
	curvilinear	0/0	0/0	1/10	8/34.8	0/0	0/0	0/0		cordwrapped	0/0	0/0	0/0
	cordwrapped	5/12.8	0/0	2/20	2/ 8.7	0/0	0/0	0/0		stick	0/0	0/0	0/0
	stick									cordwrapped	0/0	0/0	0/0
	cordwrapped	26/66.7	0/0	0/0	2/ 8.7	0/0	0/0	0/0		paddle edge	0/0	0/0	0/0
	paddle edge									impressed	0/0	0/0	0/0
	impressed	15/38.5	0/0	1/10	1/ 4.3	0/0	1/ 5.9	0/0	Exterior technique	incised	0/0	0/0	0/0
Exterior technique	incised	0/0	11/100	1/10	1/ 4.3	0/0	0/0	0/0		90 degree	0/0	0/0	0/0
	90 degree									punctate	0/0	0/0	0/0
	punctate	1/ 2.6	0/0	2/20	10/43.5	0/0	0/0	1/ 4.3		acute	0/0	0/0	0/0
	acute									punctate	0/0	0/0	0/0
	punctate	23/59.0	0/0	0/0	4/17.4	0/0	1/ 5.9	0/0	Exterior orientation	horizontal	0/0	0/0	0/0
Exterior orientation	horizontal	6/15.4	1/ 9.1	1/10	3/13.0	0/0	1/ 5.9	0/0		vertical	0/0	0/0	0/0
	vertical	4/10.3	0/0	3/30.0	8/34.8	0/0	0/0	0/0		oblique	0/0	0/0	0/0
	oblique	29/74.4	4/36.4	0/0	5/21.7	0/0	0/0	1/ 4.3		crosshatched	0/0	0/0	0/0
	crosshatched	0/0	5/45.5	0/0	0/0	0/0	0/0	0/0	Exterior secondary motif	present	0/0	0/0	0/0
Exterior secondary motif	present	4/10.3	1/ 9.1	0/0	3/13.0	0/0	0/0	0/0		2 - 5.9 mm.	12/100	0/0	0/0
	2 - 5.9 mm.	13/33.3	4/36.4	3/30.0	10/43.5	12/100	6/35.3	12/52.2	Thickness	6 - 8.9 mm	0/0	14/87.5	8/100
Thickness	6 - 8.9 mm.	23/59.0	7/63.6	4/40	12/52.2	0/0	11/64.7	8/34.8					
Total N		39	11	10	23	12	17	23	Total N		12	16	8

area lends further support to the statement that Saginaw Thin is not a distinctively northern variant of Wayne Ware. Thin ceramics occur in both the northern and southern areas.

The hypothesis for the Southeast area cannot be entirely rejected because some CLUSTER groups appear to resemble Fitting's (1965) original types. However, because no one group is identical, a revision of Fitting's typology is proposed which will be consistent with that offered for the Northeast area. Two major groups Wayne Decorated (Figures 86-90) and Wayne Undecorated (Figures 90-96) are proposed. Varieties of Wayne Undecorated and Wayne Decorated might best be defined within local collections. The varieties suggested here are tentative. For Wayne Undecorated varieties cordmarked and smoothed are offered, and varieties incised, cord impressed, punctate and corded punctate are suggested for Wayne Decorated. Formal type descriptions appear in Appendix F.

Summary and Conclusions

Despite the fact that three clearly different ceramic traditions have been demonstrated and described, the differences between the three areas remain unclear. One trend, however, is visible in the attribute frequencies and percents presented in Appendix B. Ceramics from the East are more highly decorated not only on the exterior, but on the lip and interior, than in either of the Western ceramic traditions. Other differences in attribute distribution across the areas cannot be isolated unless a much different research strategy than the one used here is implemented.

Tests of hypotheses generated here have resulted in defining

Figure 86. -- Wayne Decorated Ceramics
from the Fort Wayne Mound

A, B, D Wayne Decorated, Incised Variety

C, E Wayne Decorated, Impressed Variety

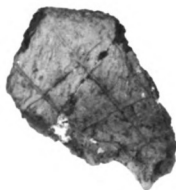
**A****B****C****D****E**

Figure 87. -- Wayne Decorated Ceramic Profiles
from the Fort Wayne Mound

Profiles correspond to vessels
illustrated in Figure 86,
exteriors to the left.



Figure 88. -- Wayne Decorated Ceramics
from Draper Park

- A - D, I Wayne Decorated, Corded
Punctate Variety
- E, F Wayne Decorated, Punctate Variety
- G Wayne Decorated, Incised Variety
- H Wayne Decorated, Impressed Variety

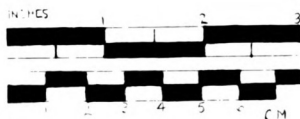
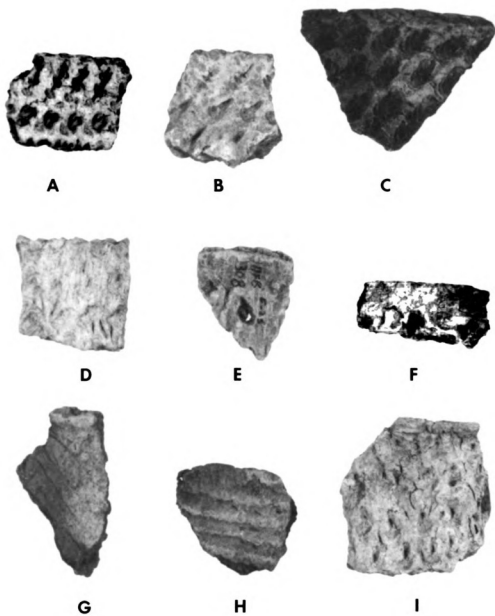


Figure 89. -- Wayne Decorated Ceramic Profiles
from Draper Park

Profiles correspond to vessels
illustrated in Figure 88,
exteriors to the right.

Figure 90. -- Wayne Ware Cermics
from Riviere Au Vase

- A Wayne Decorated, Punctate Variety
- B, C Wayne Decorated, Impressed Variety
- D Wayne Decorated, Punctate Variety
- E Wayne Undecorated, Cordmarked Variety

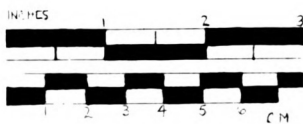
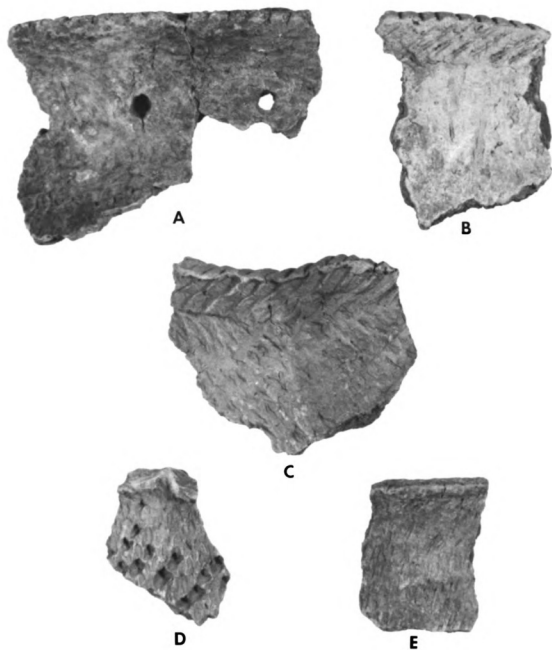


Figure 91. -- Wayne Ware Ceramic Profiles
from Riviere Au Vase

Profiles correspond to vessels
illustrated in Figure 90,
exteriors to the left.

Figure 92. -- Wayne Undecorated Ceramics
from the Fort Wayne Mound

A-E Wayne Undecorated, Cordmarked Variety

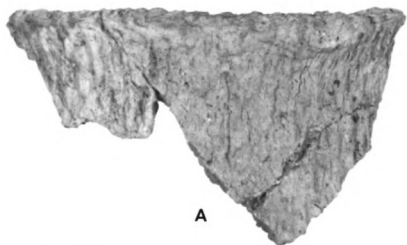
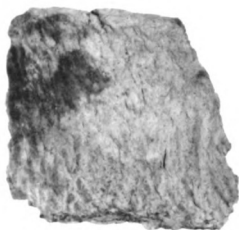
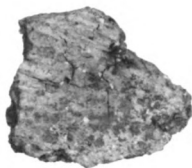
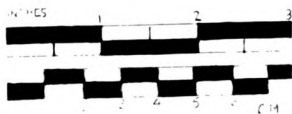
**A****B****C****D****E**

Figure 93. -- Wayne Undecorated Ceramic Profiles
from the Fort Wayne Mound

Profiles correspond to vessels
illustrated in Figure 92,
exteriors to the left.

Figure 94. -- Wayne Undecorated Ceramics
from Draper Park

- A, C, E-G Wayne Undecorated, Cordmarked Variety
- B Wayne Undecorated, Smoothed Variety
- D Wayne Undecorated, Fabric Impressed
Variety (castellated)
- F Wayne Undecorated, Cordmarked Variety
(castellated)

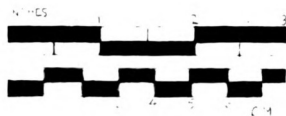
**A****B****C****D****E****F****G****H**

Figure 95. -- Wayne Undecorated Ceramic Profiles
from Draper Park

Profiles correspond to vessels
illustrated in Figure 94,
exteriors to the left.

**A****B****C****D****E****F****G****H**

Figure 96. -- Wayne Undecorated Ceramics
from Riviere Au Vase

A, D, F Wayne Undecorated,
Cordmarked Variety

B, C, E Wayne Undecorated,
Smoothed Variety

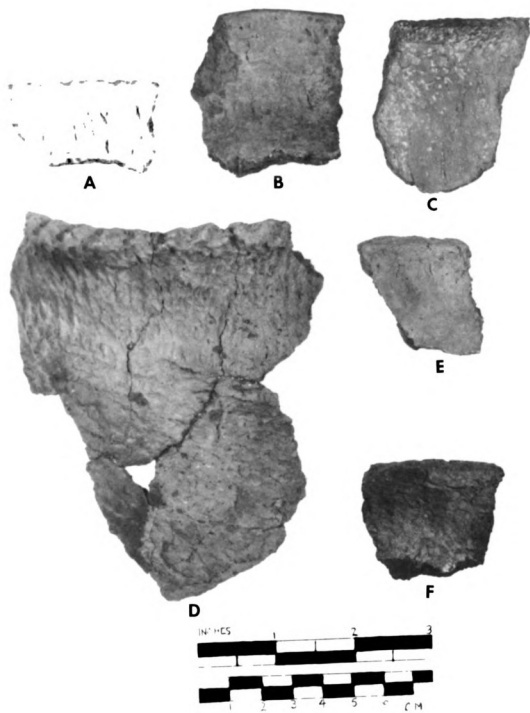


Figure 97. -- Wayne Undecorated Ceramic Profiles
from Riviere Au Vase

Profiles correspond to vessels
illustrated in Figure 96,
exteriors to the left.

three separate ceramic traditions, Spring Creek, Allegan and Wayne, for the study area. Analyses of ceramic collections from several sites in each area have identified groups of ceramics which in many cases are quite similar to types as originally defined in preceeding studies. In each area however, the relationship between ceramic groups appears to be different than that originally proposed. Consequently new, more general, empirically validated, ceramic classifications have been proposed for each based on the analyses performed here. The formal descriptions appear in Appendix F.

The repeated distinction made between decorated and plain exterior ceramics, present in all four areas, appears to be highly significant. Because this clear distinction has been made here, future researchers may find it profitable to analyze decorated and plain ceramics separately. Numbers of extraneous variables that are included when both decorated and undecorated vessels are considered simultaneously would be eliminated. The results of separate analyses might even more closely reflect intuitively defined types.

CHAPTER V

TEMPORAL CHANGE IN EARLY LATE WOODLAND CERAMICS

The purpose of this chapter is to provide a general outline of possible temporal change within Early Late Woodland ceramics and sites in the research area. The results of the seriations described here cannot be completely validated because so few radiocarbon dates are available and early Late Woodland sites in the study area are largely unstratified. Every attempt, however, has been made to meet the requirements of seriation when it is used to infer chronology and some independent evidence is available to suggest possible interpretation. Both temporal ordering of sites (Q mode analysis) and temporal change within the ceramic types (R mode analysis) in each tradition were examined.

The most useful independent evidence to check the validity of seriations in this study after radiocarbon dating and stratigraphy is the presence or absence of key attributes which are known or believed to have temporal significance. Three attribute dimensions, in particular, are important. Exterior decorative motifs of finely incised lines and cross-hatching over cordmarking are thought to be relatively early in the Wayne Tradition (Fitting 1965:41) and most likely are early when they occur in the Spring Creek and Allegan traditions as well. Cord impressions, on the other hand, appear late in both the Younge Tradition (Fitting, 1965) and the Juntunen Phase (A.D. 1200-A.D. 1400) in the Straits of Mackinac area (McPherron, 1967).

A second attribute, true collars, appear not only on Spring Creek ceramics dated to approximately A.D. 1000 but also appear in other ceramic traditions in the mid-west at approximately the same time (Fitting, 1968:21). Collars appear on Bois Blanc ceramics in the Straits of Mackinac area dated to between A.D. 1000 and A.D. 1200. A variety of collaring, called rolled rim in this study, is dated at the Spring Creek site at A.D. 960 ± 75 (M-512) and occurs in association with true collars, sometimes even on the same vessels. Rolled rims, however, are probably earlier than collars, perhaps representing a stage in vessel manufacture where rims are reinforced, especially at sites where no collars are present.

A final key attribute, the presence of castellations also appears to have some temporal significance. Castellations, which occur on 45 or 3 percent of the vessels in this study, do not appear before A.D. 1000 and are much more common on late Riviere and Macomb Linear vessels dating after A.D. 1100 in the Younge Tradition (Fitting, 1965) and Bois Blanc and Juntunen ware in the Straits of Mackinac area.

Two initial seriations were performed using the Craytor and Johnson (1968) computer program on ceramic groups generated by CLUSTER from the entire research area, and on ceramic groups from sites in the western drainages. The results of these seriations lend additional support to the results of the spatial propositions described in Chapter IV. If ceramics in the study area were from a single ceramic tradition, we would expect sites to order according to their relative temporal position. The first seriation (Table 10) illustrates the relationship between 12 sites which were ordered using the nine groups created by CLUSTER from a random sample of 300 vessels. Only 12 of the 17 sites could be used because the

Table 10. -- Seriation of Twelve Sites
from the Entire Research Area

1. Forty-Sixth Street
2. Fennville
3. Spoonville
4. Spring Creek
5. Zemaitis
6. Draper Park
7. Root
8. Riviere au Vase
9. Fort Wayne
10. Schultz
11. Moccasin Bluff
12. Fletcher

	6	9	8	12	4	3	5	2	10	11	7	1
6	200	74	78	132	74	82	72	56	66	66	38	38
9	74	200	106	92	76	112	100	64	76	76	56	56
8	78	106	200	118	128	84	76	70	60	62	90	50
12	132	92	118	200	108	110	88	96	90	70	84	82
4	74	76	128	108	200	134	130	126	104	114	94	66
3	82	112	84	110	134	200	146	146	110	110	68	74
5	72	100	76	88	130	146	200	138	112	128	106	96
2	56	64	70	96	126	146	138	200	112	118	122	122
10	66	76	60	90	104	110	112	112	200	128	80	80
11	66	76	62	70	114	110	128	118	128	200	108	88
7	38	56	90	84	94	68	106	122	80	108	200	160
1	38	56	50	82	66	74	96	122	80	88	160	200

Matrix Coefficient C = 1.27566

sample size of 300 excluded sites with small numbers of vessels.

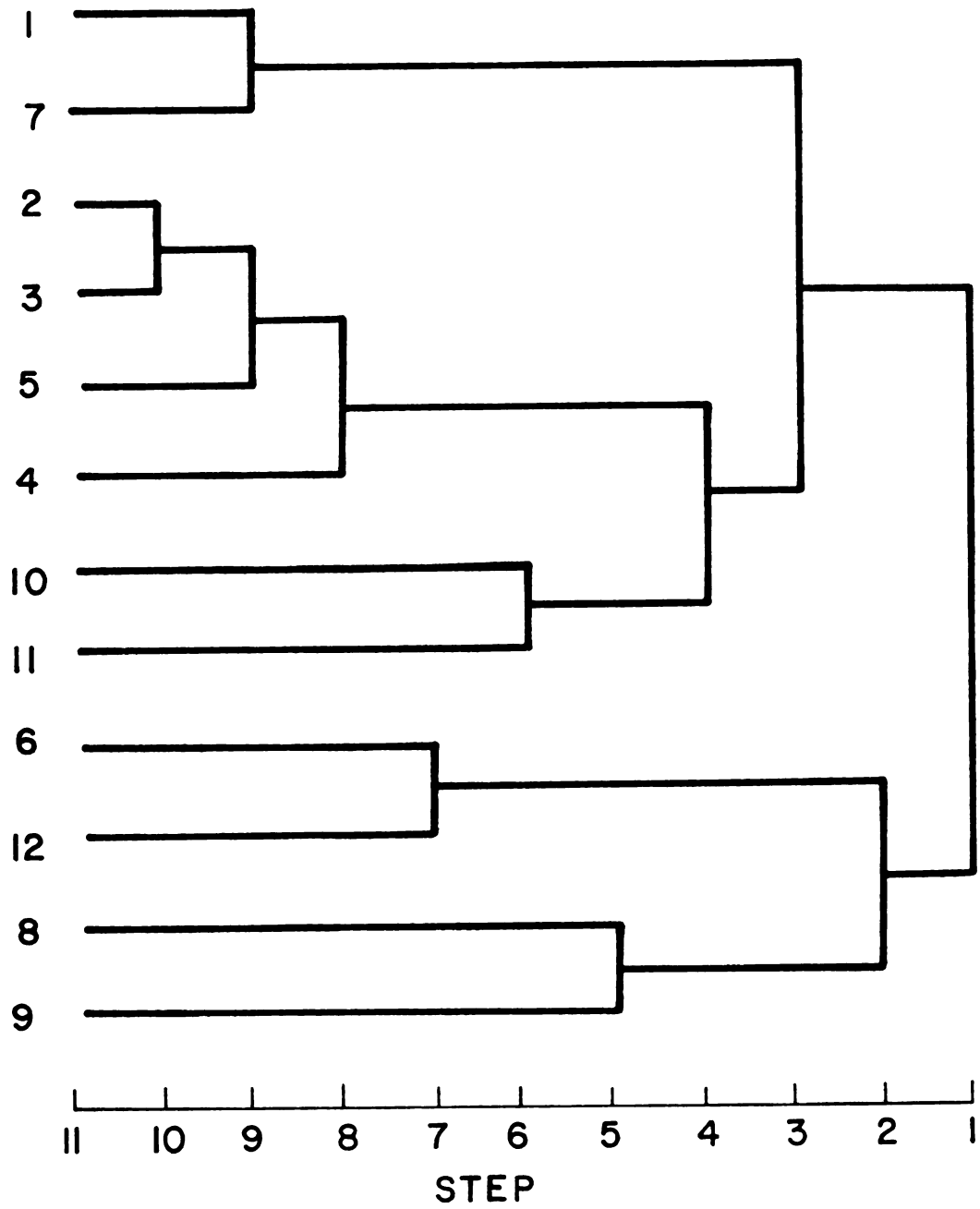
An underlying variable, in this case spatial relationship, appears to be determining the order in which sites appear. The major exception in a near perfect spatial ordering of the 12 sites is the pairing of the Moccasin Bluff and Schultz sites. The remaining sites are all ordered spatially with eastern drainage sites at one end of the order and western sites at the other.

A further and final check on these results is a CLUSTER analysis of the same 12 sites using the nine initial ceramic groups generated by CLUSTER. The analysis used the interval scale Euclidean distance option as sites were being clustered according to the percentage of ceramic groups at each. The results (Figure 98) strongly suggest that geographical distance is the underlying variable affecting the cluster order of sites. The Moccasin Bluff and Schultz sites appear again to be exceptions to the spatial order. Bettarel and Smith (1973: 110-113) suggest that the majority of the ceramics from the Moccasin Bluff site which were used in this study pre-date A.D. 1000. The ceramics from the Schultz site used in this study are located stratigraphically immediately above the Late Middle Woodland level. The suggested similarity between the Moccasin Bluff and Schultz sites therefore may reflect their position as early representatives of local early Late Woodland traditions.

The order suggested by a seriation of sites from western drainages (Table 11) does not appear to reflect spatial organization.

Figure 98. -- CLUSTER Diagram of Twelve
Early Late Woodland Sites from the
Entire Research Area

1. Forty-Sixth Street
2. Fennville
3. Spoonville
4. Spring Creek
5. Zemaitis
6. Draper Park
7. Root
8. Riviere au Vase
9. Fort Wayne
10. Schultz
11. Moccasin Bluff
12. Fletcher



DISTANCES

49.111

70.148

88.889

106.52

130.22

150.44

180.00

261.41

441.81

511.33

1017.1

Table 11. -- Seriation of Six Sites from the Western Drainages

		Fennville 2	Forty- Sixth Street 1	Spring Creek 5	Spoonville 4	Zemaitis 6	Moccasin Bluff 3
Fennville	2	200	116	94	80	78	66
Forty-Sixth Street	1	116	200	100	104	108	82
Spring Creek	5	94	100	200	152	134	100
Spoonville	4	80	104	152	200	144	98
Zemaitis	6	78	108	134	144	200	104
Moccasin Bluff	3	66	82	100	98	104	200

Matrix Coefficient C = 1.30583

Even though two ceramic traditions were identified for this portion of the research area, the order appears to reflect temporal change. The positions of the Spring Creek site, dated at A.D. 960 $\pm$ 75 (M-512) the Forty-Sixth Street site, dated at A.D. 1180 $\pm$ 100 (M-2233) and 1230 $\pm$ 100 (M-2232) indicate that the direction of the ordering. The ceramics from the Moccasin Bluff, Zemaitis and Spoonville sites should, then, predate Spring Creek, Forty-Sixth Street and Fennville Sites. Flanders (1977:146) suggests that ceramics from Zemaitis and Spoonville are in fact Late Middle Woodland. Flander's typological assessment, which is contrary to that held here, nonetheless supports the relative order suggested in the seriation of western sites. The above conclusions are at most tentative, however, as the sites seriated appear to be representative of two traditions which are similar with respect to some ceramic attributes, but not all.

Change in the Wayne Tradition

The order proposed in the seriation of sites from the eastern drainages, or Wayne Tradition sites (Table 12) appears to reflect a temporal order with latest Sites at the left of the matrix and earliest sites to the right. Fort Wayne has been radiocarbon dated at A.D. 750 ± 100 (M-1843) and the ceramics in this study from Schultz have been identified as early in the Late Woodland. The Butterfield site contains Mackinac Ware ceramics in addition to Wayne Tradition pottery dated in the Straits of Mackinac area between A.D. 800 and A.D. 1000, which suggests that the intermediate position of Butterfield in the ordering is correct. The Wayne Ware ceramics from the Foster site, presumably the latest Wayne Tradition site in the study, were found in association with shell tempered and wavy lip vessels which appear as intrusions in the Saginaw Valley after A.D. 1000. The relatively late position of Riviere au Vase in the order may be supported by the undocumented but possible association of Wayne Ware with the Younger or Fort Wayne Phase materials of the Younger Tradition. Because there are unequal sample sizes from Wayne Tradition sites the above order should be considered very tentative (Hole and Shaw, 1967:29).

Southeast Sites. Seriations of ceramic groups and the three sites in the southeast sub-area were performed. Both seriations were hand sorted by the Brainerd-Robinson technique. In addition a 3-pole graph, of site order using CLUSTER groups 1, 4 and 7, was constructed as an independent assessment. While the sample size (3 sites) is small, the results of the Brainerd-Robinson seriation (Table 13) and the 3 pole graph (Figure 99) agree in the resulting order of the Fort Wayne, Riviere au Vase and Draper Park sites.

Table 12. -- Seriation of
Wayne Tradition Sites

1. Draper Park
2. Riviere au Vase
3. Fort Wayne
4. Root
5. Foster
6. Hodges
7. Mahoney
8. Butterfield
9. Schultz
10. Fletcher

	5	2	1	10	4	8	7	6	9	3
5	200	34	32	46	14	28	40	40	42	40
2	34	200	86	90	98	78	84	50	56	16
1	32	86	200	156	94	104	70	42	58	50
10	46	90	156	200	106	96	76	34	76	50
4	14	98	94	106	200	102	112	80	62	60
8	28	78	104	96	102	200	118	106	74	56
7	40	84	70	76	112	118	200	134	74	82
6	40	50	42	34	80	106	134	200	48	50
9	42	56	58	76	62	74	74	48	200	84
3	40	16	50	50	60	56	82	50	84	200

Matrix Coefficient C = 1.12495

Table 13. -- Seriation of Three Southeast Wayne Tradition Sites

	Fort Wayne	Riviere au Vase	Draper Park
Fort Wayne	200	120	116
Riviere au Vase	120	200	124
Draper Park	116	124	200

Norm = 0

The only radiocarbon date for this sequence is the A.D. 750 $\pm$ 120 (M-1843) date from the Fort Wayne Mound. Draper Park is proposed as a later Wayne Tradition site because a total of 8 or 6.8 percent of the ceramic vessels from the site are castellated, a trait that appears in southeastern Michigan after A.D. 1100. No Wayne Ware vessels from either Riviere au Vase or the Fort Wayne Mound possess castellations. Collars and rolled rims are not present on Fort Wayne Mound vessels while Draper Park and Riviere au Vase vessels both have collared and rolled rims which probably post-date A.D. 1000 in the southeast.

Southeast Ceramics. The results of a hand sorted Brainerd-Robinson matrix (Table 14) suggests developmental trends in Wayne Tradition ceramics from the Southeast. If, as suggested, the Draper Park site is the latest site in the area, then ceramic group 5 at the left end of the matrix should represent the later end of the ceramic order. All but one of the vessels in the group come from Draper Park. Furthermore, six of the eight castellated vessels from the southeast sub-area come from groups 5, 1 and 4; the three "latest" cluster groups in the order. The earliest Wayne Decorated ceramic group according to the order is group 2 which is composed entirely of incised vessels, 45 percent of which are

Figure 99. -- Meighan Three-Pole
Graph of Southeast Wayne Tradition Sites

1. Fort Wayne
2. Riviere au Vase
3. Draper Park

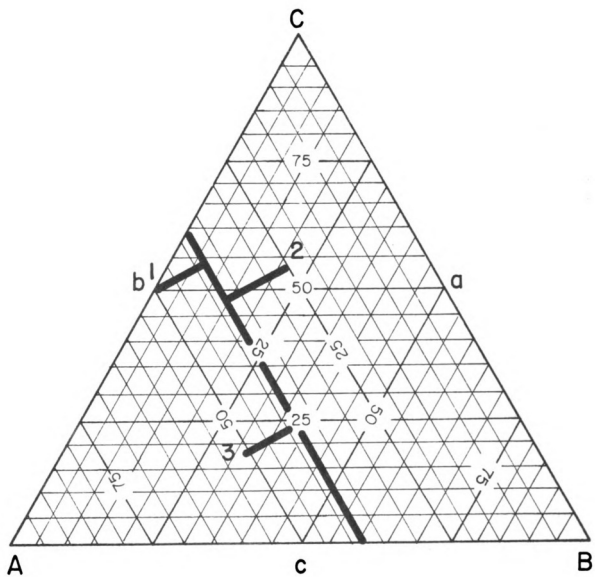


Table 14. -- Seriation of Southeast
Wayne Tradition Ceramic Groups

See Table 8 for frequency and
percentages of attributes in each cluster.

	5	1	4	8	3	6	2	9	7	10
5	200	180	174	167	160	165	162	142	121	67
1	180	200	190	187	180	184	156	156	135	81
4	174	190	200	193	186	179	146	151	130	76
8	167	187	193	200	193	186	145	159	138	83
3	160	180	186	193	200	188	145	165	144	87
6	165	184	179	186	188	200	157	172	152	97
2	162	156	146	145	145	157	200	150	123	75
9	142	156	151	159	165	172	150	200	172	125
7	121	135	130	138	144	152	122	172	200	146
10	67	81	76	83	87	97	75	125	146	200

Norm = 163

cross-hatched, a decorative motif Fitting (1965:41) suggests is Late Middle Woodland, Early Late Woodland or transitional. Ceramic groups 1 and 4 are the latest in the sequence. Ceramic group 1 is dominated by corded punctate and cord impressed exteriors. Punctates dominate the exteriors of vessels in ceramic group 4.

The above results, consistent with the little external evidence available, suggest that collars and castellations are relatively late additions in Wayne Tradition ceramics and never dominate any one significant ceramic group. Exterior decoration, possibly lacking in the very earliest and latest dominant Wayne Tradition ceramic groups (5 and 7, 9 and 10), appears to shift from incising to punctuation, with the latest Wayne Decorated ceramics being cord impressed.

Northeast Sites. Eight Northeast sub-area sites were sorted using 11 cluster groups by the Craytor and Johnson computer program. The results (Table 15) are unsatisfactory largely because sample sizes varied between a total of 279 for the Fletcher site (71 percent of the total) and only five for Valley Sweets. The raw data are clearly dominated by ceramics from the Fletcher site. Based on expectations from attributes present at various sites, Fletcher, with 29 or 10.4 percent castellated vessels, should have been at one extreme (late) in the order. The Schultz site, lacking both castellations and collars, should have been at the other end of the order. Because the results of the Craytor and Johnson seriation of Northeast sites was so effected by differences in sample size, a seriation of ceramic groups was not attempted.

Table 15. -- Seriation of Northeast Wayne Tradition Sites

1. Root
2. Foster
3. Hodges
4. Mahoney
5. Valley Sweets
6. Butterfield
7. Schultz
8. Fletcher

	5	6	8	1	7	4	3	2
5	200	56	56	50	84	54	22	34
6	56	200	68	86	64	54	44	0
8	56	68	200	110	84	84	64	42
1	50	86	110	200	102	118	92	50
7	84	64	84	102	200	114	80	74
4	54	54	84	118	114	200	80	108
3	22	44	64	92	80	80	200	44
2	34	0	42	50	74	108	44	200

Matrix Coefficient C = 1.25648

Change in the Spring Creek Tradition

With only three sites in the Spring Creek Tradition, a Brainerd-Robinson matrix (Table 16) was easily sorted indicating the order Zemaitis, Spoonville and Spring Creek.

Table 16. -- Seriation of Spring Creek Tradition Sites

	Zemaitis	Spoonville	Spring Creek
Zemaitis	200	139	133
Spoonville	139	200	161
Spring Creek	133	161	200

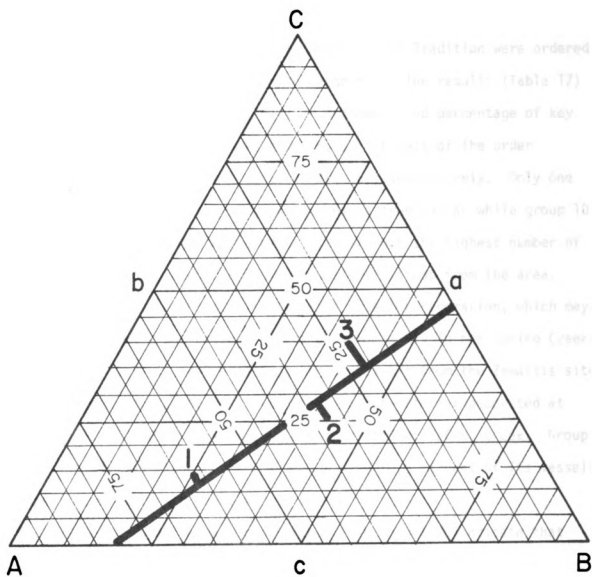
Norm = 0

A Meighan three-pole plot (Figure 100) using cluster groups 3, 9 and 10 indicates the same order. Spring Creek, with a radiocarbon date of A.D. 960 ± 75 (M-512) appears to be the latest of the three sites in the tradition. The 45 vessels from Spring Creek with true collars represent 61 percent of all collared vessels in the tradition. Zemaitis has the fewest true collared vessels with six or 8.1 percent of the total. Only two of the total 597 or .3 percent of the vessels in the Spring Creek tradition are castellated and these, paradoxically, come from the Zemaitis site. The site, in addition to having a Middle Woodland component and a transitional or Early Late Woodland component may have been briefly occupied later than A.D. 1000 which would account for the small number of vessels with true collars and castellations.

Further support for Zemaitis' relatively early date and the Spring Creek site's late date is that 11 or 61.1 percent of the Spring

Figure 100. -- Meighan Three Pole
Graph of Spring Creek Tradition Sites

1. Zemaitis
2. Spoonville
3. Spring Creek



Creek Decorated vessels with incising are from Zemaitis while only 3 or 16.7 percent of the incised vessels come from Spring Creek. The largest number of corded punctate and impressed vessels, 24, or 57 percent of the total come from Spring Creek with Spoonville having the next highest at 16 or 38 percent.

Ten ceramic clusters from the Spring Creek Tradition were ordered by hand using the Brainerd-Robinson technique. The results (Table 17) are clearly supported by the shift in frequency and percentage of key attributes over time. Ceramic group 6, on the left of the order appears to be early in that it lacks true collars entirely. Only one vessel in each of the next four groups has a true collar while group 10, farthest to the right and presumably latest, has the highest number of collared vessels, 25, occurring in any ceramic group from the area. Group 10 is also the group with the most exterior decoration, which may suggest that exterior decoration was uncommon early in the Spring Creek Tradition. Only 15 or 5.6 percent of the vessels from the Zemaitis site are exterior decorated; 22 or 13.3 percent are exterior decorated at Spoonville and 30 or 18.4 percent are decorated at Spring Creek. Group 12, with incised exterior decoration on only 10.8 percent of its vessels appears appropriately early in the order.

General trends within the Spring Creek Tradition indicate that early in the development of the tradition exterior decoration, true collars and exterior decoration were rare. Rolled rims were more common earlier in the tradition at Zemaitis and became less common as true collars increased in popularity.

Table 17. -- Seriation of
Spring Creek Tradition Ceramic Groups

(See Table 7 for frequency and
percentages of attributes in
each group).

	6	12	4	5	13	7	3	2	11	1	8	9	10
6	200	179	174	163	155	148	146	152	128	119	113	88	87
12	179	200	186	172	163	154	155	167	143	133	128	103	92
4	174	186	200	186	179	168	169	177	154	145	149	113	102
5	163	172	186	200	191	172	183	176	163	157	152	125	114
13	155	163	179	191	200	191	192	177	164	166	159	134	123
7	148	154	168	172	191	200	197	171	160	171	165	140	129
3	146	155	169	183	192	197	200	171	163	174	168	142	131
2	152	166	177	176	177	171	171	200	177	162	157	146	125
11	128	143	154	163	164	160	163	177	200	172	167	156	148
1	118	132	145	157	166	171	174	162	172	200	194	168	157
8	113	128	149	152	159	165	168	157	167	194	200	174	160
9	88	103	113	125	134	140	142	146	156	168	174	200	175
10	87	92	102	114	123	129	131	125	148	157	160	175	200

Norm = 109

Changes in the Allegan Tradition

Three sites within the Allegan Tradition were hand ordered using the Brainerd-Robinson technique. The Moccasin Bluff, Forty-Sixth Street and Fennville order, presented in Table 18 is identical to the order suggested by the Meighan 3 pole plot indicated in Figure 101.

Table 18. -- Seriation of Allegan Tradition Sites

	Fennville	Forty-Sixth Street	Moccasin Bluff
Fennville	200	172	116
Forty-Sixth Street	172	200	148
Moccasin Bluff	116	148	200

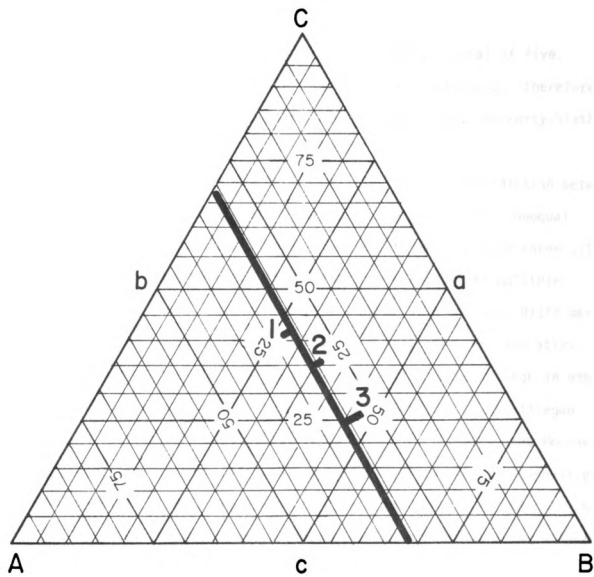
Norm = 0

Eleventh Century A.D. dates from the Moccasin Bluff site dating later ceramics than those used in this study, and two radiocarbon dates from the Forty-Sixth Street site of A.D. 1180 + 100 (M-2233) and A.D. 1230 + 100 (M-2232) suggested that Moccasin Bluff is the earliest site in the tradition while the Fennville site appears to be the latest. Rogers (1972:90), however, states that Fennville appears to be earlier than Forty-Sixth Street. Some of the ceramics from the Fennville site may be earlier in the Late Woodland. The bulk of the ceramic material, however, appears to be at least contemporaneous with or later than the Forty-Sixth Street site.

In addition, the above order is not supported by the frequency

Figure 101. -- Meighan Three-Pole Graph
of Allegan Tradition Sites

1. Moccasin Bluff
2. Forty-Sixth Street
3. Fennville



and percentages of key attributes at the sites. Moccasin Bluff has more collared vessels than either of the other two sites with 14, or 50 percent of the total number of collared vessels in the tradition. Fennville on the other hand has 22 vessels with rolled rims, more than either Moccasin Bluff or Forty-Sixth Street. Moccasin Bluff, is the only site in the Allegan Tradition with castellated vessels, a total of five. According to the frequency and percentages of key attributes, therefore, Moccasin Bluff should be the latest of the three sites, and Forty-Sixth Street the earliest.

A number of factors may be responsible for the contradiction between the radiocarbon evidence, the seriation and key attributes. Unequal sample sizes from the sites, and the fact that there are only three sites in the area may have affected the seriation. Unrecognized multiple components from one or more of the sites, especially Moccasin Bluff may also have affected the seriation results. Furthermore, the key attributes which appear to be important indicators of temporal change in other contemporary ceramic traditions may not be significant in the Allegan Tradition, though this possibility seems unlikely. Finally, the Moccasin Bluff site, located in a different river drainage system than Fennville and Forty-Sixth Street, may belong to a separate ceramic tradition. In such a case, the seriation order would be badly distorted, especially if the traditions overlap in time (Doran and Hodson, 1975:269). The simultaneous analysis of a larger sample of material from both the Kalamazoo and St. Joseph drainages should resolve most of the above problems.

The results of the hand sorted Brainerd-Robinson matrix of nine Allegan Tradition ceramic groups is presented in Table 19. The order

Table 19. -- Seriation of Allegan Tradition
Ceramic Groups

(See Table 5 for frequency and
percentages of attributes in
each group).

	9	7	1	8	5	6	4	2	3
9	200	187	138	135	106	81	82	77	45
7	187	200	157	145	116	90	91	87	55
1	138	157	200	182	158	145	153	140	108
8	135	145	182	200	171	147	146	142	110
5	106	116	158	171	200	177	175	171	149
6	81	90	145	147	177	200	191	184	160
4	82	91	153	146	175	191	200	193	164
2	77	87	140	142	171	184	193	200	168
3	45	55	108	110	149	160	164	168	200

Norm = 17

indicated appears to have later ceramic groups on the left with earlier groups on the right based on the key attributes of collaring and castellations. The earliest groups 3, 2, 4, 6 and 5 lack any castellated vessels while three of the last four ceramic groups have one or more castellated vessels, with a total of four in group 9, the latest ceramic group. Collars and rolled rims are distributed in a similar fashion. Both attributes are missing in the earliest group. In group 6, 66.7 percent of the vessels have rolled rims. True collars appear in group 5 and later groups in the order but never occur on more than 25 percent of the vessels in any one group. If the seriation represents a true chronological order, exterior decorated vessels as expected appear relatively late in the sequence.

Rogers (1972:94) notes that changes in lip decoration seem to occur in the Allegan Tradition over time, and this idea is implicit in Kingsley's (1977) definition of several variants of Allegan Decorated Lip. The results of the above seriation do not support this suggestion. The same factors which affected the seriation of Allegan Tradition sites may, however, have affected the seriation of ceramic groups as well.

Summary

The preceding seriations provide both methodological and substantive results. Polythetically defined groups appear to yield results acceptable for chronological seriation. The changes that occur in the polythetic ceramic groups are, for the most part, relative differences in the frequency and percentages of attributes as the ceramic groups change over time. The temporal significance of polythetically defined ceramic groups derives not from the occurrence of a mutually exclusive

cluster of attributes but the more gradual shifting and blending of constellations of attributes over time.

The seriation results presented here are clearly general and tentative until they can be validated by more concrete independent evidence. The results of seriation in the Allegan Tradition, in particular, need further exploration and all seriation results would be improved by a larger data base both in terms of more sites and a more even balance in sample size between sites.

The best adjective to describe temporal change in the Early Late Woodland ceramic traditions is moderate. Rogers (1972:94) notes the essentially conservative change in the Allegan Tradition. Change in the Spring Creek and Wayne Traditions also appears to be conservative. Toward the end of each of the traditions, the rate of change appears to increase, somewhat, with the addition of new attribute dimensions to some vessels such as collaring and castellations while other forms persist. The internal homogeneity of ceramic styles, over perhaps seven hundred years in each of the three traditions, may be a reflection of relatively stable societies, a suggestion which will be explored in Chapter 6.

CHAPTER VI

DISCUSSION AND INTERPRETATION

Introduction

The results presented in Chapters 4 and 5 demonstrate the existence of three distinctive ceramic traditions in southern lower Michigan during the early Late Woodland. The current chapter discusses the relationships between the Spring Creek Allegan and Wayne Traditions with respect to the boundaries that were present between each of them and the external boundary relationships that were present with areas surrounding the three traditions. Critical to the discussion are data from other archeological research dealing with both the early Late Woodland, its predecessors and successors, and the perspectives on ethnic group boundaries drawn from sociocultural anthropology.

An Ecological Perspective

Boundaries and Their Maintenance. The interdependence or relationships between ethnic groups which share boundaries may be in part attributable to differences in adaptation (Barth, 1969:19). Barth proposes a typology of relationships between groups that may be used to interpret the results of the preceeding analysis which include the following types of relationships:

1. They may occupy clearly distinct niches in the natural environment and may be in minimal competition for resources. In this case their interdependence will be limited despite co-residence in the area, and the articulation will tend to be mainly through trade and perhaps in a ceremonial-ritual sector.

2. They may monopolize separate territories, in which case they are in competition for resources and their articulation will involve politics along the border, and possibly other sectors.
3. They may provide important goods and services for each other, i.e. occupy reciprocal and therefore different niches but in close interdependence. If they do not articulate closely in the political sector, this entails a classical symbiotic situation and a variety of possible fields of articulation (Barth, 1969:19-20).

A fourth form may occur when two or more interspersed groups compete with each other for the same niche. Competition over time may result in even trial accommodation and increasing interdependence between the groups or in one group displacing the other (Barth, 1969:20).

The Allegan Tradition

Michigan Relationships. Relationships between members of the Allegan Tradition, and the Spring Creek and Wayne Traditions are indicated by sharing of a number of ceramic attributes and attribute configurations which occur in all three traditions. The differences which do occur are in terms of attribute frequency and relative percent. Particularly distinctive attributes of the Allegan Tradition include a high percentage nearly vertical or vertical rims with vertical cordmarking and undecorated cordmarked lips. While the above attributes certainly occur in both the Spring Creek and Wayne Traditions, they do not occur as frequently as in the Allegan Tradition (Appendix B). In addition, exterior decorative motifs which occur on only 13 percent of all Allegan Tradition vessels, are quite similar to decorative motifs on Wayne and Spring Creek Wares. Ceramics with the distinctive attribute configurations of Allegan Ware have been identified as a group in the Saginaw Valley (Brashler, 1973). Therefore some interaction appears to have

taken place between Allegan and Saginaw Wayne Tradition groups.

A somewhat closer relationship seems to exist between the Allegan and Spring Creek Traditions than is present between the Allegan and Wayne traditions. The closeness of relationship is indicated by the results of the first cluster analysis which suggested the eastern and western portions of the research area were significantly different. Furthermore, there is strong similarity in the percentages of a number of key attributes between the two traditions, particularly decorative attributes. One striking difference between ceramics from the two traditions relates to the attribute for rim flare. The Allegan Tradition has the lowest percentage of everted rims while the Spring Creek Tradition has the largest percentage.

The inference to be drawn from these data in boundary terms is that a somewhat distinct ethnic boundary may exist between people of the Allegan and Wayne Traditions while a somewhat weaker boundary appears to exist between the Spring Creek and Allegan Tradition groups. In part the similarities may be attributable to ease of transportation and communication between the three traditions. People of the Allegan and Spring Creek Traditions could have communicated by simply moving up and down the Lake Michigan shoreline. Communication and transportation across the lower peninsula certainly was facilitated by the rivers and their tributaries, but involved at least one or more portages and therefore may have occurred on a less regular basis simply because they were more arduous.

What the preceding patterns therefore suggest is that interaction between populations belonging to the Spring Creek and Allegan Traditions may have been more frequent than between the Allegan and Wayne Tradition.

Such interaction may have involved the exchange of resources such as Lambrix chert which occurs in relatively low percentages at the Fennville and Forty-sixth Street Sites and in somewhat higher percentages near its source in Oceana County, north of the Muskegon river and the Spoonville, Spring Creek and Zemaitis Sites (Luedtke, 1976:377). In addition to exchange of material items, interaction across the boundaries may have involved exchange of perishable goods and certainly appears to have included the exchange of pottery making and decorating ideas. No evidence is available which suggests competition for territory. Instead it appears that the Spring Creek and Allegan Traditions may have provided some goods and services for each other which were not being exchanged between the Allegan and Wayne Traditions. This pattern of interaction between the Allegan and Spring Creek Traditions therefore may be similar to Barth's third type of interdependence where groups might seem similar because of numerous reciprocal exchanges (Barth, 1969:19-20).

External Relations of the Allegan Tradition. Of particular interest is the relationship of the Allegan Tradition groups to representatives of cultural traditions located to the south and west in northern Indiana and Illinois. Bettarel and Smith (1973:112) note very strong similarities between early Moccasin Bluff Ware, Weaver Ware and the Swanson Complex, ceramics from central Illinois and Indiana. In addition, Heins Creek ceramics from Wisconsin are thought to be roughly similar to some Moccasin Bluff ceramics (Bettarel and Smith, 1973:113). The nature of the social or ethnic boundary between groups from Indiana, Illinois and the Allegan Tradition is unclear at this time. Nonetheless, a strong relationship or "influence" perhaps best conceived of as some form of boundary interaction is present between the Allegan Tradition and its

southern and western neighbors.

The Moccasin Bluff site, however, is quite possibly not part of the Allegan Tradition as was indicated by the results of the seriation presented in Chapter 5. Ceramics from the Fennville and Forty-Sixth Street sites also appear to be similar to early Late Woodland ceramics from Central Illinois (Rogers, 1972). Interaction between the Allegan Tradition and groups further east beyond the Wayne Tradition was almost certainly minimal.

Before and After the Allegan Tradition. Evidence from the Late Archaic through the historic period supports the close ties groups in southwest Michigan had with groups from northern Indiana and Illinois. During the Late Archaic, numerous identical artifact types appear in Glacial Kame and Red Ochre contexts in the two areas (Cunningham, 1948). In the Early Woodland, Marion Thick ceramics, a ceramic type defined in Illinois, appear at the Moccasin Bluff Site. Havana-Hopewell ceramics, Illinois related Middle Woodland pottery also occur at Moccasin Bluff. Illinois related Early and Middle Woodland ceramics and sites do not, however, appear in the Kalamazoo drainage nor is there any evidence for any non-Hopewellian Middle Woodland in the drainage (Kingsley, 1977).

It has already been mentioned that indigenous Late Woodland materials appear at Moccasin Bluff as well as the Forty-Sixth Street and Fennville sites which seem to be related to some early Late Woodland ceramics from Illinois. Between 1000 and 1100 A.D., however, Upper Mississippian ceramics begin to appear both at the Moccasin Bluff site (Bettarel and Smith, 1973) and in the Kalamazoo drainage (Kingsley, personal communication). With the appearance of Upper Mississippian ceramics at Moccasin Bluff the Allegan Tradition or its St. Joseph counterpart seems to

disappear. In the Kalamazoo drainage, however, the Allegan Tradition appears to continue at least until the thirteenth century A.D. based on the radiocarbon dates from the Forty-Sixth Street site. It is therefore possible that the late Allegan Tradition groups existed in the same river drainage and may have competed for resources with Upper Mississippian groups. However, it is equally possible that the two groups may have been intent on exploiting different niches if the Allegan Tradition groups maintained a hunting-collecting adaptation while the Upper Mississippian groups pursued an agricultural adaptation. The above relationships are currently being investigated by field crews from Western Michigan University (Kingsley, personal communication). The apparent simultaneous occupation of the Kalamazoo Valley by an indigenous Late Woodland population and an agricultural based Upper Mississippian population should come as no surprise as this is a pattern observed elsewhere in the Midwest, i.e. Wisconsin (Hall, 1962).

Relationships between late Allegan tradition groups and Upper Mississippian neighbors may best be characterized by Barth's fourth type of boundary interaction (Barth, 1969:20). In the St. Joseph, the relationship between indigenous people and Upper Mississippians apparently resulted in the displacement or cooptation of the indigenous groups. In the Kalamazoo drainage however, some accommodation may have been made between the two distinct groups perhaps for a period of one or two centuries.

The boundary relationships between the late Allegan Tradition and Upper Mississippian groups will need clarification in the future, as will documentation of the origin of the Allegan Tradition insofar as there does not appear to be any local Middle Woodland population in the

Kalamazoo drainage.

The Spring Creek Tradition

Michigan Relationships. The close relationship between the Spring Creek and Allegan Traditions are discussed in the previous section. The nature of the boundary relations between Wayne and Allegan Tradition groups appears to have been similar to that found between the Allegan and Wayne Traditions. The ceramic data indicate that peoples of the Spring Creek and Wayne Traditions certainly interacted with one another but the nature of their interaction across social boundaries appears to have been somewhat less frequent when compared to the relationships between Allegan and Spring Creek groups.

Key ceramic attributes present (or absent as the case may be) in the Spring Creek Tradition include low frequency of exterior decoration, relatively high frequency of rolled and collared rims (total 45%) and a relatively high frequency of everted rims (40%) (Appendix B). In fact, the Spring Creek Tradition might be characterized as the most extreme of the three in that the above attributes occur in either the lowest (decoration) or highest (collaring and eversion) percentage of all three traditions. Exterior decorative motifs, when they occur on Spring Creek Ware, are similar to decoration found on both Wayne and Allegan Tradition ceramics, but they are rare.

Ceramics from the Spring Creek and Saginaw Wayne Traditions appear to be more similar than ceramics from the southern Wayne Tradition and the Spring Creek Tradition. A large number of ceramics formally similar to Spring Creek Collared were identified in the Saginaw Valley (Brashler, 1973). Other earlier studies, Wobst (1968) and Fitting (1968), have noted

similarities between Spring Creek and Saginaw Wayne Tradition ceramics, as well as Southern Wayne Tradition Ceramics. Transportation and communication again may have played a significant role in determining the frequency of interaction between the Spring Creek and Wayne Traditions. Transportation and communication clearly were facilitated by the major rivers and their tributaries but travel to the Wayne Tradition was initially upstream rather than downstream and also involved at least one portage. Luedtke (1976:386) notes that the distribution of lithic materials is strongly related to the rivers and lake shores. From this she infers that interaction may have taken place primarily along the easiest routes of communication and transportation.

The nature of boundary relations between peoples of the Spring Creek and Wayne Traditions appears to have been somewhat different than relationships between Spring Creek and Allegan groups. This is indicated by the discontinuous distribution of chert types native to the two areas. Luedtke (1976: 330-340) documents high percentages of Bayport cherts in the Saginaw Bay area which is expected because the sources are located nearby. The frequency of Bayport chert however drops to zero west of Saginaw. Furthermore, the direction of clines on Luedtke's (1976: 340,343,344) maps points to a distribution of Bayport to the east in Western Ontario rather than Western Michigan. In Western Michigan, Lambrix and Glacial cherts occur frequently on Spring Creek Tradition sites but their distribution drops to zero toward the east. Luedtke (1976:329) hypothesizes the presence of a major social boundary when chert frequencies decline rapidly as they appear to do between the Wayne and Spring Creek Traditions.

The above chert distribution patterns, when taken with the

statistically significant differences in ceramic tradition, suggest that interaction between people responsible for the Spring Creek and Wayne traditions may have been relatively infrequent. Interaction between the Spring Creek and Northern or Saginaw Wayne Traditions, however, may have been more frequent because the two areas are relatively closer in space than the Spring Creek Tradition and the Southern Wayne Tradition. When the attribute percentages from southern Wayne Tradition ceramic assemblages was compared to those from the Spring Creek Tradition an inverse relationship was noticed. That is, key attributes of the Spring Creek Tradition, which were least frequent among all three traditions, are most frequent in the southern Wayne Tradition assemblage. The same relationship exists between frequently occurring attributes in the Spring Creek Tradition and infrequent attributes in the southern Wayne Tradition (Appendix B).

The relatively strong differences between the Spring Creek and Wayne Traditions, both in ceramics and in terms of chert distributions, suggests a different type of boundary relation than existed between the Spring Creek and Allegan Traditions. The relationship between the Spring Creek and Wayne Traditions may be best classified as Barth's second type of interdependence where two groups occupy and control separate territories and relate to each other in the political sphere and possibly others. If land use patterns from the ethnohistoric record were operative during the early Late Woodland, similarities that exist between the Saginaw Wayne Tradition and Spring Creek Tradition may be explained by the occasional crossing over into the Saginaw Drainage of distinct Spring Creek groups to hunt.

External Relationships of the Spring Creek Tradition. The only external relationship of Spring Creek Tradition that needs to be considered is along its northern boundary. The northern boundary of the tradition roughly corresponds to the Carolinian and Canadian-Carolinian transition zone boundary. North of this boundary early Late Woodland ceramics from the Straits of Mackinac area, such as Mackinac and Bois Blanc Wares (McPherron, 1967) become more frequent, as do Skegemog and Traverse Wares (Cleland n.d.) from the Traverse City area. Boundary relationships between individuals and groups responsible for the Spring Creek tradition and groups to the north should be somewhat stronger than relationships between members of the Spring Creek, Allegan and Wayne Traditions based on qualitative ceramic differences. The distinction between Spring Creek groups and peoples to the north is supported not only by qualitative ceramic differences but by differences in subsistence-settlement patterns (Cleland, 1966) and to a lesser extent by Norwood chert distribution. The Chippewa, adapted primarily to the Canadian biotic province, rarely hunted south of the Grand and Muskegon drainages (Cleland, 1966), though they did venture into the transition zone to hunt during the historic period (Quimby, 1966).

Luedtke (1976: 352-358) indicates that Norwood chert is infrequent or absent in sites south of the Muskegon drainage. The distribution of Lambrix chert, on the other hand, is high from the Muskegon to the Kalamazoo drainage. Norwood chert probably did not function as a valuable good in exchange (Luedtke, 1976:357). Furthermore, the gradual decrease in frequency of Norwood chert over space does not support the presence of a distinct social boundary though the complementary distribution of Norwood and Lambrix chert is suggestive. Boundary effect in chert distributions

may have been obscured by the "lack of closely spaced data points" (Luedtke, 1976:362).

The northern boundary of the Spring Creek Tradition may have been characterized by frequent interaction between Spring Creek groups and their northern neighbors. This is indicated by an apparent trend for a high percentage of vessels with everted rims in the Spring Creek Tradition when compared to the Allegan and Wayne Traditions. Rim eversion is a characteristic of early late Woodland Mackinac Ware in the Straits of Mackinac area (McPherron, 1967). Furthermore Bowerman Ware, an early Late Woodland ceramics from the Traverse City area (Cleland, n.d.) appear to be intermediate in terms of rim flare and decoration between Spring Creek Ware and Mackinac Ware (Margaret Holman, personal communication).

In sum, the northern boundary relations of the Spring Creek Tradition remain unclear with different lines of evidence supporting types one, two and three of Barth's boundary relationship classification.

Before and After the Spring Creek Tradition. Early and Middle Woodland sites yield evidence of a close relationship between forerunners of the Spring Creek Tradition and Havana-Hopewellian groups to the south (Quimby, 1941; Flanders, 1965). Flanders (1965; 1977) identifies the presence of Marion Thick, an Illinois Early Woodland ceramic type; classic Illinois Havana-Hopewell ceramics; and Havana-Hopewell mortuary customs in the Grand and Muskegon drainages. In addition to the classic Havana-Hopewell materials, however, are the cordmarked "Crockery Flared" ceramics which Flander's believes are Middle Woodland. These cordmarked ceramics have been demonstrated to be statistically identical to later Spring Creek Ware in this study. Some or all of the cordmarked ceramics from the Spoonville and Zemaitis sites, in particular, are probably early

Late Woodland or perhaps late Middle Woodland dating between A. D. 500 and A. D. 900. The presence of cordmarked ceramics, with "transitional" attribute combinations, such as cross-hatching over cordmarking, at sites which clearly have Middle Woodland occupations, suggests some continuity between Middle and Late Woodland cultures in the Grand and Muskegon drainage, a pattern not observed in the Kalamazoo drainage.

Finally, the persistence of a globular cordmarked style of pottery in the Muskegon-Grand drainages similar to Spring Creek Ware has been suggested by Quimby (1966) and Fitting (1970:179). The pottery from Dumaw Creek, a late 16th or early 17th Century mortuary site in Oceana County have been compared to Wayne (i.e., Spring Creek) Wares (Fitting, 1970:180).

Indications of some relationships between upper Mississippian groups to the south and the Spring Creek tradition peoples have recently been noted (Kingsley, personal communication). The nature of the relationship, i.e., contact or diffusion is, however, unclear at this time though a major Upper Mississippian intrusion does not appear to have been present in the Grand and Muskegon drainages.

Available evidence therefore suggests that the Spring Creek Tradition may have continued uninterrupted beyond A.D. 1000, perhaps even to the Early Historic period. However, the lack of known sites dating between A.D. 1000 and A.D. 1600 in the Muskegon and Grand drainages prohibits testing the above hypothesis at this time.

The Wayne Tradition

Boundary relationships between groups responsible for the Wayne, Allegan and Spring Creek traditions have already been discussed.

Relationships within the Wayne tradition groups, between the peoples occupying the Saginaw drainage and the southern Wayne Tradition sites need consideration because the two areas were originally thought to represent two separate traditions. One key attribute thought to differentiate Saginaw from southern Wayne Tradition ceramics was the thickness of vessels (Fischer, 1972). In fact, thin vessels are proportionately more frequent on vessels from the south than in the northern Saginaw area (Appendix B). In most other respects, attributes and attribute configurations occur in approximately the same percentage within the Saginaw and southern portions of the Wayne Tradition (Appendix B). Finally, the distribution of Bayport, Kettlepoint and Upper Mercer cherts does not suggest the presence of any major social boundary within the Wayne Tradition (Luedtke, 1976).

External Relationships of the Wayne Tradition. The north, east, and southern boundaries of the Wayne Tradition are most interesting and complex. The distribution of Wayne Tradition sites, like the distribution of Spring Creek Tradition sites, is apparently limited by the Canadian-Carolinian transition zone. North of this zone are the Mackinac, Bois Blanc and Juntunen wares of the Straits of Mackinac area (McPherron, 1967). The boundary between these two major ceramic and cultural traditions appears to be distinct i.e., the ceramics look very different when Wayne Wares from Saginaw are compared to Straits area material. Some interaction across the boundary, however, is clearly indicated by the presence of Mackinac and Wayne Wares in the same level at the Butterfield site (Wobst, 1968). Of interest is the fact that Butterfield is located at the southern edge of the Canadian-Carolinian transition zone. Whether Wayne Tradition and Mackinac groups occupied the site at the same time,

however, is not clear. An alternative explanation, that the ceramics were made locally by a single indigenous local group, seems unlikely given the somewhat dramatic dichotomy in the ceramics. Wobst (1968:265) suggests that the transition zone may have comprised a separate cultural entity which is reflected by the "hybridization" of the ceramics. Luedtke (1976:402) on the other hand suggests that the transition zone was occupied by several cultural traditions who shared a common adaptation. This would account for ceramic differences such as seen at Butterfield and other transition zone sites.

Wobst (1968:265) believes that the transition zone does not represent a linear boundary. He and Fitting (1970) also note the occasional occurrence of Wayne like ceramics occurring north of the transition zone. Such an interpretation seems likely in that some social interaction almost certainly occurred between the northern and southern portions of the peninsula between the Spring Creek and Wayne Traditions and northern groups. The presence of a major northern social boundary, however, does seem indicated, for both the Wayne and Spring Creek traditions, given the ceramic distributions.

The distribution of Bayport and Norwood cherts overlap in small percentages in the north central portion of Michigan, but Luedtke (1976:362) sees no indication of major social boundaries. The lack of clear evidence for boundaries indicated by chert distribution, however, may be caused by a lack of data (Luedtke 1976:362). The nature of the northern boundary of both the Wayne and Spring Creek Traditions, therefore, need much clarification.

Added to the complexity of the boundary relationships of the northern or Saginaw Wayne Tradition is the identification of a small but

definite Upper Mississippian component in the Saginaw Valley on sites (i.e., Fosters and Mahoney) which also contain Wayne Ware. The presence of these ceramics in small quantities suggests some small amount of interaction between the Saginaw Valley people and the groups from the southwest part of the state or northern Indiana and/or Illinois, perhaps between A.D. 1100 and A.D. 1200. The nature of the interaction is unclear as to whether it involved trade, stimulus diffusion or actual migration of a small group.

Wayne tradition boundary relationships to the south and east are equally or more complex than northern relationships. Wayne Tradition ceramics are the most highly decorated of the three traditions in this study. Furthermore, the decorations on Wayne Ware are often more complicated than those on Spring Creek and Allegan Wares, occasionally with more than a single band of exterior decoration. The relative complexity of Wayne Wares in comparison to Spring Creek and Allegan Wares appears to be related to interaction between Wayne Tradition groups and people from a much different series of cultural traditions in southeast Michigan and adjacent areas of Ontario and northern Ohio. All three sites yielding Wayne Ware from southeast Michigan have also produced Younger Tradition ceramics. The Younger Tradition, defined by Fitting (1965) appears to have strong ties to Glen Meyer pre-Ontario Iroquois types from southwest Ontario (Fitting 1965:154-158). Younger tradition ceramics are much more highly decorated than Wayne Ware with more varied and complex decorative motifs.

Fitting (1965) initially assigned Wayne Ware to the Middle Woodland period, pre-dating the Younger tradition. Subsequently, radiocarbon dates on both Wayne and Younger Tradition materials established the

contemporaneity of the Wayne Tradition with at least the early part of the Younger Tradition (Fitting, 1966). Therefore, a new interpretation of these data is necessary.

What seems most likely at this writing is that the presence of Wayne and Younger Tradition ceramics at the same site indicates the interaction of two distinct groups occupying the same area. Two of the three southeast Wayne Tradition sites are mortuary sites described by both Fitting (1965) and Halsey (1968, 1976). Younger and Wayne groups shared mortuary sites and most probably interacted with each other in a number of important, though at this time, largely undocumented respects. The relationship may have been one similar to the type 1 boundary interaction described by Barth (1969:19). In type 1 boundary interaction, two distinct social groups shared residence in an area but occupied discrete niches in the natural environment. Consequently, no competition for resources occurred and relationships between groups occurred perhaps through trade and in the ceremonial-ritual sector.

If the Wayne-Younger interdependence is a Type 1 interaction, Wayne and Younger groups must have differed with respect to subsistence settlement pattern because they occupied different niches. Unfortunately, only one southeast Wayne Tradition habitation site, Draper Park, has been excavated. Preliminary floral and faunal analysis from the site indicate presence of intensive fishing and collecting of wild plant foods in addition to some evidence of domestic squash and pumpkin (Weston, personal communication).

Other evidence from the Southeast suggests that Michigan Younger Tradition groups and Ohio Western Basin Tradition groups may have been food producers. An A.D. 700 ± 120 (M-1519) date from the Sissung Site

in Monroe County is associated with charred corn "in a feature." (Prah1, 1969; Fitting, 1966, 1970; Prah1, Brose and Stothers, 1974). Based on these above, albeit slender lines of evidence, and the lack of any direct association between Wayne Tradition ceramics and domesticated plants, the possibility exists that Wayne Tradition groups practiced an economy more dependent on hunting, fishing and collecting while the Younge Tradition groups relied on food production. The hypothesized hunting-gathering adaptation of the Wayne Tradition is supported by results of Halsey's (1976) analysis of the Wayne Mortuary Complex which is discussed in more detail in the next section.

The ceramic data support the hypothesis of interaction between Younge and Wayne Tradition groups in the sharing of some decorative techniques and motifs. The relatively large percentage of decoration on Wayne Tradition ceramics, a characteristic which differentiates the Wayne from Allegan and Spring Creek Traditions, seems to be in part caused by the interaction of Wayne and Younge Tradition groups and perhaps southwest Ontario groups. Further evidence indicating interaction between groups from southeast Michigan and southwest Ontario comes from the distribution of Kettle Point chert which originates in Ontario and occurs in relatively high amounts (40-60%) on southeast Michigan Sites (Luedtke, 1976:380). While these data clearly support interaction during the Late Woodland between southeast Michigan and Ontario, it is not clear whether the interaction involves Wayne or Younge Tradition groups or both.

The Wayne Tradition may have been contemporary with the Western Basin Tradition of northern Ohio (Prah1, Brose and Stothers, 1974:262). The authors, however, persist in erroneously identifying Wayne Wares as

Middle Woodland when there is evidence that Wayne Ware continues to at least A.D. 1000 based on the presence of collars and castellations on both Saginaw and Southeastern Wayne ceramics. Nonetheless, a relationship between the later Western Basin and Younger Traditions and the Wayne Tradition seems probable though the nature of that relationship needs further documentation and clarification.

Before and After the Wayne Tradition. Forerunners of the Wayne Tradition in the Saginaw Valley are well documented at the Schultz, Fletcher, and other smaller sites. The ceramic assemblages at these sites include Schultz Thick, an early Woodland ceramic type similar to Marion Thick; Shiawassee Ware, also early Woodland similar to Illinois Black Sand pottery; and Tittabawassee and Green Paint Wares, Middle Woodland ceramics similar to Havana-Hopewell materials from Western Michigan and Illinois (Fischer, 1972). Fischer (1972) believes the early and Middle Woodland ceramics at Schultz to be locally made. Inhabitants of the Saginaw Valley, therefore appear to have interacted closely with Western Michigan groups during the Early and Middle Woodland periods, sharing ideas about pottery making as well as in other areas. Fischer (1972) sees a gradual shift to Late Woodland ceramics in the area which may be supported by Halsey's work with the Wayne Mortuary Complex.

The Wayne Mortuary Complex, Halsey (1976) believes, is a "last fling" of Hopewellian-like mortuary ceremonialism in Michigan. Wayne Mortuary practices are similar to Hopewellian practices in that burials often occur with clusters of artifacts and raw material, some exotic or imported, but for the most part locally derived (Halsey, 1976).

Halsey (1976) concludes, however, that the Wayne Mortuary complex

originated in New York and was locally elaborated within Michigan. All ceramic evidence from the current study (seriations, comparisons, etc.) plus the presence of a strong Hopewellian Middle Woodland manifestation in most of southern Michigan, argues in direct opposition to Halsey's conclusion. What seems to cause Halsey the most trouble in defining a Michigan origin for the Wayne Mortuary is the lack of evidence of a Middle Woodland occupation in the Southeast part of the state or in the areas of southern Wayne Tradition. The absence of identifiable Middle Woodland in this area is a problem of major magnitude and has resulted in a generation of a number of hypotheses, including the now revised assignment of Wayne Ware to the Middle Woodland and the derivation of the Wayne Mortuary complex from New York. Until a well documented sequence of sites with radiocarbon dates from all over Southern lower Michigan and the Wayne Tradition, in particular, are available, the various conflicting lines of evidence concerning the origins of the Wayne Tradition remain as largely untestable hypotheses.

The southern Wayne Tradition seems to disappear with the ascendancy of the Younger Tradition. Fitting (1970: 154-155) believes the disappearance to be related to the movement of Glen Meyer peoples or Glen Meyer "influence" from Ontario into the southeast between A.D. 1100 and A.D. 1300. Furthermore, Fitting suggests that Wayne Tradition groups were either absorbed or moved to the north where the Younger Tradition was less prominent, joining other Wayne peoples. Late radiocarbon dates from Saginaw Valley sites such as Bussinger (A.D. 1220 ± 100 (M-1796) and A.D. 1290 ± 100 (M-1755) support Fitting's hypothesis. Ceramic evidence also supports the relatively longer duration of the Wayne Tradition in the Saginaw Valley, namely relatively high number of

castellated vessels (Appendix B). Castellations are an attribute which does not appear before A.D. 1100 and becomes more common after A.D. 1200 in the Younger Tradition. Therefore, some evidence exists which suggests that the Wayne Tradition lost its distinctiveness in the southern portion of the Tradition's distribution but that it continued until at least the 13th Century A.D. in the Saginaw drainage. The period between the end of the 13th Century and the early historic period in the Saginaw Valley is very poorly known, though based on ethnohistoric evidence, it is possible that several different groups from the north, south, east and west may have been using the area and no one group dominated.

Summary

The preceding discussion raises many questions and suggests numerous testable and untestable hypotheses concerning early Late Woodland Traditions in Michigan and their mutual relationships. A variety of social relationships existed which certainly involved the exchange of ideas about making ceramics, resources such as chert, perhaps perishable goods and people, and migration of new peoples into and out of socio-cultural traditions. The social boundaries across which these exchanges, interactions and/or migrations took place remain somewhat unclear at this time. A number of generalizations, however can be made.

First, no social boundary seems to be impermeable in character. Instead what seems to be the case is a relatively fluid relationship between groups in the Spring Creek, Allegan and Wayne Traditions. Pottery making ideas and probably other goods and services seem to have moved with relative ease between the three traditions, yet each retained a particularly discrete configuration of ceramic attributes and presumably

a somewhat distinct value system which was supported by more intense communication and interaction within the tradition than between traditions.

Second, boundaries between traditions are not fixed and permanent over time. In the case of the southern Wayne and Allegan Traditions new groups appear to move into the area between A.D. 1000 and A.D. 1200 causing drastic changes in those traditions and new, as yet unclear boundary relations to develop between the Saginaw, Wayne and Spring Creek Traditions and the Upper Mississippian, Younger and Western Basin Traditions.

Third, boundary relationships between groups in the three related traditions and their northern and southern neighbors appear to be qualitatively different than relationships among the three. To say that impenetrable boundaries existed between the three related traditions and their neighbors would be a denial of many lines of evidence presented here. Yet, the external boundaries do seem to involve different types of relationships than existed between the traditions. The external relationships seem to involve fundamental differences in socio-political, religious-mortuary, subsistence-settlement- patterns and perhaps other spheres of activity. The Spring Creek, Allegan and Wayne Traditions seem to vary relatively little with respect to these dimensions.

Fourth, observed differences between the ceramic styles of the Spring Creek, Wayne and Allegan Traditions may be the result of the external boundary relationships of members of the three traditions in addition to the more intense communication and interaction within each tradition. Specifically, Wayne Tradition groups appear to have acquired

some ideas about pottery decorating from Younger Tradition, pre-Ontario Iroquois and/or Western Basin Tradition groups. Likewise, the relatively simple Allegan and Spring Creek Tradition ceramics are similar in their lack of decoration to ceramics made by Early Late Woodland groups in Northern Indiana, Illinois and southern Wisconsin.

Other hypotheses and their implications have been discussed in this chapter which bear further examination and systematic testing. The following chapter presents a general model to which some results of this study are applied.

CHAPTER VII

THE EARLY LATE WOODLAND IN SOUTHERN LOWER MICHIGAN: A MODEL

Introduction

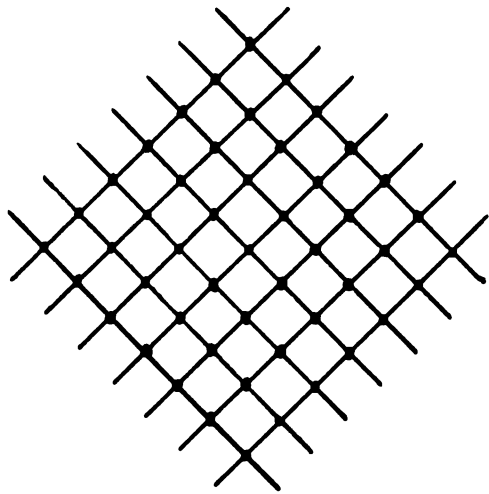
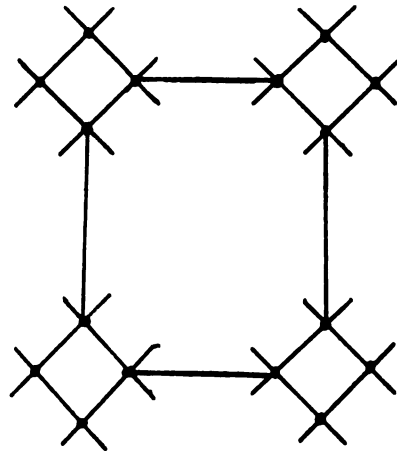
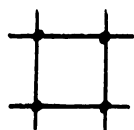
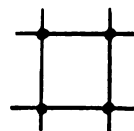
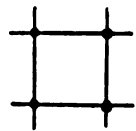
The presentation of the following model and its application is an attempt to organize the results derived from this study into a testable framework for future research concerning the Early Late Woodland in southern lower Michigan. The discussion includes a description of a model of sociocultural patterning proposed by Yellen and Harpending (1972) and its preliminary application to some of the results of this study.

Yellen and Harpending (1972) propose a model of hunter-gatherer social patterning, which has implications for a discussion of the Early Late Woodland in southern Lower Michigan. The model, which is essentially a scheme for classifying hunter-gatherers on the basis of nucleation, has broader significance in terms of subsistence patterns, evolutionary stages and boundaries and boundary maintenance. Specifically the nucleation model gives archaeologists "... a framework for the interpretation of similarities and differences evidenced in prehistoric material remains" (Yellen and Harpending, 1972: 252). Identification of the type of nucleation indicated by the structure of archeological remains allows archaeologists to predict the type of socio-political organization, subsistence-settlement type, group boundaries and interaction across boundaries in the form of a testable general model. This chapter will propose and discuss the implications of such a model based on the results present in the previous chapters and other supportive data.

The Yellen and Harpending model describes the interaction between social units, which may be villages, families or any social category, in terms of the network of social relations which exist between pairs of units (Figure 102). When social relations are intensive within individually distinct clusters or villages and infrequent between village clusters, the pattern of relationships is nucleate (Yellen and Harpending, 1972:247-248). Correlates of nucleated social patterning include endogamous marriage, territoriality and strong boundary maintenance, relatively infrequent movement of goods across boundaries, slow information flow, and linguistic differentiation. Among hunter-gatherer groups, nucleated social patterning occurs where food is plentiful and good food preservation techniques exist, as in the case of relatively permanent Northwest coast cultures (Yellen and Harpending, 1972:251). Non-industrial agricultural and horticultural groups which also have a relatively stable food supply and good food preservation and storage also tend to be characterized by nucleate social patterning. Archaeologically, the nucleate pattern would be manifest in the discontinuous distributions of artifact styles indicating discrete cultural traditions (Yellen and Harpending, 1972:248).

At the opposite extreme of the Yellen and Harpending model is non-nucleated or anucleate social patterning. This pattern occurs when relations between social units are extensive or diffuse and units do not cluster. Correlates of non-nucleate social patterning include high group exogamy, frequent movement of goods across loosely defined or non-existent boundaries, rapid information flow, lack of fixed territorial boundaries and linguistic similarity among units. Non-nucleate social patterning is selected for by poor environments and/or highly variably

Figure 102. -- Types of Social Patterning
(Yellen and Harpending, 1972: 61)

**Anucleate****Intermediate****Nucleate**

natural resources among hunter-gatherers because of the need for flexibility in their subsistence-settlement strategy (Yellen and Harpending, 1972:251). Cultures which tend to be anucleate include the Kung Bushmen, Eskimos and other hunter-gatherers. Archaeologically, non-nucleate patterning would appear as an undifferentiated pattern or distribution of artifact types or style from a single cultural tradition.

Nucleate and anucleate social patterns represent extremes of a continuum and a variety of intermediate forms between the two extremes may exist (Figure 102). Intermediate patterns occur where some clustering between some social units is present and where one or more of the units in a cluster have relationships with one or more units belonging to another cluster.

Correlates of intermediate social patterning would include some group exogamy, occasional movement of goods across loosely defined boundaries, some information flow, presence of territorial boundaries which may not be clearly fixed and some but not total linguistic similarity between units. Intermediate social patterning might occur among hunter-gatherer groups who occupy environments which are neither poor nor extreme, and which may or may not require storage and preservation of food. Such groups may be marginal horticulturalists or groups practicing a mixed hunting gathering and horticultural economy. Intermediate social patterning would be recognized archaeologically by the sharing of some but not all artifact styles by separate culture traditions.

Application of the Model

By applying the Yellen and Harpending model to what is known about ceramic traditions identified in this study, the type of social patterning present in the early Late Woodland may be defined. Furthermore, development of the model for the case in point results in the generation of testable hypotheses concerning correlates of that pattern. According to the model, nucleate social patterning would be indicated by the presence of discrete ceramic traditions for each area, where few, if any, similarities between traditions would occur. On the other hand, non-nucleate social patterning would be indicated by the presence of a single tradition where no significant differences exist from site to site or area to area. The intermediate pattern would be indicated by the presence of a discrete ceramic tradition where sharing of some ceramic types or attributes between traditions would be expected.

As was previously demonstrated, analysis and discussion of ceramic variability resulted in definition of three statistically defined ceramic traditions. Ceramic attributes and attribute configurations, however, appear to be shared by the three traditions in different percentages, suggesting relatively fluid social relationships and a type of social patterning intermediate between the two extreme positions proposed by Yellen and Harpending (1972).

Other data presented in this study support the presence of intermediate social patterning in the Spring Creek, Allegan and Wayne Traditions. First, while there is some ecological diversity in the three traditions, the environment is not poor and there are no extremes in resource availability. Instead, enough microenvironmental variation occurs in the river drainages, which correlate with the three ceramic traditions, to support

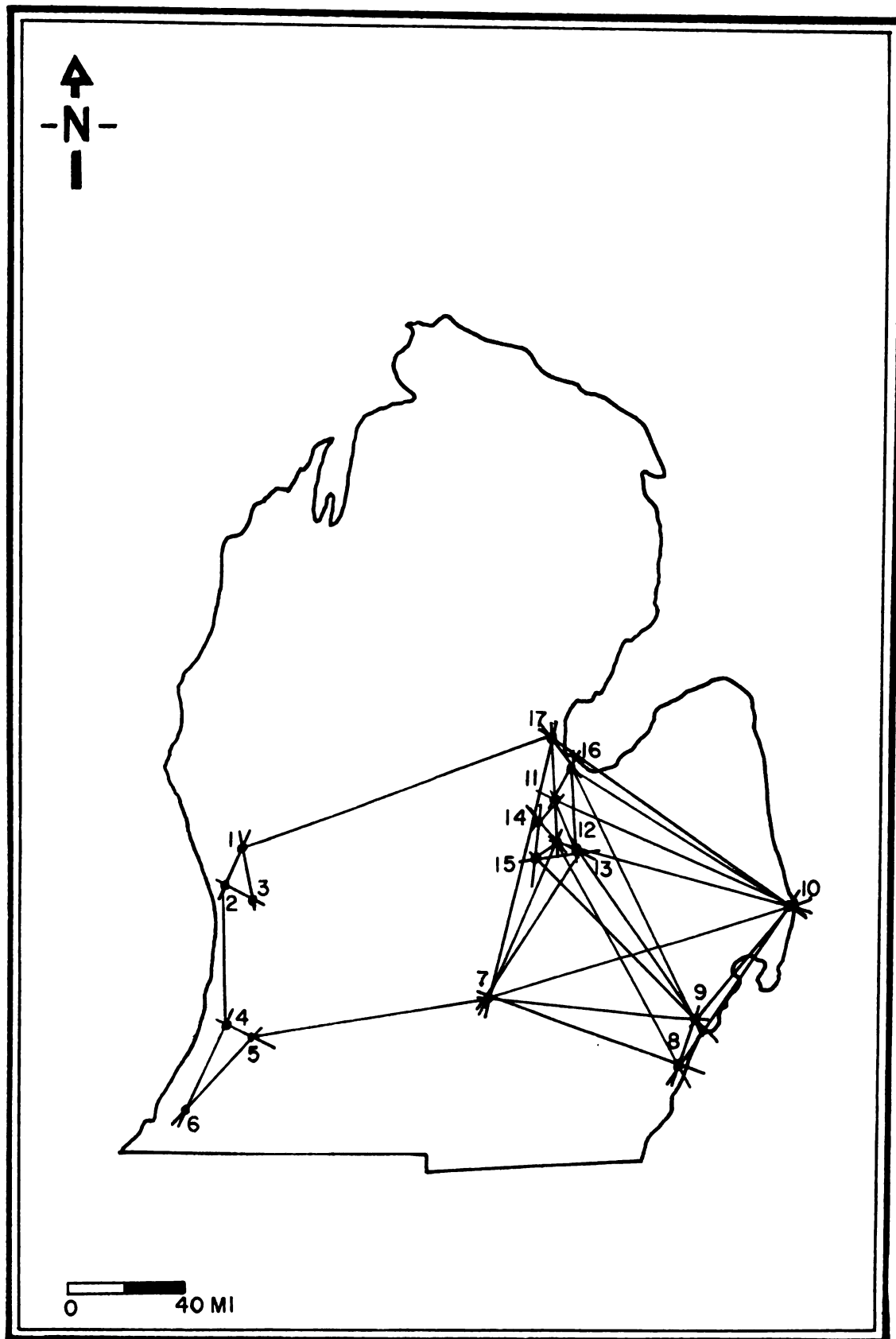
a balanced hunting-gathering-fishing seasonal round. Furthermore, the location of all sites within one-quarter mile of a river or its tributary, provides reason to believe that each tradition is exploiting specific local areas where several micro-environments melt rather than the entire drainage area.

Second, the environmental characteristics described in Chapter 2 for each tradition did not inhibit the eventual adoption of food production by some prehistoric groups in southern lower Michigan, (i.e., the Younger Tradition and the Upper Mississippian). In addition, the environment did not appear to favor the presence of semi-permanent hunter-gatherers, like northwest coast peoples in the area. The above subsistence-settlement types are correlated with nucleate social patterning rather than an intermediate or anucleate type.

Third, no direct evidence is available for food production in the Spring Creek, Allegan or Wayne Traditions despite the fact that corn is known from the early Late Woodland but in a Younger Tradition context. Some indirect evidence, however, is available suggesting a trend toward food production in the Saginaw, Wayne and Spring Creek Traditions. The general subsistence-settlement pattern which emerges for all three traditions, then, suggests the presence of hunting, gathering and fishing strategy which may have been augmented perhaps in later parts of the Spring Creek and Saginaw Wayne Traditions by early attempts at growing domesticated plants. The possibility exists that the development of agriculture in the southern Allegan and Wayne Traditions was truncated by the entire disappearance of these traditions with the intrusion of Upper Mississippian and Younger Tradition groups in those areas. In summary, ceramic distributions, environmental characteristics and

Figure 103. -- Social Patterning in
Early Late Woodland Sites of
Southern Lower Michigan

- | | |
|-----------------------|-------------------|
| 1. Spring Creek | 10. Draper Park |
| 2. Spoonville | 11. Valley Sweets |
| 3. Zemaitis | 12. Schultz |
| 4. Fennville | 13. Hodges |
| 5. Forty-sixth Street | 14. Mahoney |
| 6. Moccasin Bluff | 15. Foster's |
| 7. Root | 16. Fletcher |
| 8. Fort Wayne Mound | 17. Butterfield |
| 9. Riviere Au Vase | |



subsistence-settlement patterns all appear to indicate the presence of a type of social patterning intermediate between the non-nucleate and nucleate types proposed by Yellen and Harpending. A schematic representation of the model application is presented in Figure 103.

The above lines of evidence are, in fact, working hypotheses generated from the data available from the early Late Woodland period in southern lower Michigan. The significance and value of the Yellen and Harpending model lies in the fact that it provides a framework for testing the hypotheses and generating new ones.

CHAPTER VIII

CONCLUSIONS

The following chapter is organized according to three types of conclusions which emerge from this study. These are substantive conclusions, method and technique conclusions and questions generated for future research. Substantive conclusions pertain to the specific results of hypotheses tests related to the problem considered in the thesis. Method and technique conclusions deal with the types of data manipulation employed in the study. The questions for future research are specifically the problems encountered in the discussion and interpretation of the substantive results.

Major substantive conclusions are three in number. First, and most significant, three discrete internally homogeneous cultural traditions have been identified for the early Late Woodland in southern lower Michigan: the Spring Creek, Allegan and Wayne Traditions. The statistical definition of the three traditions resolves a major debate lasting over a decade concerning the early Late Woodland period in Michigan. The second conclusion following the definition of the Spring Creek, Allegan and Wayne traditions is the identification of temporal change within each tradition both in terms of the ordering of sites and shifts which occurred in attribute frequency and attribute combinations over time.

The above conclusions lead to a third substantive conclusion concerning the nature of boundaries and boundary relationships during

the Late Woodland. Though the results are preliminary, it seems clear that social boundaries did exist and while they may have shifted and been relatively flexible, were nonetheless perpetuated throughout the area during early Late Woodland. The boundary relationships extant in the southern half of the study area, however, appear to have undergone significant change involving accommodation and perhaps eventual absorption by non-indigenous peoples from the Younger and Western Basin Traditions and Upper Mississippian groups. In the northern half of the research area there is some evidence for continuation of the Spring Creek and Saginaw Valley Wayne traditions perhaps to the early historic period. While the boundary relationships between these two areas are not clear at this time, they may have continued to interact in much the same fashion until the early historic period where conditions were radically altered by European contact and resultant Iroquois incursions from the east.

I am confident in the above conclusions even though the uneven distribution of sites in the study area might have skewed or biased the results. If the uneven site distribution is responsible for the observed patterns, the Spring Creek Tradition ceramics and Saginaw Valley Wayne Tradition ceramics would have been more like each other than the Spring Creek and Allegan Tradition ceramics were. This pattern would have been supported by the geographic distance between the sites of the three traditions and the ease of transportation between the Spring Creek and Saginaw Valley Wayne Tradition areas. In addition, Allegan Tradition ceramics would have been more similar to southern Wayne Tradition ceramics than they evidently were for the same reason. Finally, if biased site distribution was the factor determining the structure or patterns observed

in the data, the ceramics from the Saginaw area and southern Wayne Tradition sites would have been significantly different for each area. This difference would have been supported by the absence of rivers which would have facilitated communication between the two areas. The results therefore seem valid, given the data we have at this time.

Three methodological conclusions are evident in this study. First, statistically derived ceramic classifications can be used to solve anthropological problems in a more sophisticated way than the simple typology of potsherds. The use of such statistical methods and techniques in the resolution of anthropological problems is in its infancy. As more varied statistical approaches and computerized applications are experimented with and adopted or rejected, the better our understanding of prehistoric peoples will become. Certainly, the problem addressed in this study could not have been accomplished in the absence of rapid computational equipment, or in the absence of a sufficient sample of excavated sites and ceramic collections.

Second, in many ways the study has been an exercise in comparing the utility of two opposing methods of classification, polythetic agglomeration and monothetic subdivision. The results derived from the application of both methods to the same data set are largely compatible. Polythetic agglomerative techniques of classification however, appear from the results of this study, to be more sensitive to the blending and shifting of attributes which seems to take place within and between the Spring Creek, Allegan and Wayne traditions. Monothetic subdivision may be more appropriate to the definition of types in contexts where a single spatially and temporally defined tradition exists. Clearly, the problem of this study was to define just how many and what the

distinctive characteristics were of the tradition or traditions in the Early Late Woodland of southern Lower Michigan. Therefore, polythetic agglomerative techniques were appropriate and most useful.

The third methodological conclusion relates both to the character of the data set used in the study and the usefulness of computer analysis. Some early attempts at defining traditions within the early Late Woodland such as Rogers (1972) based their definition of a discrete tradition on relatively subjective analyses of data from one or two sites. In all fairness, however, it has only been within the last 5 years that enough data has appeared to provide a base for a large-scale comparative analysis. Likewise, the statistical procedures to accomplish such an analysis are still in the testing stage. With these two factors in mind, it is nonetheless imperative to realize that the definition of ceramic traditions is a procedure best accomplished with more than one or two collections of artifacts from one or even a handful of sites. Most important is the consideration of the range of variability which always exists within any given culture. Almost certainly the range of variability is not reflected by the ceramic assemblage or assemblage of any other item of material culture from a single site. This is not to deny the validity of subjective attempts to define traditions on the basis of one or two sites, but is to emphasize and recognize the tenuous and preliminary nature of such attempts, which must necessarily be incorporated into larger empirical and comparative studies as the data base increases and our analytic procedures become more refined.

In many ways the most significant contributions of this study are not the answers but the numerous questions that were generated. Several of these questions may be resolved within the not so distant future by

work currently under way. The discussion and interpretation in Chapters 6 and 7 presented many of these questions in the form of testable propositions grounded in anthropological knowledge about the way the structure or distribution of remains in the prehistoric record reflects various aspects of long gone behavior. Many of the questions raised will not be resolved, however, until more data is collected concerning the important transitional period of the early Late Woodland. Some of the critical areas for future exploration suggested by this study include the following:

1. What was the subsistence-settlement pattern of the Spring Creek, Wayne and Allegan Traditions and did they differ as preliminary analysis suggests they may have? Were subsistence-settlement strategies during the early Late Woodland in southern Michigan shifting to a greater reliance on food production? Available data provide only hints concerning these questions, suggesting that Spring Creek, Allegan and Wayne Tradition groups held on to a hunter-gather existence until at least A.D. 1000 and maybe beyond.
2. What are the origins of the three traditions? No clear evidence links the southern Wayne and Allegan Traditions in particular to any precursor, and the ceramic evidence suggesting a natural shift from the Hopewellian Middle Woodland groups to the Spring Creek and Northern or Saginaw Wayne Tradition is tenuous at best.
3. Likewise, what are the terminal dates for each of the traditions, under what conditions do they end and for what reasons? Were the Allegan and southern Wayne Traditions cut

short by the introduction of new populations and/or ideas, while the northern or Saginaw Wayne and Spring Creek Traditions continued, perhaps to the early historic period?

4. Were the Younger Tradition and Wayne Tradition contemporaries? And, if so, was their mutual occupation of the same area made possible by the occupation of different ecological niches and different subsistence-settlement patterns?

5. Did Allegan Tradition groups continue to occupy the Kalamazoo drainage after Upper Mississippian groups moved into the area? Were they able to occupy the same area because they exploited different niches and had different subsistence-settlement patterns as may have been the case of the Wayne and Younger traditions?

6. Do the early Woodland ceramics from the Moccasin Bluff site belong to a tradition distinct from the Allegan Tradition as this study suggests? If so, what is the nature of the boundary relationships that existed between the Allegan and probable Moccasin Bluff Traditions?

These are only a few of the questions raised by this study. All of them, I believe, are questions which may be answered by the collection of new data and the reanalysis of already excavated data using new techniques and models such as the Yellen and Harpending (1972) model discussed in Chapter 7. Ultimately, with enough data and proper theoretical, methodological and technical frameworks, we should be able to refine the present study perhaps ultimately identifying micro-variation not only in ceramics but in boundary relations, as well as other areas of early Late Woodland life.

APPENDICES

APPENDIX A

EARLY LATE WOODLAND CERAMIC ATTRIBUTE LIST

<u>Attribute Class</u>	<u>Attribute</u>
Lip cross-section	<u>flat</u> : lip is flattened at a ninety degree angle to the longitudinal axis of the rim.
	<u>round</u> : lip is rounded, and sides of upper rim are approximately parallel to each other.
	<u>splayed</u> : cross-section of the rim is wider at the lip than the base of the rim.
	<u>wedge</u> : two flat angled surfaces of the lip meet forming approximately a ninety degree angle.
	<u>beveled</u> : surface of the lip is flattened either towards or away from the interior of the vessel.
	<u>thickend</u> : lip edge protrudes over the exterior rim profile but not over the interior.
Lip planview	<u>other</u> : a lip cross-section not defined above.
	<u>flat</u> : lip planview is a straight uninterrupted line.
	<u>castellated</u> : lip planview is interrupted by repeated, smooth and regular sections either rounded or angular.
Rim thickening	<u>absent</u> : no added thickness on rim exterior.
	<u>rolled rim</u> : where a flap of clay has been rolled over from the lip to the exterior and insufficiently smoothed over.

<u>Attribute Class</u>	<u>Attribute</u>
	<u>collared</u> : rim thickening which occurs at least one centimeter below the lip margin on the exterior.
Lip preparation	<u>smoothed</u> : lip is smoothed over.
	<u>cordmarked</u> : lip is treated with a cordwrapped paddle.
Lip decoration	<u>present</u>
Lip decorative technique	<u>incised</u> : lip is scored or slashed with a sharp edged or pointed tool.
	<u>punctate</u> : lip is jabbed with a sharp or pointed implement at a ninety degree angle to the surface of the lip.
	<u>impressed</u> : lip is indented or stamped at less than a ninety degree angle to the surface of the lip.
Lip decoration: type of tool	<u>cordwrapped stick</u> : an implement which has a hard core, not necessarily a stick, wrapped with a cord.
	<u>sharp edged or pointed</u> : an implement which has a sharp edge or end used for either punctating or incising.
	<u>cordwrapped cord</u> : an implement usually having a soft core, wound with a cord.
	<u>cordwrapped paddle edge</u> : an implement composed of a paddle with a sharp edge and cord wrapped around it leaving a "V" shaped cross-section when impressed.
	<u>turtle suture</u> : edge of a turtle plastron or carapace.
	<u>other</u> : an implement not defined above.
Lip decoration: orientation	<u>vertical</u> : where the direction of the lip decoration is at a ninety degree angle to the lip of the vessel.
	<u>horizontal</u> : where the decoration is applied in a direction parallel with the lip of the vessel.

Attribute ClassAttribute

Rim cross-section

oblique: where the direction of the decoration is less or greater than a ninety degree angle to the lip of the vessel.

straight: interior and exterior of the rim are parallel to the longitudinal axis of the rim.

everted: where the interior and possibly the exterior of the rim deviate to the right of the longitudinal axis of the rim (exterior to the right).

Interior decoration

presentInterior decoration:
Type of tool

cordwrapped stick: see above under lip decoration.

cordwrapped paddle edge: see above under lip decoration.

cordwrapped cord: see above under lip decoration

sharp edged or pointed: see above under lip decoration.

turtle suture: see above under lip decoration.

other: a tool type not defined above.

Interior decoration:
technique

incised: see above under lip decoration.

punctate: see above under lip decoration.

impressed: see above under lip decoration.

Interior decoration:
orientation

vertical: where the direction of the decoration is parallel to the longitudinal axis of the vessel.

horizontal: where the direction of the decoration runs approximately ninety degrees to the longitudinal axis of the vessel.

Attribute ClassAttribute

	<u>oblique</u> : where the direction of the decoration runs at less than a ninety degree angle to the longitudinal axis of the vessel.
Interior decoration: number of rows	<u>one</u> <u>two</u> <u>more than two</u>
Interior decoration: secondary motif(s)	<u>present</u>
Exterior surface preparation	<u>cordmarked</u> : exterior surface of rim has been treated with a cordwrapped paddle. <u>fabric impressed</u> : exterior of the rim has been impressed with woven fabric, possible over a paddle while shaping the vessel. <u>smoothed over</u> : exterior surface of the rim has been smoothed over while shaping the vessel or after it has been treated with a paddle.
Exterior surface preparation orientation	<u>no pattern</u> : cordmarking or fabric impressions lack regular pattern on rim exterior. <u>vertical</u> : cordmarking or fabric impressions are regular and run parallel to the longitudinal axis of the vessel. <u>oblique</u> : cordmarking or fabric impressions are regular and run at a 45 degree angle to the longitudinal axis of the vessel. <u>horizontal</u> : cordmarking or fabric impressions are regular and run approximately at a ninety degree angle to the longitudinal axis of the vessel.
Exterior decoration	<u>present</u>

Attribute Class

Exterior decoration:
type of tool

Attribute

sharp edged or pointed: see above
under lip decoration.

curvilinear: circular or round ended
implement usually used for punctates.

rectilinear: a square or rectangular
shaped implement used for punctates.

cordwrapped stick: see above under
lip decoration.

cordwrapped paddle edge: see above
under lip decoration.

cordwrapped cord: see above under
lip decoration.

knotted cord: cord that has closely
spaced knots.

turtle suture: see above under lip
decoration.

other: a tool type not defined above.

Exterior decoration:
technique

impressed: see impressed under lip
decoration.

incised: see incised under lip
decoration.

punctate, 90 degree angle: a tool
jabbed into the exterior at an angle
90 degrees to the surface of the
vessel.

punctate, acute: a tool jabbed into
the exterior at less than a 90 degree
angle.

Exterior decoration:
number of rows

one

two

three or more

Exterior decoration:
orientation

horizontal: direction of decoration
runs at approximately a 90 degree
angle to the longitudinal axis of
the vessel.

Attribute ClassAttribute

vertical: decoration runs approximately parallel to the longitudinal axis of the vessel.

oblique: direction of decoration is between 0 and 90 degrees from the longitudinal axis of the vessel.

cross-hatched: criss crossed obliques.

other: any other pattern not included above.

Exterior decoration
secondary motifs

present

Rim thickness

2.0 - 5.9 mm.

6.0 - 8.9 mm.

over 9.0 mm.

Rim diameter

100 - 200 mm.

200 - 300 mm.

over 300 mm.

Paste

sandy: grains of sand readily visible.

silty: powdery, no grains of sand visible.

Temper size:
largest observed particle

0-1 mm.

1-2 mm.

2-3 mm.

greater than 3 mm.

Exterior decoration:
location

near lip: on or near lip margin.

neck: between lip margin and shoulder.

shoulder: juncture of neck and body of vessel.

lip and shoulder: both of the above.

neck and shoulder: both of the above.

APPENDIX B

NUMBER AND PERCENTAGE OF ATTRIBUTES BY AREA¹

DIMENSION	ATTRIBUTE	SOUTHEAST N/%	NORTHEAST N/%	SOUTHWEST N/%	NORTHWEST N/%
Lip Cross- section	flat	128/80.5	281/72.6	223/77.2	367/61.5
	round	20/12.6	65/16.8	24/8.3	131/21.9
	splayed	0/0	1/.3	0/0	0/0
	wedge	0/0	8/2.1	4/1.4	10/1.7
	beveled	5/3.1	13/3.4	9/3.1	13/2.8
	thickened	5/3.1	9/2.3	26/9.0	72/12.1
	other	0/0	0/0	2/0.7	4/.7
Lip Planview	flat	150/94.3	357/92.2	283/97.9	595/99.7
	castellated	8/5.0	30/7.8	5/1.7	2/.3
Rim Thick- ening	rolled	62/39	146/37.7	52/18.0	192/32.2
	collared	2/1.2	9/2.3	26/9.0	74/12.4
Lip Prep- aration	smoothed	108/67.9	262/67.7	152/52.6	315/52.8
	cordmarked	50/31.4	106/27.4	135/46.7	281/47.1
Lip Dec- oration	present	98/61.6	225/58.1	55/19.0	137/22.9
Lip Tech- nique	incised	7/4.4	42/10.8	15/5.2	10/1.7
	punctate	4/2.5	7/1.8	1/.3	6/1.0
	impressed	86/54.1	175/45.2	49/17.0	120/20.1
Lip Tool	cord wrapped				
	stick	19/11.9	26/6.7	12/4.2	16/2.7
	pointed	8/5.0	46/11.9	15/5.2	17/2.8
	cord wrapped				
	cord	2/1.2	2/.5	5/1.7	5/.8
	cord wrapped				
	paddle edge	55/34.6	110/28.4	20/6.9	86/14.4
	turtle				
	suture	10/6.3	18/4.6	0/0	2/.3
	other	0/0	11/2.8	2/0.7	11/1.8
Lip Orien- tation	vertical	26/16.4	86/22.2	11/3.8	16/2.7
	horizontal	8/5.0	11/2.8	0/0	17/2.8
	oblique	63/39.6	125/32.3	44/15.2	99/16.6
Rim Flare	straight	113/71.1	320/82.7	242/83.7	353/59.1
	everted	45/28.3	66/17.0	46/15.9	240/40.2
Interior Prepara- tion	smoothed	103/64.8	361/93.3	244/84.4	521/87.3
	brushed	10/6.3	29/7.5	16/5.5	44/7.4
	cordmarked	11/6.9	4/1.0	12/4.2	23/3.9
Interior Decora- tion	present	76/47.8	160/41.3	6/2.1	53/8.9

APPENDIX B (cont'd)

DIMENSION	ATTRIBUTE	SOUTHEAST N/%	NORTHEAST N/%	SOUTHWEST N/%	NORTHWEST N/%
Interior Tool	cord wrapped stick	15/9.4	16/4.1	0/0	7/1.2
	cord wrapped paddle edge	51/32.1	84/21.7	1/.3	37/6.2
	cord wrapped cord	2/1.2	7/1.8	1/.3	2/.3
	pointed	1/0.6	28/7.2	4/1.4	8/1.3
	turtle suture	5/3.1	13/3.4	0/0	0/0
	other	2/1.2	12/3.1	0/0	0/0
Interior Tech- nique	incised	1/.6	23/5.9	5/1.7	6/1.0
	impressed	73/45.9	129/33.3	1/.3	45/7.5
	punctate	2/1.2	7/1.8	0/0	4/.6
Interior Orienta- tion	vertical	11/6.9	56/14.5	3/1.0	7/1.2
	horizontal	3/1.9	2/.5	1/.3	3/.5
	oblique	60/37.7	99/25.6	2/.7	42/7.0
Interior Number of Rows	one	68/42.8	139/35.9	5/1.7	42/7.0
	two	6/3.8	16/4.1	0/0	2/.3
	over two	0/0	2/.5	1/.3	1/.2
Interior Secondary Motif	present	7/4.4	9/2.3	0/0	2/.3
Exterior Prepara- tion	cordmarked fabric	124/78	316/81.6	273/94.5	496/83.1
	impressed	4/2.5	28/7.2	3/1.0	17/2.8
	smoothed over	27/17.0	38/9.8	13/4.5	62/10.4
Exterior Prepara- tion Orienta- tion	no pattern	33/20.8	51/13.2	6/2.1	21/3.5
	vertical	113/71.1	304/78.6	249/86.2	418/70
	oblique	13/8.2	29/7.5	15/5.2	75/12.6
	horizontal	2/1.2	4/1.0	1/.3	21/3.5
Exterior Decora- tion	present	68/52.8	121/31.3	39/13.5	67/11.2
Exterior Tool	pointed	10/6.3	26/6.7	16/5.5	19/3.9
	curvilinear	9/5.7	13/3.4	16/5.5	4/.6
	rectangular	5/3.1	7/1.8	0/0	0/0

APPENDIX B (cont'd)

DIMENSION	ATTRIBUTE	SOUTHEAST N/%	NORTHEAST N/%	SOUTHWEST N/%	NORTHWEST N/%
Exterior Technique	cord wrapped stick	9/5.7	12/3.1	1/.3	10/1.7
	cord wrapped paddle edge	26/16.4	43/11.1	0/0	30/5.0
	cord wrapped cord	2/1.2	16/4.1	0/0	3/.5
	knotted cord	0/0	1/.3	0/0	1/.2
	turtle suture	4/2.5	3/.8	0/0	0/0
	other	1/.6	0/0	5/1.7	0/0
	impressed	18/11.3	32/8.3	13/4.5	10/1.7
	incised	10/6.3	15/3.9	9/3.1	18/3.0
	90 degree punctate	15/9.4	24/6.2	12/4.2	7/1.2
	acute punctate	25/15.7	48/12.4	4/1.4	32/5.4
Exterior Number	one	14/8.8	27/7.0	31/10.7	35/5.9
	two	6/3.8	11/2.8	1/.3	16/2.7
	over two	24/15.1	51/13.2	2/.7	8/1.3
Exterior Orienta- tion	horizontal	12/7.5	17/4.4	16/5.5	24/4.0
	vertical	14/8.8	22/5.7	19/6.6	10/1.7
	oblique	37/23.3	74/19.1	1/.3	31/5.2
	cross- hatched	2/1.2	5/1.3	2/.7	1/.3
	other	1/.6	0/0	1/.3	0/0
Exterior Secondary Motif	present	8/5.0	11/2.8	2/.7	2/.5
Rim Thick- ness	2-5.9 mm	67/42.1	126/32.6	65/22.5	219/36.7
	6-8.99 mm	79/49.7	251/64.9	186/64.4	315/52.8
	over 9.0 mm	10/6.3	7/1.8	18/6.2	43/7.2
Rim Diam- eter ²	1-200 mm	-/-	-/-	-/-	-/-
	2-300 mm	-/-	-/-	-/-	-/-
	over 300 mm	-/-	-/-	-/-	-/-
Paste ²	sandy	0/0	11/2.8	-/-	200/33.5
	silty	159/100	372/96.1	-/-	377/63.1
Temper size ²	0-1 mm	-/-	-/-	-/-	-/-
	1-2 mm	-/-	-/-	-/-	-/-
	2-3 mm	-/-	-/-	-/-	-/-
	over 3 mm	-/-	-/-	-/-	-/-

APPENDIX B (cont'd)

DIMENSION	ATTRIBUTE	SOUTHEAST N/%	NORTHEAST N/%	SOUTHWEST N/%	NORTHWEST N/%
Exterior Decora- tion Location ²	rear lip	-/-	9/2.3	-/-	-/-
	neck	-/-	37/9.6	-/-	-/-
	shoulder	-/-	12/3.1	-/-	-/-
	lip and shoulder	-/-	5/1.3	-/-	-/-
	neck and shoulder	-/-	50/12.9	-/-	-/-
	TOTAL N	169	397	289	597

¹Numbers and percentages may not always add up to 100% because of missing data on individual sherds.

²Missing or incomplete data on numerous vessels for these attribute dimensions.

APPENDIX C

PERCENTAGE OF ATTRIBUTES IN NINE CLUSTERS BASED ON 300 RANDOMLY SELECTED VESSELS FOR THE ENTIRE AREA¹

DIMENSION	ATTRIBUTE	CLUSTERS								
		1	2	3	4	5	6	7	8	9
Lip Cross- section	flat	95	89.5	73.7	67.7	17.5	78.3	40.9	75	68.6
	round	0	5.3	5.3	6.5	70.0	0	54.5	21.4	21.6
	splayed	0	0	0	0	0	0	0	0	0
	wedge	0	0	0	3.2	0	4.3	0	0	3.9
	beveled	0	2.6	0	9.7	2.5	0	4.5	0	5.9
	thickened	5	2.6	21.1	9.7	7.5	17.4	0	3.6	0
	other	0	0	0	0	2.5	0	0	0	0
Lip Planview	flat	100	100	100	96.8	97.5	95.7	95.5	96.4	88.2
	castellated	0	0	0	0	2.5	4.3	4.5	3.6	11.8
Rim Thick- ening	rolled	25	39.5	36.8	22.6	22.5	13.0	31.8	32.1	43.1
	collared	15	5.3	0	32.3	7.5	0	9.1	5.4	3.9
Lip Prep- aration	smoothed	0	0	0	35.5	80	95.7	100	94.6	82.4
	cordmarked	100	100	100	61.3	20	4.3	0	3.6	17.6
Lip Dec- oration	present	5	0	0	0	0	0	9.1	96.4	84.3
Lip Tech- nique	incised	0	0	0	0	0	0	4.5	23.2	0
	punctate	5	0	0	0	0	0	0	3.6	0
	impressed	0	0	0	0	0	0	4.5	71.4	78.4
Lip Tool	cord wrapped stick	0	0	0	0	0	0	0	19.6	7.8
	pointed	5	0	0	0	0	0	9.1	28.6	2.0
	cord wrapped cord	0	0	0	0	0	0	0	5.4	5.9
	cord wrapped paddle edge	0	0	0	0	0	0	0	37.5	58.8
	turtle suture	0	0	0	0	0	0	0	3.6	3.9
	other	0	0	0	0	0	0	0	3.6	3.9
	other	0	0	0	0	0	0	0	3.6	3.9
Lip Orien- tation	vertical	0	0	0	0	0	0	0	17.9	23.5
	horizontal	5	0	0	0	0	0	4.5	5.4	3.9
	oblique	0	0	0	0	0	0	0	73.2	54.9
Rim Flare	straight	100	100	0	64.5	50	91.3	68.2	85.7	68.6
	everted	0	0	100	35.5	50	8.7	31.8	14.3	31.4
Interior Prepara- tion	smoothed	95	86.8	100	67.7	82.5	100	90.9	85.7	98.0
	brushed	0	2.6	0	25.8	5.0	0	9.1	7.1	0
	cordmarked	5	5.3	0	6.5	10.0	0	0	1.8	2.0
Interior Decora- tion	present	0	0	0	0	0	0	18.2	12.5	98.
Interior Tool	cord wrapped stick	0	0	0	0	0	0	0	1.8	15.7

APPENDIX C (cont'd)

[illegible]

APPENDIX C (cont'd)

DIMENSION	ATTRIBUTE	CLUSTERS								
		1	2	3	4	5	6	7	8	9
Exterior Technique	impressed	0	0	0	6.5	0	0	0	1.8	15.7
	incised	10	0	0	16.1	0	0	0	8.9	2.0
	90 degree									
	punctate	0	0	0	19.4	0	0	0	7.1	9.8
	acute									
Exterior Number	punctate	5	0	0	6.5	0	0	0	8.9	21.6
	one	5	0	0	25.8	0	0	0	7.1	15.7
	two	0	0	0	6.5	0	0	0	10.7	3.9
	over two	0	0	0	6.5	0	0	0	5.4	19.6
Exterior Orientation	horizontal	0	0	0	16.1	0	0	0	5.4	5.9
	vertical	0	0	0	22.6	0	0	0	3.6	11.8
	oblique	15	0	0	6.5	0	0	0	16.1	31.4
	cross-hatched	0	0	0	0	0	0	0	1.8	0
	other	0	0	0	0	0	0	0	0	0
Exterior Secondary Motif	present	0	0	0	0	0	0	0	3.6	7.8
Rim Thickness	2-5.9 mm	0	2.6	63.2	22.6	10	43.5	18.2	33.9	39.2
	6-8.99 mm	100	86.8	31.6	67.7	80	52.2	54.5	50.	56.9
	over 9.0 mm	0	2.6	5.3	6.5	10	4.3	27.3	7.1	2.0
Rim Diameter ²	1-200 mm	0	2.6	5.3	3.2	0	0	0	1.8	2.0
	2-300 mm	0	---	0	6.5	2.5	0	0	7.1	2.0
	over 300 mm	0	---	0	0	2.5	0	0	0	0
Paste ²	sandy	5	23.7	36.8	22.6	42.5	4.3	40.9	8.9	5.9
	silty	95	76.3	42.1	71	40	95.7	59.1	76.8	92.2
Temper size ²	0-1 mm	0	0	0	0	0	0	0	1.8	0
	1-2 mm	0	10.5	0	6.5	12.5	0	0	10.7	5.9
	2-3 mm	35	13.2	0	16.1	10.	21.7	13.6	14.3	21.6
	over 3 mm	65	60.5	78.9	71.	60	78.3	86.4	58.9	72.5
Exterior Decoration Location ²	rear lip	0	0	0	6.5	0	0	0	0	3.9
	neck	5	0	0	3.2	0	0	0	7.1	7.8
	shoulder	0	0	0	0	0	0	0	0	3.9
	lip and shoulder	0	0	0	0	0	0	0	0	0
	neck and shoulder	0	0	0	0	0	0	0	7.1	5.9
	shoulder	0	0	0	0	0	0	0	0	0
TOTAL N		20	38	19	31	40	23	22	56	51

¹Missing data on occasional vessels may cause some percentages for attribute dimensions to not add up to 100 percent.

²Missing or incomplete data on many vessels for these attributes.

APPENDIX D

PERCENTAGE OF ATTRIBUTES IN ELEVEN CLUSTERS BASED ON 300 RANDOMLY SELECTED VESSELS FROM 300 SITES ¹

DIMENSION	ATTRIBUTE	CLUSTERS										
		1	2	3	4	5	6	7	8	9	10	11
Lip Cross-section	flat	78.6	87.8	73.3	54.5	63.0	61.9	80.	96.2	70.0	65.	70.6
	round	14.2	4.9	13.3	27.3	21.7	23.8	16.	0	30.	35.	29.4
	splayed	0	0	0	0	0	0	0	0	0	0	0
	wedge	0	0	2.2	0	4.3	0	0	0	0	0	0
	beveled	7.1	4.9	6.7	0	8.7	9.5	4.	0	0	0	0
	thickened	0	2.4	4.4	18.2	2.2	4.8	0	3.8	0	0	0
	other	0	0	0	0	0	0	0	0	0	0	0
Lip Planview	flat	96.4	87.8	84.4	100	87.0	85.7	100	92.3	95.	100	100
	castellated	3.6	12.2	15.6	0	13.0	14.3	0	7.7	5.0	0	0
Rim Thickening	rolled	17.8	22.0	40.	18.2	39.1	57.1	20	30.8	10.	5.0	41.2
	collared	3.6	2.4	0	0	2.2	0	0	3.8	0	0	0
Lip Preparation	smoothed	92.9	95.1	71.1	100	87.0	100	0	0	90.	100	82.4
	cordmarked	7.1	4.9	28.9	0	13.0	0	100	100	10	0	17.6
Lip Decoration	present	78.5	100	71.1	100	93.5	95.2	0	7.7	15.	0	5.9
Lip Technique	incised	7.1	14.6	4.4	90.0	2.2	0	0	3.8	10.	0	0
	punctate	7.1	2.4	2.2	0	0	0	0	0	5.0	0	0
	impressed	64.3	83.	62.2	9.1	91.3	95.2	0	3.8	0	0	0
Lip Tool	cord wrapped											
	stick	17.9	7.3	15.6	0	10.9	0	0	3.8	0	0	0
	pointed	7.1	12.2	6.7	90.0	2.2	0	0	3.8	10.0	0	0
	cord wrapped											
	cord	3.6	7.3	17.8	0	0	0	0	0	0	0	5.9
	cord wrapped	46.4	51.2	8.9	9.1	82.6	90.5	0	0	0	0	0
	paddle edge											
	turtle suture	0	4.9	17.8	0	0	0	0	0	0	0	0
	other	3.6	12.2	2.2	0	0	4.8	0	0	0	0	0
	other											
Lip Orientation	vertical	17.9	29.3	26.7	36.4	37.0	4.8	0	7.7	5.0	0	5.9
	horizontal	7.1	7.3	6.7	9.1	6.5	0	0	0	0	0	0
	oblique	53.6	61.0	33.3	54.5	52.5	90.5	0	0	5.0	0	0
Rim Flare	straight	89.3	78.1	64.4	81.8	73.9	76.2	96.0	61.5	70.0	95	100
	everted	10.7	21.9	35.6	18.2	26.1	23.8	4.0	38.5	30.0	5.0	0
Interior Preparation	smoothed	75	92.7	91.1	100	97.8	100	96.0	73.1	100	90.	100
	brushed	17.9	7.3	4.4	0	2.2	0	0	15.4	0	10.	0
	cordmarked	7.1	0	4.4	0	0	0	4.0	11.5	0	0	0
Interior Decoration	present	17.8	7.3	95.6	100	97.8	100	0	0	5.0	0	0
	present											
Interior Tool	cord wrapped											
	stick	0	2.4	22.2	0	10.9	0	0	0	0	0	0

APPENDIX D (cont'd)

DIMENSION	ATTRIBUTE	CLUSTERS										
		1	2	3	4	5	6	7	8	9	10	11
Interior	cord wrapped											
	paddle edge	7.1	0	31.1	0	86.9	90.5	0	0	0	0	0
	cord wrapped											
	cord	3.6	0	15.6	0	0	0	0	0	0	0	0
	pointed	0	0	4.4	100	0	4.8	0	0	0	0	0
	turtle suture	0	0	20.0	0	0	0	0	0	0	0	0
	other	7.1	4.9	6.7	0	0	4.7	0	0	5.0	0	0
	incised	0	0	0	100	0	0	0	0	0	0	0
	impressed	14.3	4.9	97.8	0	97.8	95.2	0	0	0	0	0
	punctate	0	2.4	2.2	0	0	4.8	0	0	5.0	0	0
	vertical	3.6	0	48.9	45.4	23.9	0	0	0	5.0	0	0
	horizontal	3.6	0	0	0	0	0	0	0	0	0	0
	oblique	7.1	4.8	51.1	54.5	71.7	100	0	0	0	0	0
	one	3.6	7.3	82.2	90.9	91.3	90.5	0	0	5.0	0	0
Number of Rows	two	10.7	0	13.3	0	6.5	9.5	0	0	0	0	0
	over two	0	0	2.2	0	0	0	0	0	0	0	0
Interior	present	0	0	2.2	0	15.2	4.8	0	0	0	0	0
Secondary Motif												
Exterior Preparation	cordmarked	85.7	90.2	82.2	100	80.4	90.5	88.0	100	0	100	88.2
	fabric											
	impressed	3.6	9.8	8.9	0	2.2	9.5	12.0	0	5.0	0	5.9
Exterior Preparation	smoothed											
	over	10.7	0	4.4	0	15.2	0	0	0	85.0	0	0
	vertical	82.1	85.4	88.9	90.9	78.3	90.5	84.0	88.5	0	75.	94.1
	oblique	7.1	12.1	2.2	0	4.3	9.5	12.0	7.7	5.0	25.	0
Orientation	horizontal	0	0	0	0	0	0	0	3.8	0	0	5.9
	no pattern	0	0	4.4	0	2.2	0	0	0	10.0	0	0
Exterior	present	96.4	2.4	48.9	36.3	93.5	0	0	7.7	0	0	0
Decorations												
Exterior Tool	pointed	50.	2.4	4.4	18.2	4.3	0	0	3.8	0	0	0
	curvilinear	3.6	0	13.3	0	0	0	0	3.8	0	0	0
	rectangular	3.6	0	2.2	0	4.3	0	0	0	0	0	0
	cord wrapped											
	stick	10.7	0	4.4	0	15.2	0	0	0	0	0	0
	cord wrapped											
	paddle edge	21.4	0	6.6	9.1	63.	0	0	0	0	0	0
	cord wrapped											
	cord	3.6	2.4	13.3	9.1	4.3	0	0	0	0	0	0
	knotted cord	0	0	2.2	0	0	0	0	0	0	0	0
	turtle suture	0	0	2.2	0	0	0	0	0	0	0	0
	other	0	0	0	0	0	0	0	0	0	0	0
	impressed	21.4	2.4	26.7	9.1	23.9	0	0	0	0	0	0
	incised	39.2	2.4	0	18.2	0	0	0	3.8	0	0	0
Exterior	90 degree											
Technique	punctate	14.2	0	17.8	0	8.7	0	0	3.8	0	0	0

APPENDIX D (cont'd)

DIMENSION	ATTRIBUTE	CLUSTERS										
		1	2	3	4	5	6	7	8	9	10	11
Exterior Number	acute											
	punctate	21.4	0	4.4	9.1	60.9	0	0	0	0	0	0
	one	35.7	0	13.3	0	10.9	0	0	0	0	0	0
	two	7.1	0	4.4	0	6.5	0	0	0	0	0	0
	over two	42.9	2.4	20.0	18.2	37.0	0	0	0	0	0	0
	horizontal	10.7	2.4	17.8	9.1	6.5	0	0	3.8	0	0	0
	vertical	14.3	0	15.6	0	6.5	0	0	3.8	0	0	0
	oblique	60.7	0	13.3	27.3	78.3	0	0	0	0	0	0
	cross-hatched	7.1	0	0	0	0	0	0	0	0	0	0
	other	0	2.4	0	0	0	0	0	0	0	0	0
Exterior Secondary Motif	present	10.7	0	13.3	0	0	0	0	0	0	0	0
Rim Thick- ness	2-5.9 mm	28.6	24.4	17.8	81.8	28.3	38.1	0	65.4	30.0	0	58.9
	6-8.99 mm	67.9	68.3	77.8	18.2	69.6	57.1	96.0	30.8	60.0	90	35.3
	over 9.0 mm	3.6	7.3	2.2	0	0	0	4.0	3.8	10.0	10	0
Rim Diam- eter ²	1-200 mm	0	0	0	0	0	0	0	3.8	5.0	0	0
	2-300 mm	0	4.9	0	0	4.3	0	0	0	0	0	0
	over 300 mm	0	0	0	0	0	0	0	0	0	0	0
Paste ²	sandy	10.7	0	0	0	4.3	0	0	7.7	0	5.0	0
	silty	89.3	100	97.8	100	93.4	100	100	92.3	95.0	95.0	100
Temper size ²	0-1 mm	0	0	0	0	0	0	0	0	0	0	0
	1-2 mm	3.6	9.8	6.7	27.3	4.3	23.8	4.0	34.6	0	0	17.6
	2-3 mm	14.3	26.8	17.8	18.2	32.6	23.8	8.0	11.5	25.0	10	82.4
	over 3 mm	82.1	63.4	73.3	54.5	56.5	52.3	88.0	53.8	75.0	90	0
Exterior Decora- tion Location ²	rear lip	14.3	0	2.2	0	0	0	0	0	0	0	0
	neck	25.0	0	6.7	27.3	17.4	0	0	0	0	0	0
	shoulder	0	0	2.2	0	8.7	0	0	0	0	0	0
	lip and shoulder	3.6	0	4.4	0	0	0	0	0	0	0	0
	neck and shoulder	21.4	2.4	13.3	9.1	26.1	0	0	0	0	0	0
TOTAL N		28	41	45	11	46	21	25	26	20	20	17

¹ Percentages of some attribute dimensions may not add up to 100 percent due to missing or incomplete data on occasional vessels

² Large amounts of missing data occur in these dimensions

APPENDIX E

PERCENTAGE OF ATTRIBUTES IN ELEVEN CLUSTERS BASED ON 300 RANDOMLY SELECTED VESSELS FROM WESTERN SITES¹

DIMENSION	ATTRIBUTE	CLUSTERS										
		1	2	3	4	5	6	7	8	9	10	11
Lip Cross- section	flat	81.8	75.8	90.0	8.6	63.2	72.2	52.0	100	57.1	100	70
	round	0	21.2	0	60.	31.6	11.1	32.0	0	5.7	0	7.5
	splayed	0	0	0	0	0	0	0	0	0	0	0
	wedge	9.1	0	5.0	0	0	2.8	4.0	0	2.9	0	2.5
	beveled	0	0	5.0	0	0	0	4.0	0	8.6	0	0
	thickened	0	3.0	0	31.4	5.2	13.8	4.0	0	26.7	0	20.
	other	0	0	0	0	0	0	4.0	0	0	0	0
Lip Planview	flat	100	97.0	100	97.1	100	100	100	100	100	100	100
	castellated	0	3.0	0	2.9	0	0	0	0	0	0	0
Rim Thick- ening	rolled	36.3	9.1	20	2.9	84.2	13.9	20.	42.9	22.9	28.0	37.5
	collared	18.2	18.2	5.0	14.3	0	11.1	28.	0	8.6	0	15.0
Lip Prep- aration	smoothed	72.7	90.0	95.0	94.3	84.2	94.4	68	0	5.7	0	10.0
	cordmarked	18.2	9.1	5.0	5.7	15.8	5.6	32	100	94.3	100	90.
Lip Dec- oration	present	0	3.0	0	0	52.6	100	76	0	0	0	0
Lip Technique	incised	0	0	0	0	5.3	13.9	0	0	0	0	0
	punctate	0	0	0	0	10.5	0	0	0	0	0	0
	impressed	0	3.0	0	0	36.8	86.1	72	0	0	0	0
Lip Tool	cord wrapped											
	stick	0	0	0	0	5.3	13.9	0	0	0	0	0
	pointed	0	3.0	0	0	10.5	13.9	0	0	0	0	0
	cord wrapped											
	cord	0	0	0	0	0	8.3	8.0	0	0	0	0
	cord wrapped											
	paddle edge	0	0	0	0	15.8	52.8	68.	0	0	0	0
Lip Orien- tation	turtle suture	0	0	0	0	0	2.8	0	0	0	0	0
	other	0	0	0	0	21.0	8.3	0	0	0	0	0
	vertical	0	0	0	0	26.3	19.4	4.0	0	0	0	0
	horizontal	0	3.0	0	0	15.8	2.8	12.	0	0	0	0
	oblique	0	0	0	0	0	75.	60	0	0	0	0
Rim Flare	straight	81.8	72.7	100	51.4	5.2	86.1	52.0	19.0	88.6	100	65.0
	everted	18.2	27.3	0	48.6	94.8	13.8	48.0	81.0	11.4	0	35.0
Interior Prepara- tion	smoothed	100	90.9	100	77.1	89.5	91.6	88.0	85.7	91.4	68.0	97.5
	brushed	0	9.1	0	8.6	5.2	2.8	0	4.8	5.7	4.0	0
	cordmarked	0	0	0	8.6	0	0	8.0	4.8	2.9	24.0	0
Interior Decora- tion	present	0	0	0	8.6	0	2.8	68.0	0	2.9	0	2.5
Interior Tool												
	cord wrapped											
	stick	0	0	0	0	0	0	12	0	0	0	0

APPENDIX E (cont'd)

DIMENSION	ATTRIBUTE	CLUSTERS										
		1	2	3	4	5	6	7	8	9	10	11
Interior Technique	cord wrapped	0	0	0	0	0	0	44	0	0	0	0
	paddle edge											
	cord wrapped											
	cord	0	0	0	0	0	0	8.0	0	0	0	0
	pointed	0	0	0	8.6	0	2.8	0	0	2.9	0	2.5
	turtle suture	0	0	0	0	0	0	0	0	0	0	0
	other	0	0	0	0	0	0	4.0	0	0	0	0
	incised	0	0	0	8.6	0	2.8	0	0	0	0	2.5
	impressed	0	0	0	0	0	0	68.0	0	0	0	0
	punctate	0	0	0	0	0	0	0	0	2.9	0	0
	vertical	0	0	0	5.7	0	0	0	0	2.9		2.5
	horizontal	0	0	0	2.9	0	2.8	0	0	0	0	0
	oblique	0	0	0	0	0	0	64	0	0	0	0
Interior Number of Rows	one	0	0	0	5.7	0	0	64	0	0	0	0
	two	0	0	0	0	0	0	0	0	2.9	0	0
	over two	0	0	0	0	0	2.8	0	0	0	0	0
	present	0	0	0	0	0	0	0	0	0	0	0
Secondary Motif												
Exterior Prepara- tion	cordmarked	90.9	48.5	100	94.3	100	83.3	84.0	100	91.4	96.	97.5
	fabric											
	impressed	0	3.0	0	0	0	5.6	0	0	2.8	4.	0
Exterior Prepara- tion Orienta- tion	smoothed	9.1	42.4	0	2.9	0	5.6	8.0	0	0	0	2.5
	vertical	90.9	18.2	100	91.4	84.2	72.2	44.0	100	71.4	92.0	90.
	oblique	0	33.3	0	2.9	10.5	8.3	32.0	0	17.1	8.0	7.5
	horizontal	0	3.0	0	0	5.3	8.3	8.0	0	5.7	0	0
	no pattern	0	6.1	0	2.9	0	5.6	8.0	0	5.7	0	0
Exterior Decora- tion	present	100	0	0	0	0	22.2	56.0	0	0	0	7.5
Exterior Tool	pointed	27.2	0	0	0	0	11.1	4.0	0	0	0	5.0
	curvilinear	63.6	0	0	0	0	0	0	0	0	0	0
	rectangular	0	0	0	0	0	0	0	0	0	0	0
	cord wrapped											
	stick	0	0	0	0	0	2.8	4.0	0	0	0	2.5
	cord wrapped											
	paddle edge	0	0	0	0	0	5.6	44.0	0	0	0	0
	cord wrapped											
	cord	0	0	0	0	0	0	4.0	0	0	0	0
	knotted cord	0	0	0	0	0	0	0	0	0	0	0
Exterior Technique	turtle suture	0	0	0	0	0	0	0	0	0	0	0
	other	9.1	0	0	0	0	0	0	0	0	0	0
	impressed	45.5	0	0	0	0	0	12.0	0	0	0	0
	incised	0	0	0	0	0	11.1	4.0	0	0	0	5.0
	90 degree											
	punctate	45.4	0	0	0	0	2.8	0	0	0	0	0

APPENDIX E (cont'd)

DIMENSION	ATTRIBUTE	CLUSTERS										
		1	2	3	4	5	6	7	8	9	10	11
Exterior Number	acute											
	punctate	9.1	0	0	0	0	5.6	40.0	0	0	0	2.5
	one	72.7	0	0	0	5.2	13.9	36.0	0	0	0	0
	two	9.1	0	0	0	0	2.8	12.	0	0	0	2.5
	over two	0	0	0	0	0	5.6	8.0	0	0	0	0
Exterior Orientation	horizontal	18.2	0	0	0	0	8.3	4.0	0	0	0	2.5
	vertical	54.5	0	0	0	0	5.6	8.0	0	0	0	2.5
	oblique	0	0	0	0	5.2	2.8	44.0	0	0	0	2.5
	cross-hatched	0	0	0	0	0	5.6	0	0	0	0	0
	other	9.1	0	0	0	0	0	0	0	0	0	0
Exterior Secondary Motif	present	0	0	0	0	0	0	0	0	0	0	0
Rim Thickness	2-5.9 mm	36.3	21.2	0	25.7	10.5	47.2	36.0	0	5.7	48.	85.
	6-8.99 mm	63.6	45.5	100	60.	84.2	47.2	60.0	100	94.3	36.	7.5
	over 9.0 mm	0	30.3	0	8.6	5.3	0	0	0	0	8.0	2.5
Rim Diameter ²	1-200 mm	0	0	0	2.9	10.5	2.8	0	0	0	0	2.5
	2-300 mm	0	0	0	0	5.2	2.8	4.0	0	2.9	0	0
	over 300 mm	0	0	0	0	5.2	0	4.0	0	0	0	0
Paste ²	sandy	18.2	54.5	10.0	34.3	21.1	5.6	28.0	38.1	2.9	24.	15.0
	silty	45.5	39.4	80.	45.7	78.9	63.9	64.0	42.8	97.1	0	72.5
Temper size ²	0-1 mm	0	3.0	0	2.9	0	2.8	0	0	2.8	0	10.0
	1-2 mm	18.2	9.1	10.0	0	5.3	2.8	4.0	0	2.9	8.0	2.5
	2-3 mm	18.2	12.1	15.0	17.1	10.5	11.1	24.0	0	2.9	8.0	32.5
	over 3 mm	27.2	69.7	65.0	57.1	84.2	52.8	64.0	81.0	91.4	8.0	42.5
Exterior Decoration Location ²	near lip	54.5	0	0	0	0	0	0	0	0	0	0
	neck	0	0	0	0	0	0	0	0	0	0	0
	shoulder	0	0	0	0	0	0	0	0	0	0	0
	lip and shoulder	0	0	0	0	0	0	0	0	0	0	0
	neck and shoulder	0	0	0	0	0	0	0	0	0	0	0
TOTAL N		11	33	20	35	19	36	25	21	35	25	40

¹ Percentages of some attribute dimensions may not add up to 100 percent due to missing or incomplete data on occasional vessels.

² Large amounts of missing data occur in these dimensions.

APPENDIX F

FORMAL CERAMIC DESCRIPTIONS

Alleghan Ware (Figures 23-30)

Vessel Sample:	Forty-sixth Street	38
	Fennville	115
	Moccasin Bluff	136
	Total	289
Temper:	Grit, generally greater than 2.0 mm.	
Hardness:	2.0-3.0	
Texture:	Coarse, crumbly: frequently exfoliates from both the interior and exterior.	
Color:	Yellowish-brown, red-brown to cinnamon, medium brown.	
Surface finish:	Most pots are cordmarked (94.5%) though a small number are fabric impressed (1.0%) and smoothed over (4.5%).	
Decoration:	Only 13.5% of all vessels are decorated on the exterior. Most vessels have vertical or oblique cordmarking up to the lip. When decoration does occur, it is usually a single row of acute punctates or impressions over the cordmarking. Lip decoration most often consists of cordwrapped paddle edge impressions. However, decoration occurs on only 19% of all lips and is usually done on vessels which have smoothed over lips. Most vessels have cord wrapped paddle flattened lips and no decoration. Interiors are also often treated with a cordwrapped paddle but are for the most part smoothed. Decoration on interiors is very infrequent (2.1%) when it occurs, it mostly consists of some tool impression.	

- Type: Allegan Decorated: Allegan Decorated is defined by the presence of decoration on the exterior surface of vessels.
- Variants: Variants of Allegan Decorated include impressed (4.5%), incised (3.1%), punctate (4.2%), and acute punctate (1.4%). Collaring is present on most variants with the exception of incised vessels (exterior).
- Type: Allegan Undecorated: This type is defined by the lack of exterior decoration.
- Variants: Plain Lip: This variety lacks lip decoration as well as exterior decoration.
Decorated Lip: Lips are decorated usually by tool impression.
Allegan Collared: formerly defined as Spring Creek Collared but renamed to be consistent with the Tradition name. Collaring does not appear to have significance at the type level but at the variety or perhaps sub-variety level.
- Form: Rim: collaring occurs on 27% of all Allegan Ware, both Allegan Decorated and on Allegan Undecorated. Rims are straight (over 88%)-when rims are everted it is slight. Castellations occur on five vessels from Moccasin Bluff, and on no vessels from either the Fennville or Forty-sixth Street sites.
Lip: Lips are most often flat (77.2%) with a small percentage of round (8%) and thickend (9%) forms.
Base: Unknown, though probably round with a generally globular body form.
- Geographic range: Southwestern Michigan, probably confined to the Kalamazoo River drainage and possibly as far south as the St. Joseph though perhaps not including the St. Joseph itself.
- Chronological range: Early Late Woodland, perhaps as early as A.D. 500 and continuing at least to the end of the 13th century.

Relationships:

Clear relationships exist between Allegan Ware and Wayne and Spring Creek Wares within Michigan. Less clear relationships exist between early Late Woodland wares in Illinois and Wisconsin (Bettarel and Smith, 1973). If Moccasin Bluff ceramics are the products of a separate tradition Allegan Ware would certainly be related.

Spring Creek Ware (Figures 34-51)

Vessel Sample:

Spoonville	165
Spring Creek	163
Zemaitis	269
Total	<u>597</u>

Temper:

Grit particles rarely less than 2 mm. More than 50% are above 3 mm. in size.

Texture:

Coarse and rough, but reasonably solid. Minor tendency for folded collars to exfoliate.

Hardness:

Unknown.

Color:

Quite variable, ranging from yellow-brown, to brown, cinnamon, red-brown to brown black. Some vessels are encrusted with heavy char on both the interior and exterior.

Surface finish:

Majority of all vessels are cordmarked (83%); smoothed over cordmarking is found on 13% and fabric impressions are found on 3% of all vessels.

Decoration:

Only 11 percent of all Spring Creek Ware vessels are decorated on the exterior. Decoration usually consists of one or two rows of punctates or acute punctates over cordmarking, though incising is present on 3% of all pots. Lip decoration is more common than exterior decoration occurring on 23% of all pots, most of which are cord wrapped stick impressions. Non-decorated lip vessels quite often have been slapped with a cordwrapped paddle. Interiors which are mostly smoothed (87%), are least frequently decorated of any surface (9%).

- Type: Spring Creek Decorated: defined by the presence of exterior decoration.
- Variants: Variants of Spring Creek Decorated occur according to type of decoration such as acute punctate, incised, and punctate. Most decorated variants, however, are also collared though the presence of exterior decoration should take precedence in the naming of variants.
- Type: Spring Creek Undecorated: this type lacks exterior decoration and makes up 88.8% of the sample.
- Variants: Decorated Lip: all of these vessels possess decoration most of which is impressed with a cordwrapped stick or paddle edge on a smoothed lip surface.
Plain Lip: no lip decoration is present, though many of these vessels have cordwrapped paddle flattened surfaces.
- Form: Rim: castellations are rare but collaring (rolled rim and true collars) occur on about 45% of all Spring Creek Ware vessels. Collaring was a defining attribute for the type Spring Creek Collared (Fitting, 1968; Rogers, 1972), but in the sample considered here occurs on both Decorated and Undecorated types and does not constitute a mutually exclusive ceramic type or variant. Over 40% of all rims are moderately everted.
Lip: Slightly over half of all Spring Creek Ware vessels are flat lipped and 12% have thickened lips. Round lips occur on over a fifth of all vessels.
Base and Body: rounded bases are present and general body form is globular.
- Geographic Range: The Lower Grand and Muskegon River drainages possibly extending upstream.
- Chronological range: Early Late Woodland, possibly as early as A.D. 500 and extending to at least A.D. 1000, probably beyond.

Relationships: Closely related to the Allegan Tradition in the Kalamazoo drainage, and the Wayne Tradition in Eastern Michigan. Relationships may also exist between Spring Creek Wares and northern Michigan early Late Woodland types such as Bowerman Ware (Cleland, n.d.).

Wayne Ware (Figures 56-83, 86-97)

Vessel Sample:	Draper Park	127
	Fort Wayne Mound	12
	Riviere Au Vase	32
	Fletcher	279
	Schultz	52
	Butterfield	12
	Valley Sweets	5
	Mahoney	11
	Foster	7
	Hodges	9
	Total	546

Temper: Grit particles most of which are between 1 and 3 mm. in size.

Texture: Friable, coarse, with a tendency to exfoliate both interior and exterior surfaces.

Hardness: 2.0-3.0

Color: Yellow-Brown, red-brown, brown; grey-brown.

Surface finish: Cordmarking most common (80%) though 13% of the vessels are smoothed over and approximately seven percent are fabric impressed.

Decoration: One third of all Wayne Ware vessels are decorated on the exterior, the most common technique being tool impressions and acute punctates. Incising and punctates also occur on more than five percent of the vessels. Exterior decoration most often occurs in an oblique orientation with three or more rows most frequent. About 60% of all vessels are decorated on the lip mostly with tool impressions; while interior decoration is less common, occurring on approximately 40% of the vessels.

- Type: Wayne Decorated: defined by the presence of exterior decoration.
- Variants: Incised: sharp tool incising, usually over cordmarking, includes crosshatching (6%).
Cord Impressed: horizontal linear cordwrapped cord impressions on approximately 6% of all vessels.
Punctate: Ninety degree angle punctates occurring on approximately 8% of all vessels.
Acute punctate: also called corded punctate (Fitting, 1965) occurring on 15% of all vessels. Tool is not always a corded implement.
- Type: Wayne Undecorated: no exterior decoration though lips and interiors are often decorated.
- Variants: Cordmarked: approximately 40% of all Wayne Ware is both undecorated and cordmarked on the exterior. Cords range from fairly loose to tight and fine.
Smoothed: approximately 15% of all Wayne Undecorated vessels have smoothed over cordmarking near the rim.
- Form: Rim: Collars, both rolled and true collars occur though the rolled type is much more common, occurring on approximately 38% of all vessels both decorated and undecorated types. Six percent of Wayne Ware vessels are castellated-more frequently in the Saginaw area than in the southern sites. Rims are predominantly straight though approximately one-fourth of them are moderately everted.
Lip: lip form is most often flat (75%) with rounded lips being second most common on 1% of all vessels.
Base and Body: rounded to semi-conoidal bases are normal and vessel bodies are most often globular to slightly elongated.

- Geographic range: Wayne Wares are distributed predominantly in eastern lower Michigan in the Saginaw River drainage and south to Lake Erie. Occasional sherds have been reported in non-Wayne cultural contexts to the north or south of this area (Fitting, 1970).
- Chronological range: Early Late Woodland, possibly before A.D. 700; may extend beyond A.D. in the Saginaw area.
- Relationships: Closely related to Allegan and Spring Creek Wares; may be similar to some late Middle or early Late Woodland forms in Ohio and Ontario (Fitting, 1965:159) though the relationship has not been demonstrated.

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