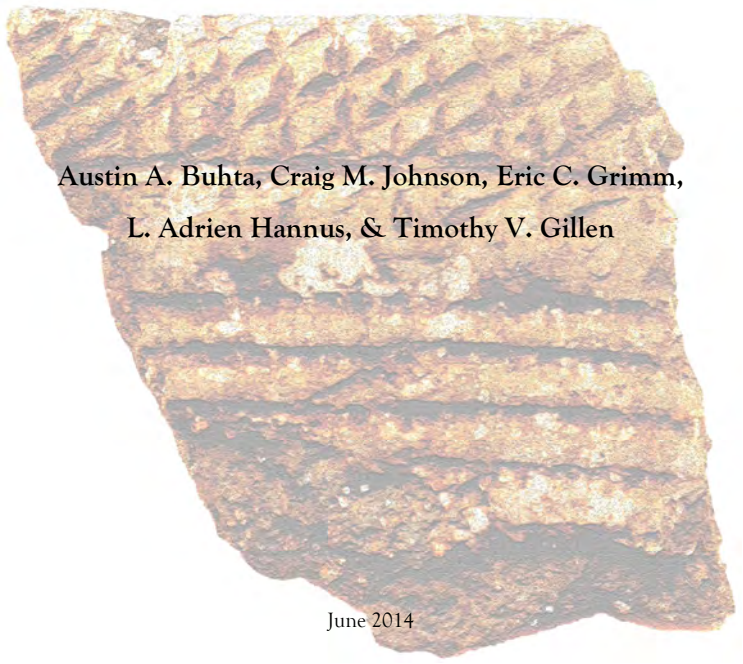
On the Periphery?: Archeological Investigations of the Woodland Tradition in West-Central Minnesota

Austin A. Buhta, Craig M. Johnson, Eric C. Grimm,
L. Adrien Hannus, & Timothy V. Gillen



June 2014

Archeological Contract Series 269

Prepared by:
Archeology Laboratory
Augustana College
2032 South Grange Avenue
Sioux Falls, South Dakota 57105

Prepared for:
The Oversight Board of the Statewide Survey of Historical and Archaeological Sites and the Minnesota Historical Society
345 Kellogg Boulevard West
St. Paul, Minnesota 55102-1906

This project was funded by the Arts and Cultural Heritage Fund of the Minnesota Clean Water, Land, and Legacy Amendment as part of the Statewide Survey of Historical and Archaeological Sites

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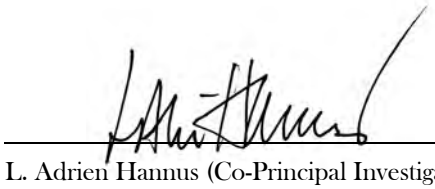

L. Adrien Hannus (Co-Principal Investigator)

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Cover Image: A Middle Woodland Havanoid rim from site 21KH46, Kandiyohi County, Minnesota.

ABSTRACT

This report presents the findings of an archeological investigation of the Woodland tradition in west-central Minnesota. The project, conducted by the Archeology Laboratory, Augustana College, Sioux Falls, South Dakota, is one of a series undertaken as part of the Legacy Amendment-funded studies focused on the investigation of poorly understood areas in the state. The primary objective of the study was to expand the breadth of knowledge concerning west-central Minnesota's Woodland tradition, including how early these groups appear, how late they survive, their physical manifestations, and their interaction with other prehistoric contexts. The current investigation examined a series of Woodland-period ceramic collections from both the west-central Minnesota study area and the broader region, and conducted limited test excavations at three previously identified Woodland sites in Kandiyohi County. A lakebed sediment core was also obtained from Elkhorn Lake in the study area. A detailed paleoenvironmental reconstruction of the study area will be possible when the pollen from this core is analyzed. Results of the current investigation suggest that west-central Minnesota was occupied during the Woodland period by peoples with potting traditions linked to developments in eastern, rather than southwestern, Minnesota. Woodland sites in the study area contain ceramics ranging from early Brainerd ware to terminal Woodland pottery. The only radiocarbon dates obtained from Woodland components in the study area derive from Brainerd ware vessels at site 21DL2; the dates indicate a late-period Brainerd occupation of the area. Locational distributions of Woodland sites in west-central Minnesota reflect a strong correlation with water features—particularly lakeshores. Tested sites 21KH36, 21KH46, and 21KH93 were found to contain multiple Woodland components; however, no features datable to the Woodland period were discovered and no discernable stratigraphic separation between components was observed at these sites. Previous investigations at 21KH46 suggest the possibility of stratified pottery components in at least a small portion of that site; however, final analyses have not been completed at this time.

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TABLES (CONTINUED)

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FIGURES (CONTINUED)

FIGURES (CONTINUED)

FIGURES (CONTINUED)

ACKNOWLEDGEMENTS

We are indebted to many for their help in the completion of this work. Our most sincere gratitude is extended to Roy McClain, Jim Lundquist, and Dr. William Reid, who granted us permission to conduct survey and test excavations on their property. We also wish to thank the Minnesota Department of Natural Resources in this regard. Without their assistance, this project would not have been possible. For allowing us access to their personal artifact collections, we thank Charles Hanson, Vince Jennegis, Chuck Koishiol, and Larry Levin. Special thanks are extended to Larry and his wife Barb for serving as our personal site tour guides during the earlier phases of work, for allowing us to borrow catalogs and photographs of specimens in their collection for digital reproduction, for fielding loads of different questions about the sites, and for their general hospitality. Thanks again Barb and Larry. For providing us with assistance in accessing various publicly curated artifact collections, we wish to acknowledge the efforts of Ed Fleming (Science Museum of Minnesota), Ann Lundberg (Big Stone County Historical Society Museum), Adam Smith (Stearns County Heritage Center), and Erin Endress (Wright County Museum). We would like to thank William and Mavis Hallberg for their hospitality. We thank Tom Cinadr for assistance with the files search. For his help with all things curation, we thank Dan Cagley. Additional thanks are directed towards Beth Hobbs, Minnesota Department of Transportation, who not only provided data for previously recorded Woodland sites in the study area, but also generated a custom-made MN/Model map for the project. Connie Arzigian of the Mississippi Valley Archaeology Center, University of Wisconsin, La Crosse assisted in providing site location information for Wisconsin sites. We thank Tim Tumberg for fielding more questions and providing access to more reports and site data related to 21KH46. We wish to acknowledge the efforts of Scott Anfinson, Pat Emerson, and Bruce Koenen, for administering the project, for providing advice and support (and reports, field notes, photos, and access to artifact collections at Ft. Snelling) throughout. Very special thanks are extended to Scott and Bruce, who joined us in the field to assist in excavations (and sweating) at 21KH46 and 21KH93. Thanks again, everyone, we truly appreciate it.

PROJECT OVERVIEW

In October of 2012, the Archeology Laboratory, Augustana College (ALAC), Sioux Falls, South Dakota, entered into a contract (No. 4308088) with the Minnesota Historical Society (MHS) and the Oversight Board of the Statewide Historical and Archaeological Survey, St. Paul to conduct an archeological investigation of the Woodland tradition in west-central Minnesota. In North America, the Woodland period (ca. 800 B.C.–A.D. 1750) is understood to represent a time of great transition, featuring the introduction of new technologies, economies, and social practices. Broadly speaking, the hallmarks that are usually associated with this tradition include an increased reliance upon horticultural practices (Gibbon 1998a:230), the introduction of ceramics, semi-permanent dwellings coupled with increased population density (Grange 1980; Hill and Kivett 1940; Hoffman 1968; C. Johnson 1994:3-32), bow and arrow utilization, and burial mound construction (Howard 1968; E. Johnson 1973; Neuman 1975). However, this traditional view of the Woodland period has been found to be both overly simplistic and not entirely sufficient for application in most areas of Minnesota (see for example Anfinson and Wright 1990:222; Dobbs 1989:106; Gibbon 2012a:93-94).

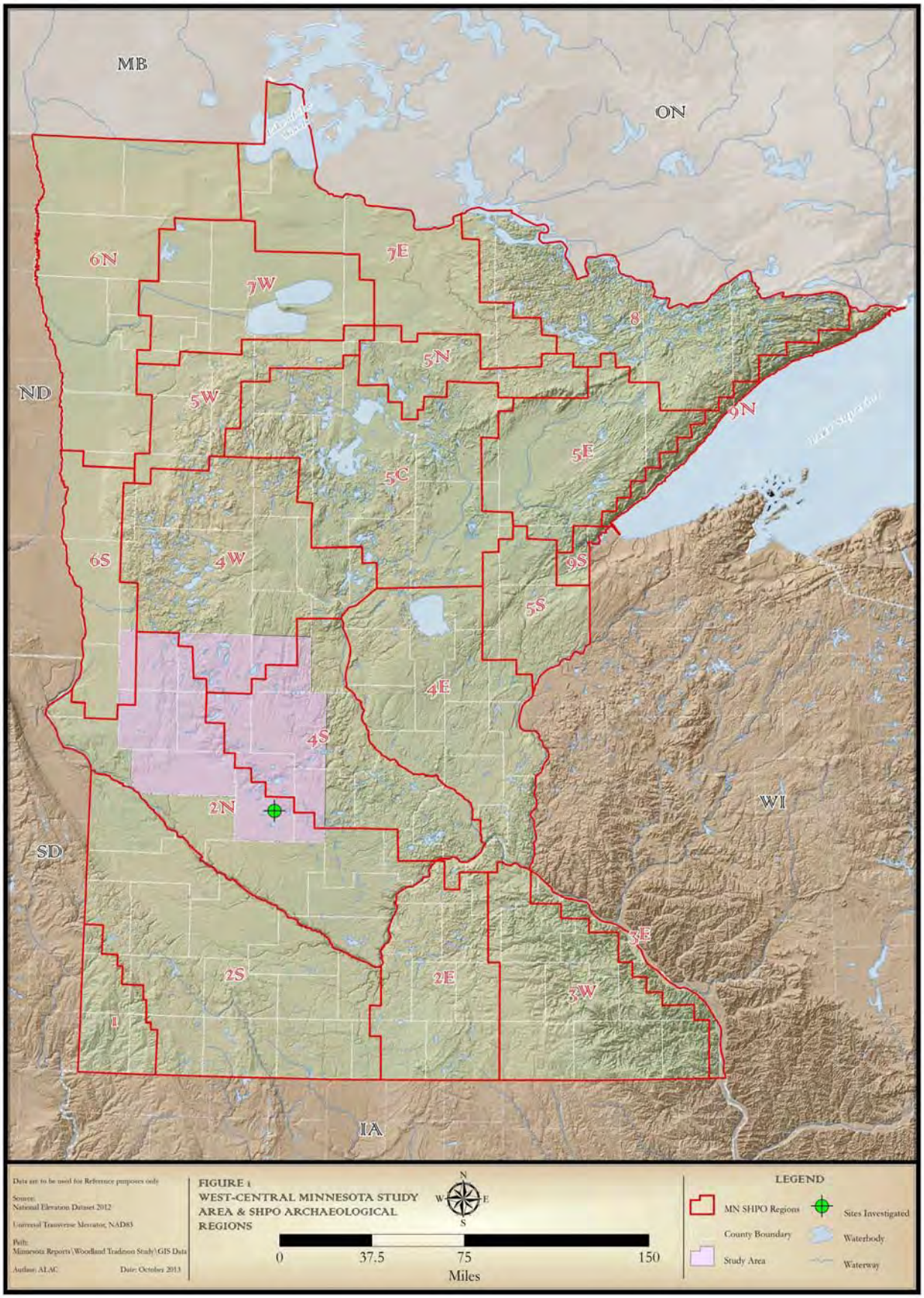
In general terms, the Woodland tradition is one of the most intensively researched periods in Minnesota prehistory. Indeed, over 4,000 sites with Woodland components have been identified throughout the state, and these numbers will surely continue to increase with time. In addition, as noted in the project Request for Proposals (RFP), a "…relatively well-defined…" ceramic typological classification system has been developed for Minnesota's Woodland period, and numerous wares are associated with the 11 recognized historic contexts that presently subdivide the tradition (see Arzigian 2008:1). However, only about 15 percent of Minnesota's documented Woodland sites are located in west-central Minnesota, and the collective understanding of the Woodland contexts and ceramic typologies associated with this area is severely lacking.

For the purposes of this study, "west-central Minnesota" is defined as all of Grant, Stevens, Douglas, Pope, Swift, and Kandiyohi counties, as well as the southern half of Todd County and the western portions of Stearns and Meeker counties. The study area falls within portions of Minnesota State Historic Preservation Office (SHPO) archaeological subregions 2n, 4s, 4w, and 6s (Table 1; Figure 1), and is one of the least understood areas of the state in terms of archeology.

At first glance, the region appears as a periphery of sorts for many of the state's known Woodland-period ceramic wares. The reasons for this circumstance are presently unclear. There is a paucity of intensively investigated Woodland sites within the study area and those sites that have been thoroughly investigated are located on the region's periphery. The lack of intensively excavated sites in the study area has, in turn, resulted in a shortage of Woodland-period radiocarbon dates from the region, as well as the aforementioned issues related to ceramic classification. Compounding this issue, both within the current study area and beyond, is that many of the Woodland sites that *have* been tested are poorly stratified and/or contain mixed deposits, making it difficult to evaluate the development and change in ceramics through time, as well as the functional relationships present among sites that are believed to be contemporaneous.

Table 1. Archaeological Region Identification Key.

Southwest Riverine	**1**
Prairie Lake	**2**
Prairie Lake North	*2N*
Prairie Lake South	2S
Prairie Lake East	2E
Southeast Riverine	**3**
Southeast Riverine East	3E
Southeast Riverine West	3W
Central Lakes Deciduous	**4**
Central Lakes Deciduous South	*4S*
Central Lakes Deciduous East	4E
Central Lakes Deciduous West	*4W*
Central Lakes Coniferous	**5**
Central Lakes Coniferous North	5N
Central Lakes Coniferous South	5S
Central Lakes Coniferous East	5E
Central Lakes Coniferous Central	5C
Red River Valley	**6**
Red River Valley North	6N
Red River Valley South	*6S*
Northern Bog	**7**
Northern Bog East	7E
Northern Bog West	7W
Border Lakes	**8**
Lake Superior	**9**
Lake Superior North	9N
Lake Superior South	9S


MB
ON
ND
SD
WI
IA
6N
7W
7E
8
5N
5W
9N
5E
5C
6S
4W
9S
5S
4E
4S
2N
3E
2S
2E
3W
1
Lake Superior
Data are to be used for Reference purposes only
Source:
National Elevation Dataset 2012
Universal Transverse Mercator, NAD83
Path:
Minnesota Reports\Woodland Tradition Study\GIS Data
Author: ALAC
Date: October 2013
FIGURE 1
WEST-CENTRAL MINNESOTA STUDY AREA & SHPO ARCHAEOLOGICAL REGIONS
N
W
E
S
0
37.5
75
150
Miles
LEGEND
MN SHPO Regions
Sites Investigated
County Boundary
Waterbody
Study Area
Waterway

When did Woodland groups occupy the region and where did they originate? Are settlement and subsistence patterns detectable in the region's archeological record and how, if at all, do they vary from those of Woodland groups documented elsewhere in the state? How did these groups interact with other prehistoric groups and how did they interact with their environment? Is construction of a viable Woodland chronology supported by absolute dates feasible for west-central Minnesota? What would the construction of such a chronology entail and what is a realistic timetable for its development? What are the implications of this relative to Minnesota's Woodland chronology and is that chronology in need of reevaluation? The current investigation attempts to explore these and other issues in order to further understand the west-central Minnesota Woodland presence within the larger context of the state's Woodland tradition.

DESCRIPTION AND OBJECTIVES

As outlined on page 2 of the project RFP, the aim of this study was to determine: "…how early they [Woodland contexts in west-central Minnesota] appear, how late they survive, their physical manifestations, and their interaction with other prehistoric contexts that pre-date them, that are coeval with them, and that post-date them." Three primary tasks comprised the project:

1) Review archeological, environmental, and ethnographic literature pertinent to the Woodland period in west-central Minnesota, examine known Woodland site distributions in the area via the Office of the State Archaeologist's (OSA's) site inventory, and examine artifacts in major local museums and private collections.

2) Excavate a single major multi-component Woodland site in the study area or intensively test several such sites. Excavations are to include at least 20 square meters in units of at least one square meter and some fine-recovery sampling should be utilized to recover subsistence information and materials for radiocarbon dating. The focus of excavations is on obtaining *in situ* artifacts and associated materials suitable for developing the Woodland ceramic/cultural sequence in the study area.

3) Complete an analytical and descriptive report that summarizes the findings of the literature search, collections research, fieldwork, artifact analysis, and absolute dating results.

These tasks, outlined by the MHS on pages 2-3 of the RFP, served as the foundation for the research design that was ultimately constructed.

Research Design

A research orientation was established and field methodology was implemented pursuant to the specifications set forth in the RFP, as well as to governing state (Anfinson 2005) and federal (Advisory Council on Historic Preservation 2012) standards for the management and protection of cultural resources. The desired outcome of this design corresponds to that outlined in the RFP—the recognition of an initial outline of Woodland contexts present in the study area, the timeframe comprising their occupation of the region, and the identification of characteristics associated with their material culture, subsistence and settlement patterns, and their interaction with other known prehistoric contexts and their environment.

The RFP states that the first task of the project is to assess what is known about the distribution and composition of Woodland tradition sites in west-central Minnesota through a review of inventory records and reports, an examination of institutional and private artifact collections, and interviews with local artifact collectors. Site inventory records and reports from the OSA, Ft. Snelling History Center, and the SHPO were obtained between the fall of 2012 and the spring of 2013. A Woodland-period site locational probability map of the study area was generated in MN/Model by Elizabeth Hobbs, Minnesota Department of Transportation. Two private artifact collections and five publicly curated collections were also examined during the course of the investigation; limited interviews were conducted with the owners of the private collections. Examined collections include those from sites in Kandiyohi (21KH27, 21KH36, 21KH44, 21KH46, 21KH48, 21KH93, 21KHBI, 21KHBP, 21KHBV, 21KHCC, 21KHCF, 21KHCL, 21KHHF, and 21KHLD), Meeker (21ME1, 21ME1-B, and 21ME23), and Stearns (21SN5 and 21SN6) counties in the study area, as

well as those from sites in Big Stone (21BS22, 21BS39, and 21BS51), Lincoln (21LN2), and Wright (21WR17) counties to the west, southwest, and east of the study area, respectively.

The second task outlined in the RFP is to "…excavate a single major multi-component Woodland site in the heart of the area or to intensively test several such sites." The RFP provided a list of four sites felt to be viable candidates for testing, all of which are located in southern Kandiyohi County (see Figure 1, above). These are sites 21KH36, 21KH44, 21KH48, and the Levin site (21KH93). Although sites 21KH36 and 21KH93 were felt to be viable candidates based on preliminary reconnaissance work, it was discovered that sites 21KH44 and 21KH48 had been extensively disturbed over the years as a result of cultivation. Therefore, sites 21KH44 and 21KH48 were eliminated from consideration for this study. However, another nearby Woodland site, 21KH46, was brought to the investigators' attention early in the site selection process. It was believed that this site, like 21KH36 and 21KH93, also contained some undisturbed deposits. The investigators felt that each of these three localities warranted more detailed exploration and, ultimately, portions of each site were selected for testing.

The final task outlined in the RFP is the compilation of a comprehensive investigation report detailing the findings of the study and recommendations for future research. The framework and components of the report are outlined below.

PERSONNEL AND PROJECT ORIENTATION

The project was conducted under the overall supervision of L. Adrien Hannus and Austin A. Buhta. GIS data management and map production were conducted by Buhta and Jason M. Kruse. Hannus and Buhta also assisted with the archeological and paleoenvironmental field investigations, and conducted background research and report writing. Artifact collection analysis and documentation was undertaken by Hannus, Kruse, Timothy V. Gillen, and Craig M. Johnson. Additional archeological field crew members included Gillen, Edward J. Lueck, Jason Bassett, and Creighton Gerber. OSA archeologists Scott F. Anfinson and Bruce Koenen assisted with field investigations. Lynette Rossum administered the project.

REPORT FRAMEWORK AND ORGANIZATION

Eight chapters and the appended data comprise the report of this investigation. A brief synopsis of each chapter, followed by a list of appendices, is provided below.

Report Chapters

1) **Project Overview** presents a general study overview, including the research objectives of the investigation, a description of the project area, project methodology, roles of personnel involved, and an outline of the framework and organization of the report.

2) **West-Central Minnesota's Woodland Tradition: A Background & Summary** provides a general overview of the Woodland tradition in Minnesota with a focus on the composition and distribution of Woodland sites in the study area. Descriptions are provided of the various defined Woodland taxonomic units known to have inhabited west-central Minnesota through time, and specific noteworthy sites and pottery types are identified for each. This background provides context within which the ceramic assemblages recovered during field investigations are evaluated (Craig M. Johnson and Austin A. Buhta).

3) **Paleoenvironmental Context** provides a general overview of the paleoenvironmental parameters comprising the west-central Minnesota study area and the four associated archaeological subregions. Two lakebed sediment cores were extracted in February of 2013 from Elkhorn Lake in the southern portion of the study area. Two AMS dates were subsequently obtained from the cores. Proposals are being developed to obtain additional dates and pollen counts from the section of the cores that corresponds with the Woodland occupation of the study area. These data will provide a means to reconstruct the local and regional paleoenvironment, allowing for a clearer understanding of the landscapes that were occupied by Woodland inhabitants through time (Eric C. Grimm).

4) **Methodology & Field Investigations** details the results of archeological test excavations conducted at three sites in the study area. Excavations were carried-out at sites 21KH36, 21KH46, and 21KH93 during the summer of 2013. Descriptions of the methods employed during the investigations as well as the results of the fieldwork and the findings are included. Documentation for each site includes artifact and material type inventories and provenience, as well as photographs and map data. Detailed analyses of the artifact assemblages are discussed in separate chapters.

5) **Ceramic Analysis** provides a detailed examination of ceramics recovered from the 2013 excavations and compares them with additional ceramic collections from within the study area and beyond. Multiple traits from each specimen are analyzed and, in comparing these traits with those of other ceramics from defined typologies, the west-central Minnesota specimens are viewed within the broader context of Minnesota's Woodland tradition. The chapter concludes by offering a series of future research topics focused on Woodland tradition ceramic studies in Minnesota (Craig M. Johnson).

6) **Analysis of Lithic, Faunal, Botanical, & Historical Artifacts** provides a description and analysis of the artifact assemblage other than the prehistoric ceramic artifacts recovered during the 2013 excavations at sites 21KH36, 21KH46, and 21KH93. Artifacts described in this chapter include lithics and faunal remains as well as historic-period specimens (L. Adrien Hannus, Timothy V. Gillen, and Austin A. Buhta).

7) **Synthesis and Recommendations** presents a discussion of the project research and evaluates the results and avenues available for further exploration. Data from the archeological and paleoenvironmental studies are amalgamated and the state of west-central Minnesota Woodland-period archeology is reevaluated based on these findings.

8) **References Cited** provides a comprehensive list of sources cited in the report.

Appendices

A) Laboratory Results of Three AMS-Dated Charcoal Samples Recovered from the Levin Site (21KH93), Kandiyohi County, Minnesota

B) Catalog and Photographic Documentation of Larry Levin Private Artifact Collection from Sites 21KH36, 21KH93, and Other Kandiyohi County Sites (Electronic Appendix on Compact Disk)

C) Data Tables for Ceramic Assemblages Analyzed During the Current Study

WEST-CENTRAL MINNESOTA'S WOODLAND TRADITION: A BACKGROUND & SUMMARY

Craig M. Johnson &
Austin A. Buhta

The Woodland tradition was initially developed as part of the cultural continuum for North America's Eastern Woodlands culture area to describe the cultures observed in the lower Midwest, particularly those of the Ohio River valley (see Gibbon 1998b:252-253; Griffin 1946). In this area, the Woodland tradition separated the earlier Archaic and later Mississippian periods in time. For many years, the Woodland period was recognized archeologically by the introduction and co-occurrence of ceramics, agriculture, and burial mounds. It also came to be associated with other technological and social innovations such as the bow and arrow and a recognized trend towards sedentism.

In the eastern and midwestern United States, the Woodland tradition was initially segregated into *Early*, *Middle*, and *Late* divisions. As Gibbon (2012a:93) points out, these divisions were rooted, primarily, in the recognition of social and economic developments identified in the Ohio Valley and adjacent areas. However, Dobbs (1989:106), Gibbon (2012a:93), and others questioned the applicability of this traditional classification and division of the Woodland period to Minnesota. Dobbs (1989:107) noted that, except perhaps in the southeastern quarter of the state, there really is no manifestation of 'Early' Woodland in Minnesota's archeological record insofar as the traditional definition is concerned. Many of the other hallmarks of the tradition, such as horticultural developments, occurred late relative to ceramic technology, which itself developed at different times in different parts of the state (Anfinson and Wright 1990:222; Dobbs 1989:106; Gibbon 2012a:93).

To address the inconsistencies in Woodland classification between Minnesota and the lower Midwest, Dobbs (1989:106-107) chose to identify Minnesota's unique expression of the Woodland tradition as the *Ceramic/Mound Stage*. More recently, though in a similar vein, Gibbon (2012a:93) chose to reclassify Minnesota's Woodland period divisions as *Initial* and *Terminal*, rather than retaining the *Early*, *Middle*, and *Late* divisions common in the lower Midwest. In the 2008 *Statewide Multiple Property Documentation Form for the Woodland Tradition* (MPDF), Arzigian (2008) retains the use of *Woodland tradition* and its more commonly recognized *Early*, *Middle*, and *Late* divisions. For the sake of familiarity, but also in recognition of the aforementioned inconsistencies, this report follows the classification scheme and divisions laid out by Arzigian (2008) in the MPDF.

As presently understood, Minnesota's Woodland tradition spans a roughly 2,550-year-period from approximately 800 B.C.–A.D. 1750. Arzigian (2008:1) identifies 11 historic contexts that comprise this tradition in Minnesota. These contexts are: the *Brainerd complex*, the *Southeast Minnesota Early Woodland complex*, the *Havana–Related complex*, the *Laurel complex*, the *Fox Lake complex*, the *Lake Benton complex*, the *Central Minnesota Transitional Woodland complex*, the *Southeast Minnesota Late Woodland complex*, the *Blackduck-Kathio complex*, the *Rainy River Late Woodland complex*, and the *Psinomani complex*. Several of these complexes have been identified either in collections from, or in the archeological record of, the west-central Minnesota study area; others have not.

The remainder of this chapter is divided into two sections. The first section identifies and discusses those complexes with some semblance of a clear presence in the west-central Minnesota study area, with a particular focus on defining ceramic traits in greater detail. Since the Woodland occupations of the study area are so poorly understood, the first section also reviews what is known about adjacent areas in Minnesota to the northeast and southwest that have been the foci of Woodland-period field research and analysis over the past 60 years.

The final section briefly discusses specific previous Woodland-period research in the study area. Site distribution patterns are explored and a preliminary site locational probability model, generated via MN/Model, is presented. Based on the findings from previous work, a select number of research questions are generated and presented for the purpose of focusing the investigation efforts of the current project.

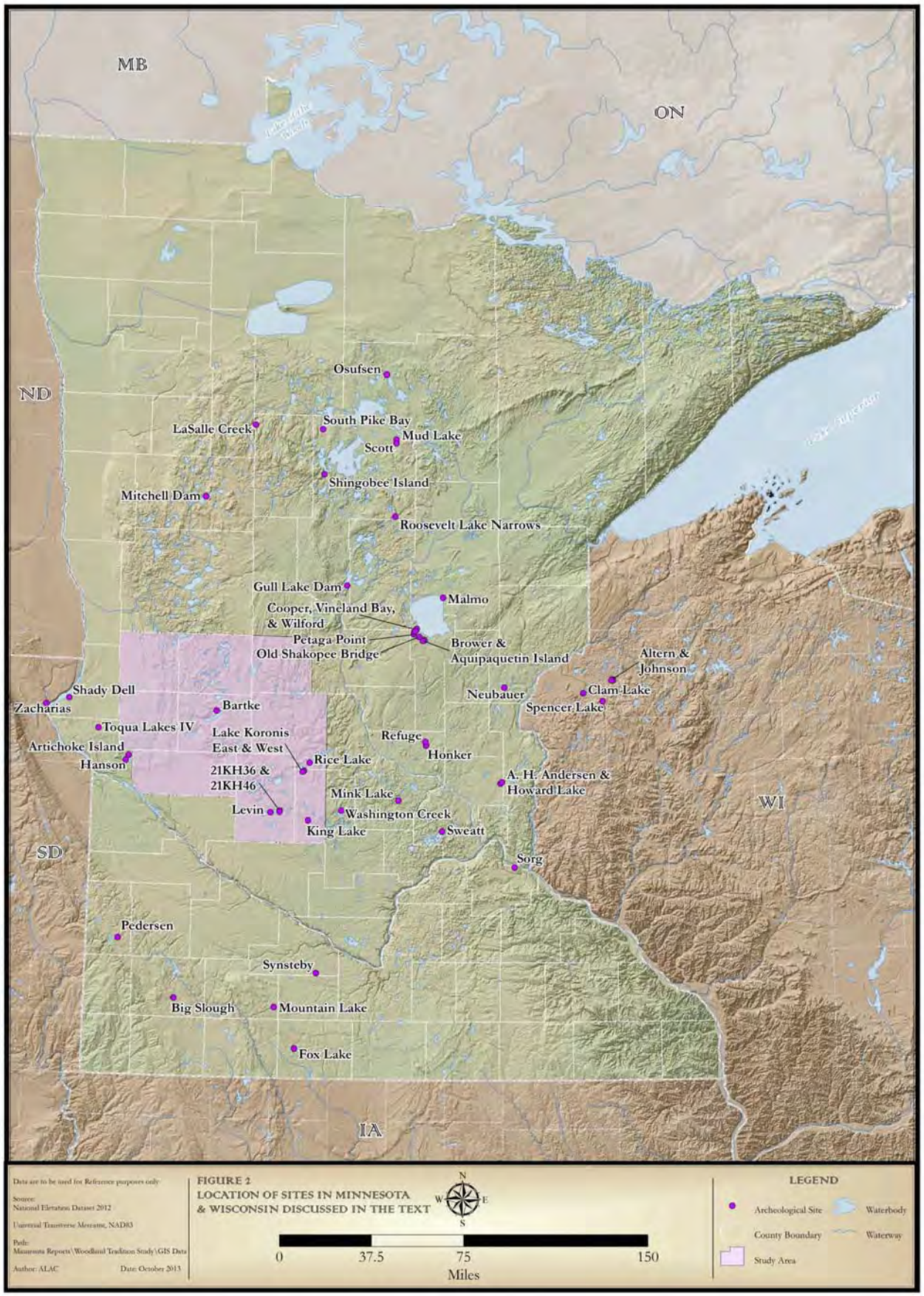
WOODLAND CULTURAL SEQUENCE

The basic Woodland tradition temporal sequence in Minnesota has been summarized by Anfinson (1979a), Arzigian (2008), and Gibbon (2012a). Anfinson (1997:47-88), Mather (1991, 2000), and Thomas (2000) deal with local and regional developments which are particularly relevant in our understanding of Woodland manifestations in west-central Minnesota. In a review of the culture-history immediately to the east of the study area, C. Johnson (1994) discusses a number of sites in central and east-central Minnesota, including several in Kandiyohi and Meeker counties. More recently, an archeological survey of Swift County (Holley et al. 2011) and a review of village cultures in southern Minnesota (Holley and Michlovic 2013) have added to our understanding of the Woodland tradition in the west-central part of the state. Specific sites discussed below are depicted in Figure 2.

Despite these efforts, a number of important excavated sites containing Woodland components remain to be fully reported. This includes sites in the Lake Mille Lacs locality such as Cooper Village (21ML9/16), Vineland Bay (21ML7), Wilford (21ML12), and Petaga Point (21ML11), although a report focusing on the Archaic component at Petaga Point has been written (Bleed 1969). Also, a number of key sites in southwestern Minnesota have been the focus of research (Pedersen-21LN2, Fox Lake-21MR2, Mountain Lake-21CO1) but, like the others, lack full excavation reports. Notwithstanding these shortcomings, research over the years on these and other sites has established a basic Woodland cultural sequence that can be used to frame the occupations in west-central Minnesota, an area that has received little attention in the past. Before this research is reviewed, a Woodland chronology is constructed that outlines those taxonomic units or ceramic complexes that are present in west-central Minnesota (Table 2). These units are briefly summarized in order to provide background information on the ceramics found at sites 21KH36, 21KH46, 21KH93 and others to be discussed later in the Ceramic Analysis chapter.

Table 2. Woodland Taxonomic Units Applicable to West-Central Minnesota.

Taxonomic Unit/Pottery Type	Date Range	Region Defined	Type/Important Sites
Late Woodland			
Kathio (Vineland/Wahkon phases)	A.D. 600/900–1300	Eastern Minnesota	21ML2, 21ML7, 21ML11
Lake Benton	A.D. 700–1200	Southwestern Minnesota	21CO1, 21LN2, 21MR2
Onamia (Vineland phase)	A.D. 800–1000	Eastern Minnesota	21ML2, 21ML7, 21ML11
Southeastern MN Late Woodland/ Clam River/Cordage Horizon	A.D. 500–1150 A.D. 650–800	Southern Minnesota, Northern Iowa, Western Wisconsin	21DK1, 21DK6, 21PN7, 47BT1, 47BT2
Middle to Late Woodland			
St. Croix (Isle phase)	A.D. 300/500–800	Eastern Minnesota	21ML11, 21PN7, 21ML2, 21ML9/16, 21CA37
Middle Woodland			
Fox Lake	200 B.C.–A.D. 700	Southwestern Minnesota	21CO1, 21LN2, 21MR2
Eastern MN Middle Woodland/Havanoid	200 B.C.–A.D. 300	Eastern Minnesota	21AN1, 21AN8, 21AK1, 21CA37, 21ML1, 21PN8
Early Woodland			
Brainerd	800 B.C.–A.D. 250	Northern Minnesota	21CA28, 21CA37 21CA184, 21HB26


MB
ON
ND
SD
WI
IA
Osufsen
LaSalle Creek
South Pike Bay
Mud Lake
Scott
Shingobee Island
Mitchell Dam
Roosevelt Lake Narrows
Gull Lake Dam
Malmo
Cooper, Vineland Bay, & Wilford
Petaga Point
Old Shakopee Bridge
Brower & Aquipaquetin Island
Altern & Johnson
Clam Lake
Neubauer
Spencer Lake
Shady Dell
Zacharias
Bartke
Toqua Lakes IV
Lake Koronis East & West
Refuge
Honker
Artichoke Island
Hanson
Rice Lake
21KH36 & 21KH46
A. H. Andersen & Howard Lake
Mink Lake
Levin
Washington Creek
King Lake
Sweatt
Sorg
Pedersen
Synsteby
Big Slough
Mountain Lake
Fox Lake
Data are to be used for Reference purposes only
Source: National Elevation Dataset 2012
Universal Transverse Mercator, NAD83
Path: Minnesota Reports\Woodland Tradition Study\GIS Data
Author: ALAC
Date: October 2013
FIGURE 2
LOCATION OF SITES IN MINNESOTA & WISCONSIN DISCUSSED IN THE TEXT
N
W
E
S
0
37.5
75
150
Miles
LEGEND
Archeological Site
Waterbody
County Boundary
Waterway
Study Area

Each of these taxonomic units is defined on the basis of distinctive ceramic types. The Middle Woodland occupations in southwestern (Fox Lake) and eastern Minnesota (Havana-related) are perhaps the easiest to identify based on their ceramic assemblages. During the Late Middle to Late periods, beginning with the appearance of St. Croix pottery through the disappearance of Kathio ceramics, identifying many types becomes problematic due to extensive overlap in the attributes or difficult-to-distinguish attributes used in their definition.

The significant overlap of many of these late types has been noted by George (1979a:68, 1979b:169-170) and Ready and Anfinson (1979a:103-105, 1979b:149-150). In the past, identifying types during the Late Middle to Late Woodland was largely based on location (see Ready and Anfinson 1979a:103). Sites in southwestern Minnesota contain Lake Benton pottery while those in central and eastern Minnesota often have a mix of St. Croix, Clam River, Onamia, and Kathio types. Even Lake Benton pottery can be difficult to distinguish from some Onamia, Kathio, and Clam River types (Anfinson 1979b:110), particularly when it comes from sites located between the two core areas in the southwestern and eastern parts of the state. This issue will be addressed later, but suffice it to say that given the overall appearance, complexity and variety of the ceramic decorations from 21KH36 and 21KH93, types decorated with cordwrapped object impressions (CWOI) from the study area were placed into Kathio and Onamia types as opposed to their Lake Benton counterparts. The following discussion of the pottery types from the units in Table 2 focuses on defining attributes, geographic distributions, stratigraphic or temporal relationships, and attribute-overlap between them.

Brainerd

Brainerd Ware, now the defining characteristic of the Elk Lake culture or complex (Hohman-Caine and Goltz 1995; Hohman-Caine and Syms 2012), is the earliest pottery in northern Minnesota—placing it earlier than Laurel, which it was previously thought to be contemporaneous with (Lugenbeal 1978). Brainerd Ware has traditionally been subdivided into Brainerd Net Impressed and Brainerd Horizontally Corded (Birk 1979). Recent research by Hohman-Caine and Syms (2012:77) replaces Brainerd Horizontally Corded with LaSalle Creek Ware and adds Truman Ware, which encompasses ceramics with parallel-grooved exterior surfaces.

The core distribution of Brainerd Ware is in the north-central portion of the state, with some identified from central Minnesota in Stearns, Wright, Big Stone, and Traverse counties (Figure 3; see also Arzigian 2008:Figure 3; Birk 1979; Hohman-Caine and Syms 2012:Figure 14). Brainerd Ware was first defined at Gull Lake Dam (21CA37) and found at other important sites such as Shingobee Island (21CA28), South Pike Bay (21CA38), Roosevelt Lake Narrows (21CA184), and LaSalle Creek (21HB26). Brainerd Ware is also present in the collections from 21KH36, 21KH46, and 21KH93, the sites chosen for testing during the current study.

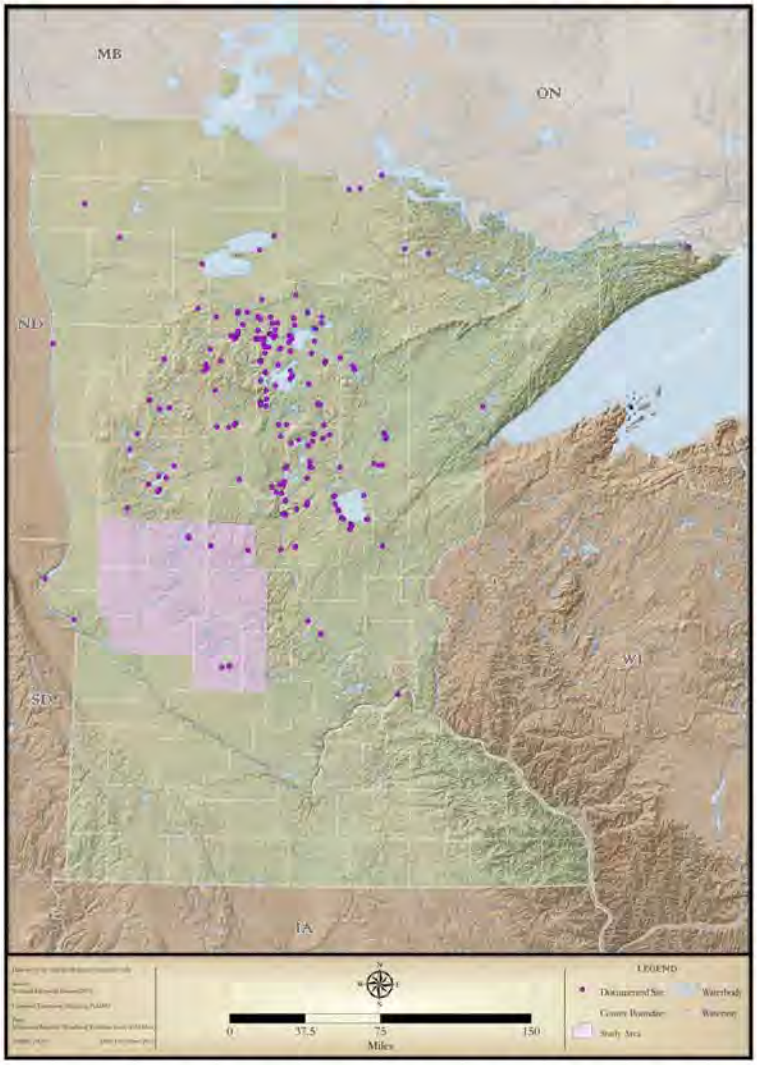


Figure 3. Distribution of Brainerd Woodland sites (after Arzigian 2008:Figure 3; based on MNSHPO data from fall, 2013).

Havana-Related

After the small Brainerd Ware presence, the Havana-related and Fox Lake complexes are the earliest Woodland manifestations in west-central Minnesota. The Havana-related or Havanoid complex is found in sites located in central and eastern Minnesota, including the Malmo (21AK1) (Hume 1962), Howard Lake (21AN1) (Wilford 1955), A. H. Andersen (21AN8) (Flaskerd 1943; Wilford 1937:19-37), Brower (21ML1) (Gibbon 1975), Honker (21SH15), Refuge (21SH18) (C. Johnson 1994:Table 3.1), Gull Lake Dam (39CA37) (E. Johnson 1971), Sweatt (21HE353) (Terrell 2010), and Sorg (21DK1) (E. Johnson 1959) sites. This pottery type is present at all three sites to be tested during the current study: 21KH36, 21KH46, and 21KH93.

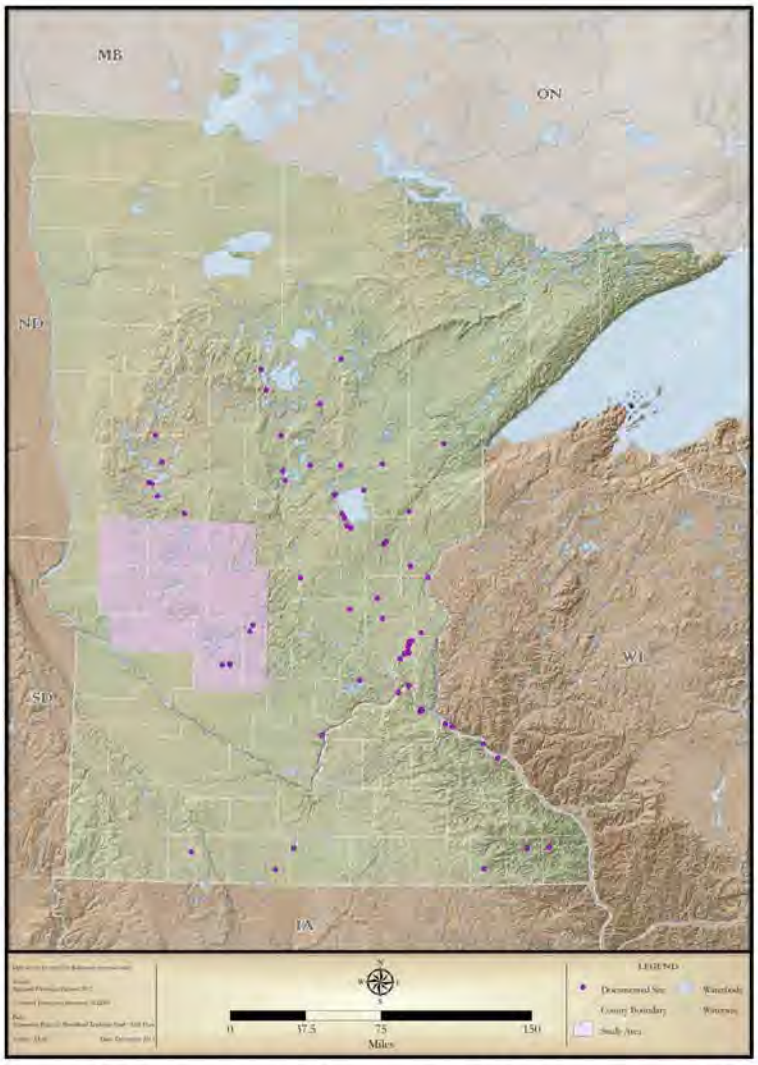


Figure 4. Distribution of Havana-related Woodland sites (after Arzigian 2008:Figure 6; based on MNSHPO data from fall, 2013).

Pottery from these and other sites is placed within a number of types, including the Malmo/Kern Series (Hohman-Caine 1979), Pokegama Smooth (George 1979c), Snake River Incised (George 1979d), Sorg (Anfinson 1979c), Vach Trailed (George 1979e), and unnamed types associated with the Howard Lake phase (Anfinson 1979d). All distribution maps of these types (Figure 4), including Gibbon (2012b) and Gibbon and Hohman-Caine (1980:Figure 2), place them well to the northeast, east, or southeast of Kandiyohi County. Gibbon (2012b) identifies Malmo from several nearby counties to the northwest and Arzigian (2008:Figure 6) extends its distribution to additional adjacent counties. These types are relatively thick (6-12 mm) grit-tempered vessels with smooth surfaces, lacking defined necks, and are either undecorated or decorated with a series of vertical/diagonal incisions near the rim, sometimes with punctates; trailed lines in parallel rows or chevrons occasionally with punctuates; incised lines, slashes, and/or punctates or bosses; broad dentate stamping sometimes set off by trailed lines and accompanied by bosses and/or punctates; and occasionally broad cordwrapped object impressions in zones or herringbone patterns.

Fox Lake

Fox Lake pottery has been identified from the study area and at a number of sites located in southwestern Minnesota, including Mountain Lake (21CO1) (Bonney 1965), Pedersen (21LN2) (Hudak 1974, 1976, 1978), and Fox Lake (21MR2) (Anfinson 1997:47-51) (Figure 5). Anfinson's (1979e:Figure 36) distribution map runs along the southern border of Kandiyohi County, and he stated that a large surface collection from the Levin site contained no Fox Lake Trailed sherds (Anfinson 1997:65). Fox Lake Incised has been identified by Hohman-Caine (1974:61) at the Vach sites in east-central Minnesota, and by Arzigian (2008:Figure 10) in southwestern Minnesota and a scatter in the central part of the state, while Gibbon (2012b) extends its range to central and northern Minnesota. Thomas (2000:14.6) suggests that Fox Lake may be present in small quantities in the Mille Lacs area. It was found at 21KH36 and 21KH93.

Anfinson (1997:59-66) has defined five Fox Lake types based on decoration or surface treatment on undecorated pottery: Fox Lake Trailed, Fox Lake Vertical Cordmarked, Fox Lake Horizontal Cordmarked, Fox Lake Smooth, and Fox Lake Cordwrapped Stick. Fox Lake pottery is relatively thick, ranging from 6-12 mm and averaging about 10 mm, and is tempered with sand or sand and grit. Several temporal trends are proposed (Anfinson 1997:65), including thinning with time, somewhat more exterior smoothing, increase in horizontal cordmarking, more complex incised patterns made with thinner lines, and less bossing and more punctates later in time.

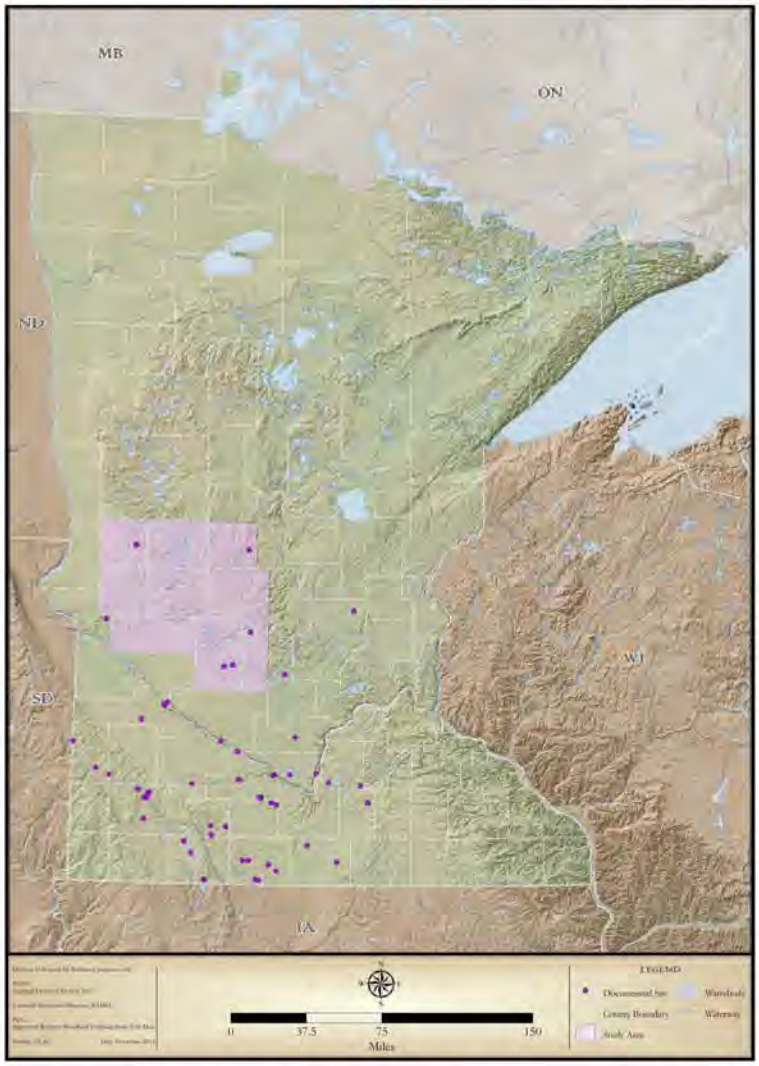


Figure 5. Distribution of Fox Lake Woodland sites (after Arzigian 2008:Figure 10; based on MNSHPO data from fall, 2013).

St. Croix

St. Croix Stamped series pottery is a widespread and pervasive potting tradition covering a broad band stretching across central Minnesota and extending up into the Red River valley (Figure 6; see also Arzigian 2008:Figure 13; George 1979b:Figure 77; Gibbon and Hohman-Caine 1980:Figure 2). Recently, Gibbon (2012b) extended its northwestern border to the second tier of counties in Minnesota south of the Canadian border. The southern border of both of these distribution maps runs along the north edge of Kandiyohi County. It is closely associated with the Arvilla complex although not a character-defined feature (E. Johnson 1973).

St. Croix pottery consists of a Dentate Stamp variety and a Comb Stamp variety with decoration present in a wide variety of linear and geometric patterns on rim exteriors, most of which involve the use of horizontal lines of stamping combined with diagonal elements; punctates and bosses are occasionally added. Other vessel areas can be decorated. A third type, Cord Stamped, has been proposed but not formally defined (Gibbon 2012b). Hohman-Caine (1983:174-188) defined four types (A-D) and various subtypes based on exterior rim decoration motif, lip decoration, and other attributes. Vessel thickness ranges from 4-5 mm.

A number of authors have noted an overlap in decoration between the St. Croix types and Onamia Dentate (George 1979b:169-170; Ready and Anfinson 1979b:149), a type that is thought to appear after St. Croix. Significantly, St. Croix pottery has been found at a few sites (Neubauer-21PN7, Altern and Johnson sites in Wisconsin) to be stratigraphically lower than Late Woodland types such as Clam River (Cooper 1964; Hohman-Caine 1966:97, 100-101). Clear stratigraphic changes occur at Neubauer over a depth of only 1.5 feet (Hohman-Caine 1966:100). In addition, St. Croix has been found in probable association with Brainerd Ware at the Gull Lake site (21CA27), although there were no clear stratigraphic changes in Malmo-Kern, Brainerd, St. Croix, Kathio, and other types of ceramics (E. Johnson 1971:55, 61). This places St. Croix pottery in a Late Middle or Early Late Woodland time period, after Havana-related occupations but before Late Woodland Clam River-Kathio-Onamia developments.

Cord Impressed Horizon

Transitional Middle to Late and Late Woodland pottery decorated with cord impressions is associated with the Southeast Minnesota Woodland complex, along with other types of pottery embellished with cordwrapped object impressions or punctates (Figure 7; Arzigian 2008:95-96). Cord impressed pottery is also a component type of Clam River Ware from east-central Minnesota and northwestern Wisconsin (George 1979a), is present in the Effigy Mound complex (Anfinson 1979f:74; Hurley 1974; Logan 1976:101-103), and is the hallmark of the widespread Cordage Horizon distributed over the upper Midwest (Benn and Green 2000:453-466).

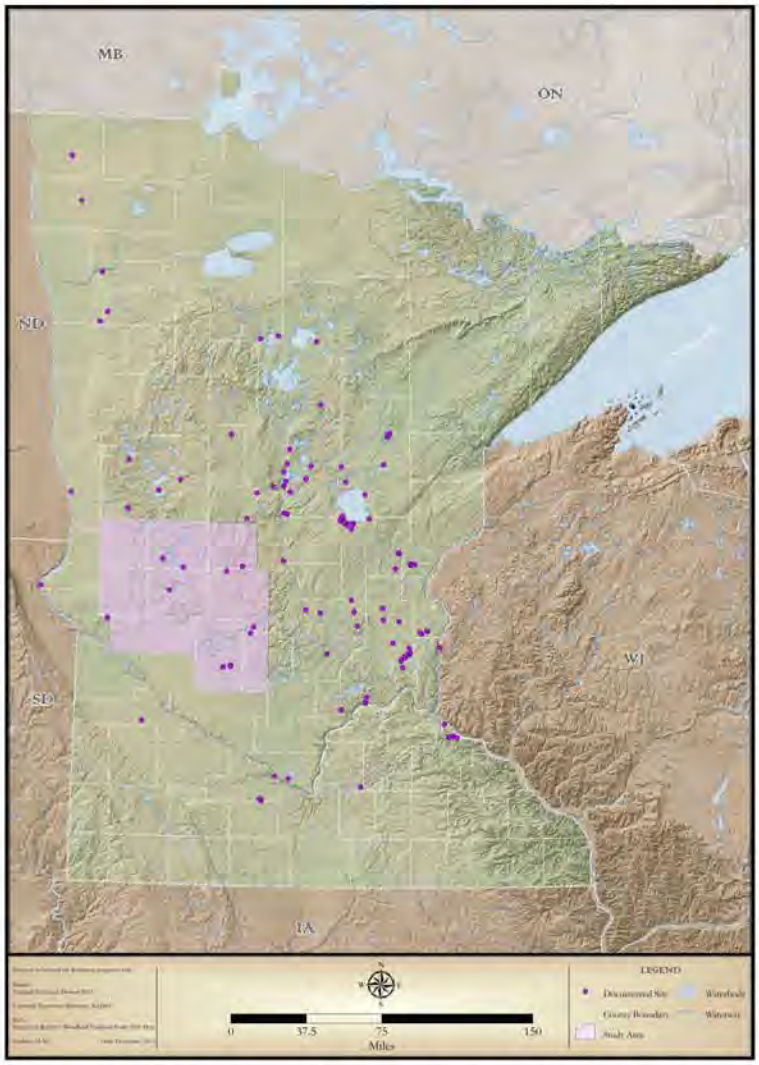


Figure 6. Distribution of Woodland sites with St. Croix and Onamia ceramics (after Arzigian 2008:Figure 13; based on MNSHPO data from fall, 2013).

Cord impressions occur in three phases in Wisconsin beginning with the transitional Middle to Late Woodland Mills phase (Lane Farm Cord Impressed) and terminating with the Lewis and Eastman phases (Madison Cord Impressed) (Arzigian 2008:96). Small amounts are found in the Prairie Lake region (Anfinson 1997:79-80, 87; Holley and Michlovic 2013:Figures 4.8, 4.14, 4.15, 5.1, 5.2, 5.10, 5.14, 5.15 and Tables 4.2, 4.3, 5.1, 5.2), in west-central Minnesota (Holley et al. 2011:Figures 3.16–3.17; Holley and Michlovic 2013:Figures 6.8 and 7.1 and Tables 6.2–6.5; Holley 2011:Figure 12), and in counties bordering the Mississippi River in southeast Minnesota (Gibbon 2012b). Arzigian (2008:Figure 15) places the northern limit of this pottery in Minnesota from Sherburne to Kandiyohi, Douglas, and Traverse counties (see Figure 7, below). This distinctive pottery is also associated with and overlaps the longer-lived and more widely distributed cordwrapped object impressed potting tradition falling under the Kathio ceramic series (Hohman-Caine 1974:61; Ready and Anfinson 1979a:103-104) and to a lesser extent Onamia and Blackduck pottery. In Minnesota, cord impressed pottery is one of the least studied and defined types, being relegated to brief discussions of ceramics from east-central Minnesota (George 1979a; Hohman-Caine 1966) in spite of its presence over a larger area (Arzigian 2008:93). Clam River is one of three groups that constitute the Blackduck-Kathio-Clam River ceramic continuum, being restricted in its distribution by Gibbon (2012b) to four counties in east-central Minnesota and others in northwestern Wisconsin.

Onamia

Onamia pottery, the defining type of the Vineland phase of the Lake Mille Lacs locality, consists of three types or varieties: Dentate Stamped, Comb Stamped (Hohman-Caine 1969) and Cordwrapped Stick Impressed (Ready and Anfinson 1979b). Hohman-Caine (1983:174-189) later defined three types based on decoration motif and technique, surface treatment, and area of decoration. It is distributed over central and southwestern Minnesota (see Figure 6, above) and grades into Lake Benton Cordwrapped Stick Impressed (Hudak 1976:3), which is common in southwestern Minnesota. Gibbon (2012b) has the broadest distribution of Onamia, extending it from the north-central to southern parts of the state.

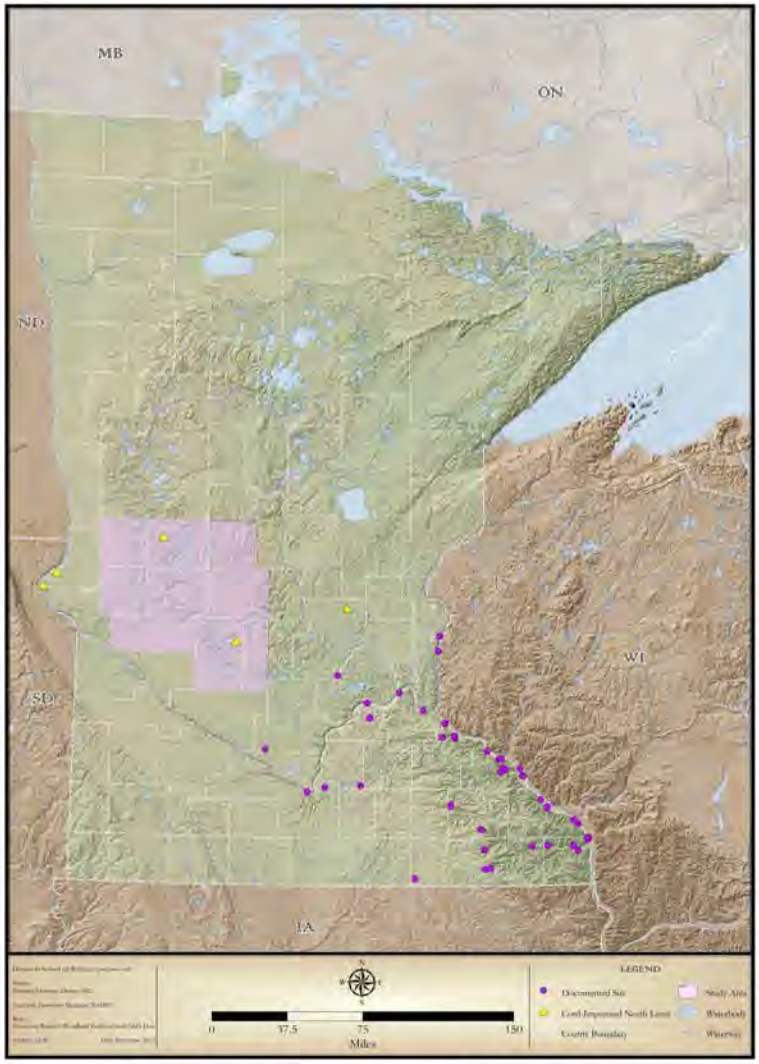


Figure 7. Distribution of Southeastern Minnesota Late Woodland sites and the northern limits of cord-impressed ceramics (after Arzigian 2008:Figure 15; based on MNSHPO data from fall, 2013).

Ready and Anfinson (1979b:150) point out the differences between Onamia and Lake Benton, although none are decorative-based. The relationship between the two is briefly noted by Benn and Green (2000:465) and discussed at greater length by Anfinson (1997:77) and Hohman-Caine (1983:214). Anfinson argues that Lake Benton has finer cordwrapped impressions, more use of punctates, and vertical cord marking on the vessel body. On the other hand, there has been somewhat more attention paid to the similarities and differences between the dentate and cordwrapped object impressed types assigned to Onamia and St. Croix (George 1979b:170; Ready and Anfinson 1979b:149-150). In these discussions, Onamia is distinguished from St. Croix by having heavier decorations in both types (see also Hohman-Caine 1974:61), although these observations are impressionistic with no supporting quantitative data. A few years later, Hohman-Caine (1983:173-174) concluded that there was no consistent difference between the two along this dimension. Anfinson (1997:88) acknowledges the presence of St. Croix-Onamia ceramics immediately outside of the northeast border of the Prairie Lake region, noting that they probably appeared early in the Lake Benton phase.

Lake Benton

Lake Benton pottery is the hallmark of the Late Woodland in southwestern Minnesota and adjacent areas of South Dakota and Iowa in the Prairie Lake region (Anfinson 1997:75-80; Benn and Green 2000:463, 465). Anfinson's (1979b:Figure 49) distribution map confines it to south of the Minnesota River, although subsequently, he (1997:Figure 36), Arzigian (2008:Figure 12), Holley et al. (2011:126-127), and Gibbon (2012b) extend its range somewhat further to the north (Figure 8). Four types have been defined, including Lake Benton Cordwrapped Stick, Lake Benton Vertical Cordmarked, Lake Benton Plain, and Lake Benton Dentate, a relatively rare type. Similarities

and differences between Lake Benton and Onamia are noted above. Anfinson (1979b:110) discusses the presence of Onamia-like ceramics in southwestern Minnesota, stating that Lake Benton Cordwrapped Stick pottery appears to be a composite of Fox Lake, Onamia, and Kathio/Clam River. Lake Benton pottery represents a change from the early Fox Lake potting tradition, with a switch from sand to grit tempering, thinning of vessels walls, more subconoidal overall vessel shape, the disappearance of trailing and embossing, and the prevalence of cordwrapped stick impressions on the exterior rims made with larger sticks impressed less deeply (Anfinson 1997:77, 88). A fifth provisional type, Lake Benton Horizontal Cordmarked, is added in this study to account for those rimsherds that exhibit all of the characteristics of the other types except that they are horizontal or diagonal cordmarked on the exterior rim. Except for the occasional widely spaced punctates in a horizontal row around the vessel and tool impressed lips, this type lacks any decoration.

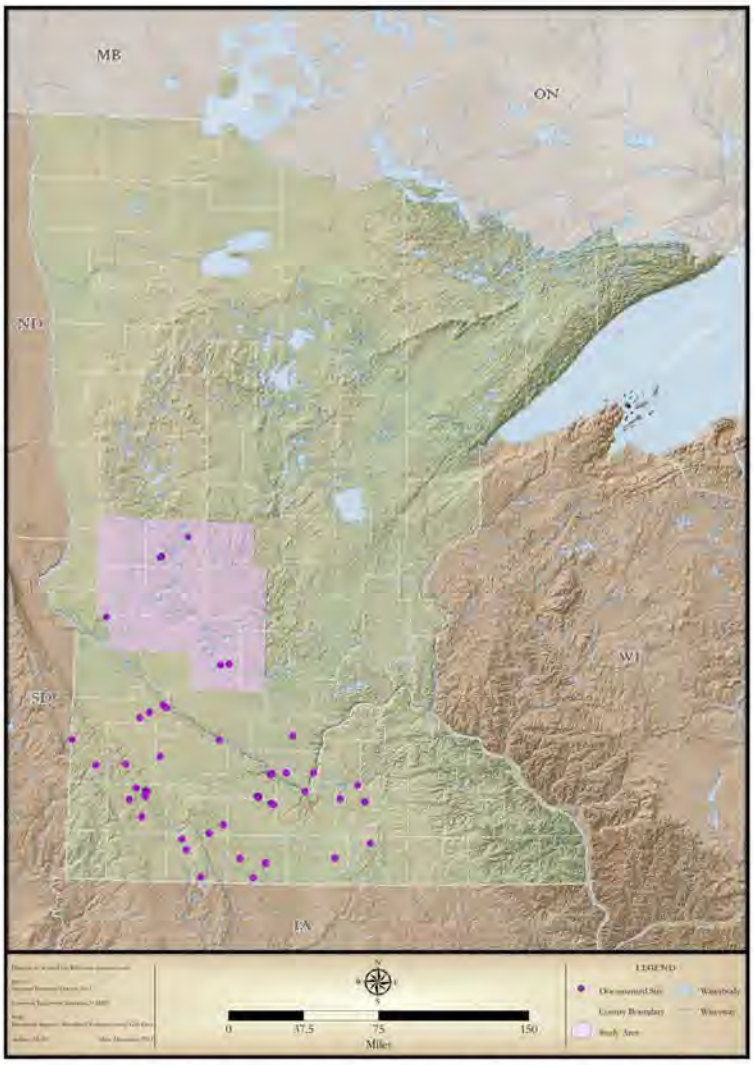


Figure 8. Distribution of Lake Benton Woodland sites (after Arzigian 2008:Figure 12; based on MNSHPO data from fall, 2013).

Kathio

There is some disagreement about the geographic distribution of Kathio ceramics. Ready and Anfinson (1979a:Figure 47) confine it to central Minnesota while Gibbon and Hohman-Caine (1980:Figure 3) extend it to the northeast and southwest, doubling its size. Most recently, Gibbon (2012b) broadens the area to include a number of sites in a wide band extending from a core in east-central to northwestern Minnesota. Defined from the Petaga Point site by Elden Johnson (Bleed 1969:26), Kathio pottery has not been subdivided into types. Decoration is limited to cordwrapped object impressions arranged in horizontal bands around the rim, commonly bound by short oblique or vertical impressions immediately below the lip. Similar decoration can be applied to the lip or interior rim either alone or in combination with other rim areas.

Although it has not been subdivided into types, it has been difficult to differentiate Kathio pottery from a number of other closely related contemporaneous types that overlap it in appearance and geographic distribution. These include Blackduck to the north, Clam River to the east, and Onamia and Lake Benton to the southwest. A number of archeologists have discussed the similarities in these ceramic groups, including Hohman-Caine (1974), George (1979a), and Ready and Anfinson (1979a, 1979b). The similarities between some of these types led Ready and Anfinson (1979a:103-104) to conclude that a case could be made against continuing to have three types (Kathio, Blackduck, Clam River) for short-rimmed fine-cordwrapped stick decorated central Minnesota Late Woodland ceramics. As a consequence, Anfinson (2006) has proposed a Blackduck-Kathio complex to include Early Blackduck, Kathio, and Clam River ceramics (Figure 9; also see Arzigian 2008:109-110). Gibbon (2012b) and Hohman-Caine (2009) also refer to the Blackduck-Kathio-Clam River continuum as a way of accentuating the blending of these three types.

BACKGROUND RESEARCH

Previous Investigations

Little in the way of archeological research (into the Woodland period or otherwise) has been undertaken to-date in west-central Minnesota. Douglas, Swift, and Kandiyohi counties have been the subject of previous county-wide archeological investigations; however, only the Swift County survey has been published (Holley et al. 2011), and it is also the only one to feature an in-depth analysis of ceramics from the region.

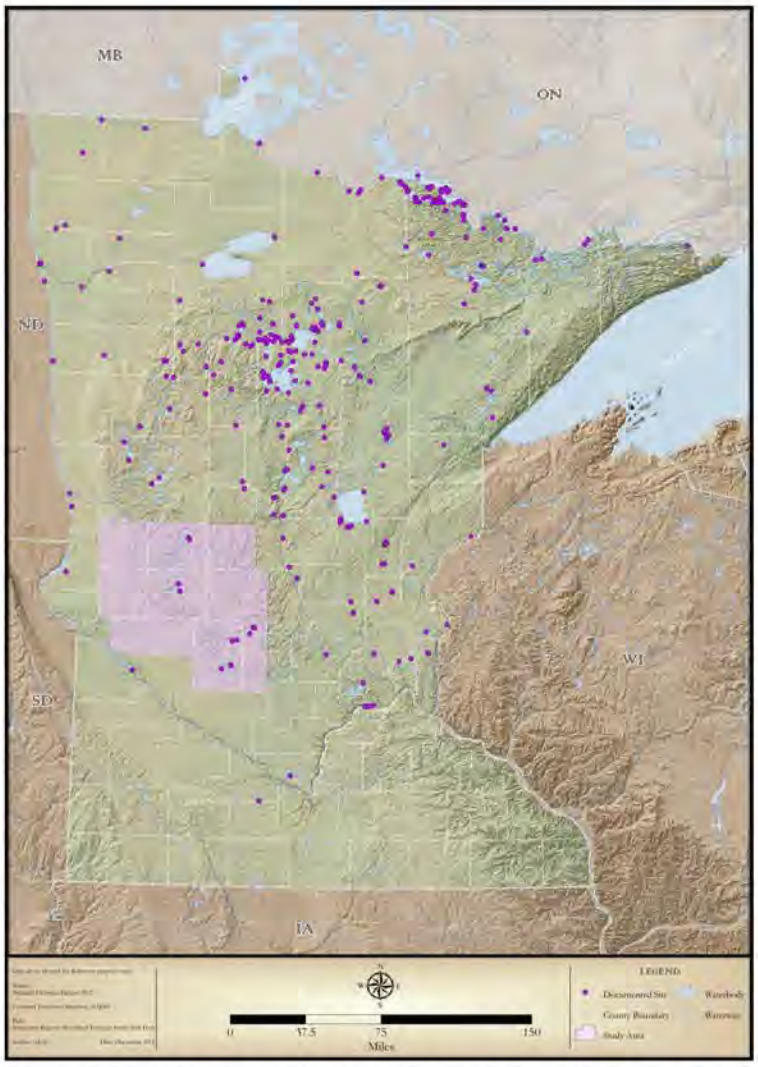
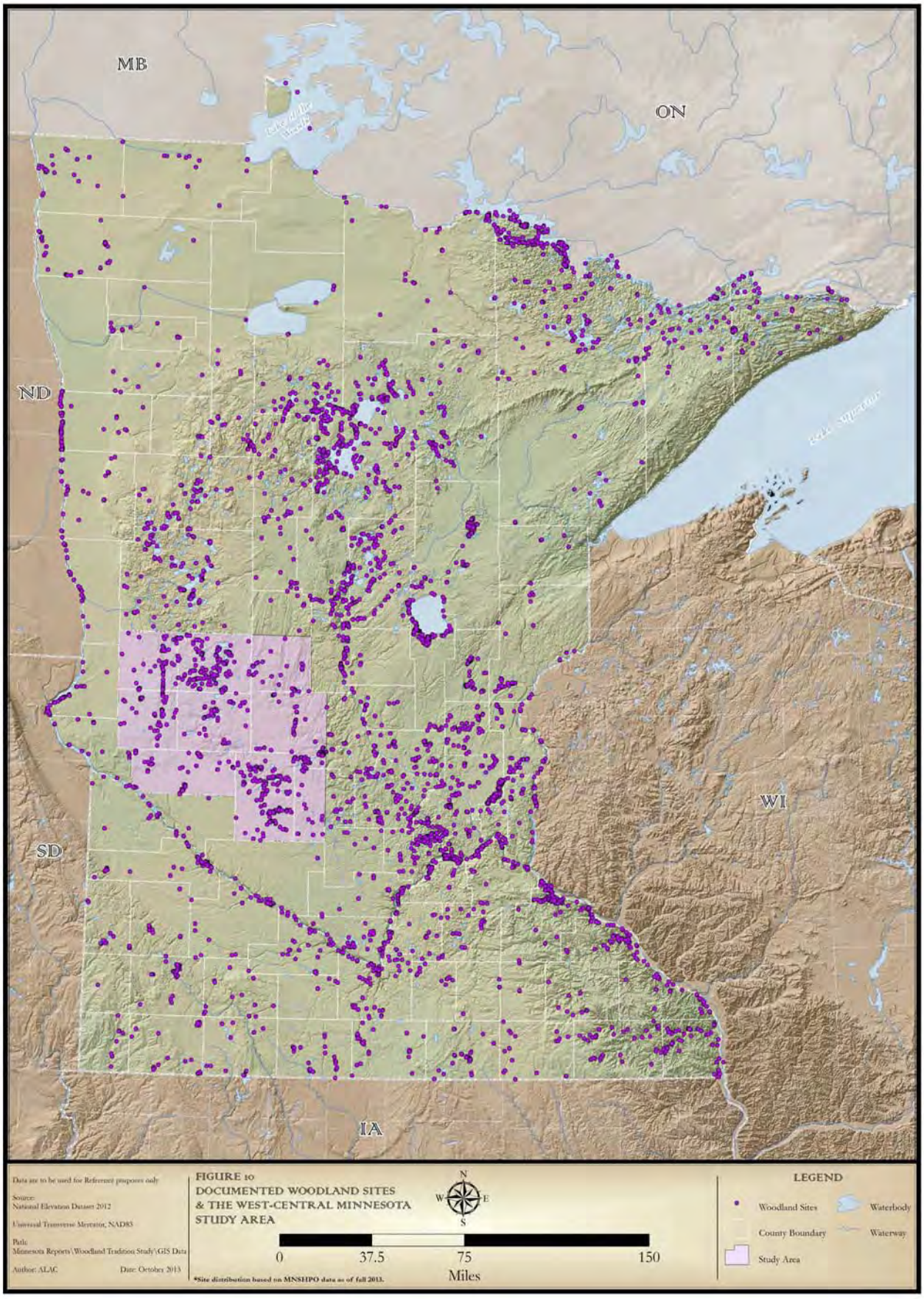


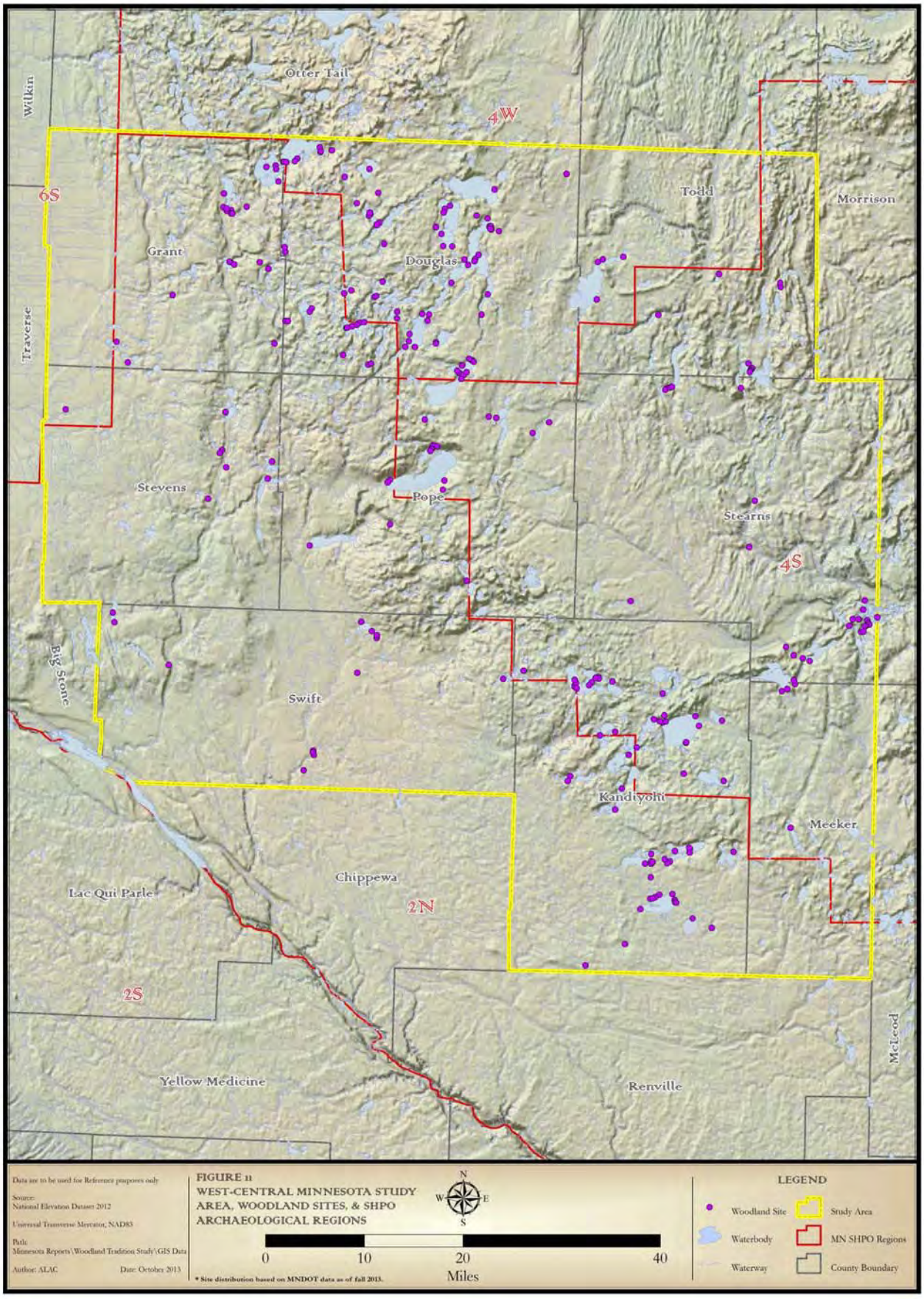
Figure 9. Distribution of Blackduck-Kathio Woodland sites (after Arzigian 2008:Figure 16; based on MNSHPO data from fall, 2013).

Although Minnesota SHPO records reflect a total of 4,266 sites with Woodland components as of the fall of 2013 (Figure 10),[1] less than 6 percent of these (n=253) are located in the study area (Figure 11). Of the 253 sites in the study area, 25 (or less than 10 percent) contained ceramics sufficient for identification to a more specific historic context. SHPO and MN/Model GIS data indicate that components related to seven of the 11 Woodland complexes identified by Arzigian (2008) are present in the study area. Based on this data, Woodland contexts with a presence in west-central Minnesota include: Brainerd (n=7); Havana-related (n=5); Fox Lake (n=6); Lake Benton (n=6); Central Minnesota Transitional Woodland—as recognized through the presence of both St. Croix and Onamia ceramics (n=10); Blackduck-Kathio (n=12); and Psinomani—as recognized through the presence of Sandy Lake ceramics (n=7). The totals are greater than the previously noted 25 sites because several of the sites are multi-component. Contexts that have yet to be identified in the region include Laurel, Rainy River Late Woodland, Southeast Minnesota Early Woodland, and Southeast Minnesota Late Woodland.

According to the project RFP, very few sites in the study area region have been the subject of intensive excavations, and those sites that have received attention all lie near the region's periphery. No major habitation site excavations have been previously conducted in Swift, Pope, Kandiyohi, southern Todd, western Stearns, or western Meeker counties. To-date, the only two habitation sites with Woodland components that have been intensively excavated in the study area are the Lake Carlos State Park Beach site (21DL2), located north of Alexandria (Gonsior 2006; Gonsior et al. 1999), and the Christina-Pelican site (21DL46/21GR41) on the south shore of Lake Christina on the Grant/Douglas County border (Mulholland et al. 2011; Rothaus and Aymond 2009). In 2007, limited test excavations were also carried out at site 21KH46 in Kandiyohi County (Tumberg et al. 2009). Although this testing did not approach the scale of the aforementioned projects, Woodland-period ceramics were recovered from potentially stratified deposits (though detailed analyses of the pottery have yet to be undertaken to confirm this); based on these findings the site was nominated for inclusion in the National Register of Historic Places (NRHP) (Muñiz et al. 2012).

[1] A number of sites in the SHPO database have no associated UTM information and these were not, therefore, mapped in Figure 10.


MB
ON
ND
SD
WI
IA
Data are to be used for Reference purposes only
Source:
National Elevation Dataset 2012
Universal Transverse Mercator, NAD83
Path:
Minnesota Reports\Woodland Tradition Study\GIS Data
Author: ALAC
Date: October 2013
FIGURE 10
DOCUMENTED WOODLAND SITES
& THE WEST-CENTRAL MINNESOTA
STUDY AREA
N
W
E
S
0
37.5
75
150
Miles
*Site distribution based on MNSHPO data as of fall 2013.
LEGEND
Woodland Sites
County Boundary
Study Area
Waterbody
Waterway


Otter Tail
Wilkin
4W
6S
Todd
Morrison
Grant
Douglas
Traverse
Stevens
Pope
Stearns
4S
Big Stone
Swift
Kandiyohi
Meeker
Chippewa
Lac Qui Parle
2N
2S
McLeod
Yellow Medicine
Renville
Data are to be used for Reference purposes only
Source:
National Elevation Dataset 2012
Universal Transverse Mercator, NAD83
Path:
Minnesota Reports\Woodland Tradition Study\GIS Data
Author: ALAC
Date: October 2013
FIGURE 11
WEST-CENTRAL MINNESOTA STUDY AREA, WOODLAND SITES, & SHPO ARCHAEOLOGICAL REGIONS
N
W
E
S
0
10
20
40
Miles
* Site distribution based on MNDOT data as of fall 2013.
LEGEND
Woodland Site
Waterbody
Waterway
Study Area
MN SHPO Regions
County Boundary

If future analysis of ceramic specimens from previous testing at 21KH46 affirms that stratified cultural horizons exist, it would elevate the importance of this Woodland locality. The spatial/temporal relationship of Woodland cultural periods continues to elude investigators due to the lack of comparable datasets, a condition frequently compounded by the heavily disturbed subsurface nature of the sites investigated. Compounding this issue is the low number of excavated Woodland sites in the region and the resultant lack of absolute dates from identified sites. The RFP states that only two Woodland-period AMS dates have been obtained from west-central Minnesota; both are carbon residue dates from ceramic sherds recovered from site 21DL2. The dates, both of which derive from vessel fragments identified as Brainerd Ware, are: "...1880 ± 50 B.P. (Beta 104090; residue from ceramic sherd; $\sigma^{13}C$ = -21.9) and 1980 ± 50 B.P. (Beta 104091; residue from ceramic sherd; $\sigma^{13}C$ = -24.8)" (Gonsior et al. 1999:37). These dates, which translate in calendar years to A.D. 70 ± 50 and 30 B.C. ± 50, respectively, are both relatively late on the timeline of dated Brainerd sites as they are presently understood (see Hohman-Caine and Syms 2012).

Research Themes and Questions

The ability to extrapolate meaningful conclusions from the limited dataset for west-central Minnesota Woodland archeology is clearly restricted. In terms of Woodland-period research themes on a statewide level, Arzigian (2008:12-18) succinctly defines those issues most deserving of attention. Heading the list are chronology, ceramic typology, and site distribution. While a far greater investment of time and resources will be needed to adequately address these topics than is presently feasible, they provide a framework within which the efforts of the current study can be examined. Questions associated with each research topic, as viewed through the prism of west-central Minnesota Woodland studies, are briefly addressed below. Additional avenues of research are discussed by Johnson in Chapter 5, this report.

1) **Will excavations at sites 21KH36, 21KH46, or 21KH93 result in the discovery of settlement features or diagnostic ceramics suitable for dating, and how will these dates fit into the chronological make-up of Woodland contexts in west-central Minnesota and beyond?** Of the four sites in the study area that were recommended as potential targets for excavation in the RFP, it was felt that sites 21KH36 and 21KH93 had the best chance of retaining intact, datable features and/or ceramics. Further investigation into other nearby sites revealed 21KH46 as another candidate with good potential. Professional excavations had not been carried out at 21KH36 or 21KH93 prior to this study and previous excavations at 21KH46 were limited to shovel tests, a single 1-m-x-1-m unit, and a 50-cm-x-50-cm expansion unit. The lack of previous work, coupled with the limited number of units to be excavated among the three sites during the current study, suggested a reduced probability for discovering intact, datable features at any of the target sites. However, features are not the only means of obtaining samples for absolute dating. Ceramic rims could be discovered with charred residue remains sufficient to yield AMS dates and each of the three target sites had previously yielded numerous ceramic rims. It was initially believed that, despite the well-documented issues with residue dates thus far (see for example Hohman-Caine and Syms 2012:51-56), this would be the most likely means of obtaining a viable suite of dates during the current study.

   In terms of the broader west-central Minnesota Woodland chronology, the expectation was that a variety of dates would be observed among the different contexts identified in the region. Dates for certain contexts in the study area may be late relative to sites associated with similar contexts dated elsewhere in the state, suggesting a diffusion of peoples from a more established population center outside the region. The relatively late Brainerd dates from 21DL2 may suggest such diffusion; however, confirmation of this would require the securing of additional late Brainerd dates from the region for comparison. It was also anticipated that dates related to other contexts would fall within a similar general range as those from other such sites in the state. This, in turn, could imply a number of scenarios, such as satellite camps occupied continuously or seasonally for specialized resource procurement, trade, or other purposes. Again, numerous additional dates would need to be obtained before any such patterns could be detected.

2) **How will the range of identifiable Woodland contexts be reflected in the ceramic wares examined during the current study and how does this composition compare with previously identified trends in the distribution of Woodland contexts throughout the study area?** As previously noted, west-central Minnesota contains sites with ceramic wares attributed to seven of the 11 Woodland historic contexts described by

Arzigian (2008); however, no particular context appears to dominate the region's archeological record. It was anticipated that findings from the current study, which includes the examination of ceramics from sites 21KH36, 21KH46, and 21KH93, as well as those in several public and private collections from the area, would not vary appreciably from those of previous researchers. Interestingly, however, the RFP mentions that many of the ceramics observed in collections from the area are difficult to classify under the standard ware types recognized in the state. Does this, then, suggest the possible presence of hitherto undefined wares in the region, or is it a reflection of the current state of Minnesota's Woodland-period ceramic typological classification system—which, as Arzigian (2008:13) points out, is in desperate need of reevaluation?

3) **Where do Woodland-period sites tend to be located within the study area and can trends in their distribution be utilized to predict the location of other such sites in the region?** Because this project lacks a large-scale field survey component, it is only possible to address this question by examining pre-existing datasets. This topic is significant not only in terms of cultural resource management but also for issues related to the other research topics identified. The other research themes are heavily reliant on site data and this theme explores the ability of researchers to identify the locations of additional sites from which new data can be obtained. Results of previous research in the region suggest a strong correlation between site location and proximity to fresh water (see below) because such areas offer the greatest collation of subsistence resources (e.g., potable water, forage, access to game, timber for shelter and fuel, and natural firebreaks). These previous findings could then be compared with an updated predictive model specifically generated for the west-central Minnesota study area. Although testing of the updated model was beyond the scope of the current study, it can serve as a baseline for testing by future researchers. It was anticipated that the updated model would, in many respects, mirror the findings of the previous site distribution studies.

Predicted Site Locations

No archeological site predictive studies have been previously completed specifically for the west-central Minnesota study area. However, three previous studies developed site location models for areas both within a larger, regional framework and on a smaller county-specific scale that are relevant to the current project. Each of these studies is briefly addressed here.

The first study was developed as part of the Minnesota Statewide Archaeological Survey (MnSAS). The MnSAS was conducted by the MHS (1981) from 1977–1980 and culminated in the investigation of portions of 26 counties and the development of site location predictive models for many of the state's diverse physiographic regions. Among the localities included in the MnSAS were Douglas and Kandiyohi counties in the current study area. Unfortunately, these counties were not investigated until relatively late in the project and, as a result, the respective findings were not included in the MnSAS summary report published in 1981 (MHS 1981). Due to a funding shortage at the end of the project, reports were never prepared for the work in Douglas and Kandiyohi counties. However, the study found that, collectively, prehistoric sites were most frequently located adjacent to shorelines and that, where lakes are present, sites are more likely to be located adjacent to lakes than to streams or rivers (MHS 1981:1).

The second study, by Anfinson (1990), consisted of a synthesis of known and predicted site locations as part of the SHPO's development of archaeological regions. Anfinson (1990:151-161) provides a separate summary of known and predicted site locations for each archaeological region, with a focus directed towards Woodland-period sites. In Region 2 (which encompasses a large area in the southern and western portions of the study area), base camps are predicted to be near woods adjacent to lakes or waterways. Large river valleys near woods are believed to have been the preferred site of winter camps, while temporary camps may have been on lakes or streams of any size. Resource procurement sites are believed to have been located primarily near water as well (Anfinson 1990:155). In Region 4 (which makes up most of the eastern and northern portion of the study area), main base camps are predicted to be along major lakes—specifically near inlets, outlets, and wild rice beds. Temporary camps are predicted to be anywhere near water, and resource procurement sites may be in any number of different localities. Mounds are predicted to be on higher ground, such as terraces or uplands, and near base camps (Anfinson 1990:157). For Region 6 (in the extreme northwesternmost corner of the study area), it is predicted that base camps should be located along major waterways near ample supplies of timber. Temporary camps should also be located along waterways. Burial mounds and lithic procurement sites are predicted to be located along beach ridges, as these areas represent the only prominent

topography in the region while also representing the only readily available source of lithics. Subsistence sites are likely to occur anywhere within the region (Anfinson 1990:159).

The most comprehensive site predictive study to be undertaken in Minnesota to-date is the MN/Model (Hudak et al. 2002). MN/Model is a GIS-based statewide predictive locational model for prehistoric archeological sites. It utilizes a suite of statistical models to map archeological site potential for surface sites that predate 1837 (Minnesota Department of Transportation [MNDOT] 2002a). Because of the immense scope of the project and the extreme environmental variability present throughout the state, a regional approach was necessary. As part of this regional approach, the state was segregated into 20 distinct subsections based on a series of defining environmental characteristics, and separate models were generated for each of these areas.

The west-central Minnesota study area includes portions of three of these subsections. The majority of the study area is located within the *Hardwood Hills* subsection (MNDOT 2002b); however, the southernmost portion of the study area falls into the *Minnesota River Prairie* subsection (MNDOT 2002c), and a small part in the extreme northwestern corner of the study area is located within the *Red River Prairie* subsection (MNDOT 2002d).

The Hardwood Hills subsection model places the majority of high potential areas around water features—primarily the lakes and chains of lakes that cover the region. In the study area, the highest concentration of these is found in Douglas, northern Kandiyohi, and to a lesser extent, Pope and southern Todd counties. Another area of high and medium site potential is predicted to be found along the Crow and Sauk rivers and the numerous lakes along them between Paynesville and Cold Spring in southern Stearns County (MNDOT 2002e). In the Minnesota River Prairie subsection, the majority of high potential areas are predicted to be located along major rivers and large lakes. In the current study area, these localities are focused along the Pomme de Terre River valley at, and upstream from, its confluence with the Minnesota River in western Swift County, and also along a chain of lakes in southern Kandiyohi County. Areas of medium site potential are predicted to be found along other major tributaries of the Minnesota River, such as the Chippewa River, as well as further north along the Pomme de Terre in eastern Grant County (MNDOT 2002e). The model for the Red River Prairie subsection predicts that, in the current study area, the majority of high potential areas will follow the valley of the Pomme de Terre River through eastern Grant and Stevens counties. Other areas of high and medium site potential in the study area are predicted to be found along the Mustinka River, as well as in an area of scattered lakes in Grant and northern Stevens counties that lie west of the Pomme de Terre (MNDOT 2002g).

A current model specific to the west-central Minnesota study area was generated from the MN/Model for this project by Elizabeth Hobbs, MNDOT (Figure 12). At present, a considerable portion of the study area's archeological site potential is classified by the model as *unknown*. This is an artifact of the lack of survey work conducted throughout the area to-date. In the westernmost tier of counties (Grant and Stevens counties), areas exhibiting the highest site locational probability appear to follow the course of prominent waterways such as the Pomme de Terre and, to a lesser extent, Mustinka, rivers. Another substantial zone of high probability surrounds the series of lakes in northern and northeastern Grant County, most notably Pelican Lake and the westernmost shores of Lake Christina. Elsewhere throughout the study area, the areas of highest site locational probability are clearly defined by the distribution of lakes there; a finding that holds well with earlier observations from the region (see for example MHS 1981:1). While the preference for lakes over waterways is not in-and-of-itself surprising, it is interesting to note the high incidence of low probability lands modeled adjacent to most of the study area's major waterways and the near complete absence of high probability localities in such settings.

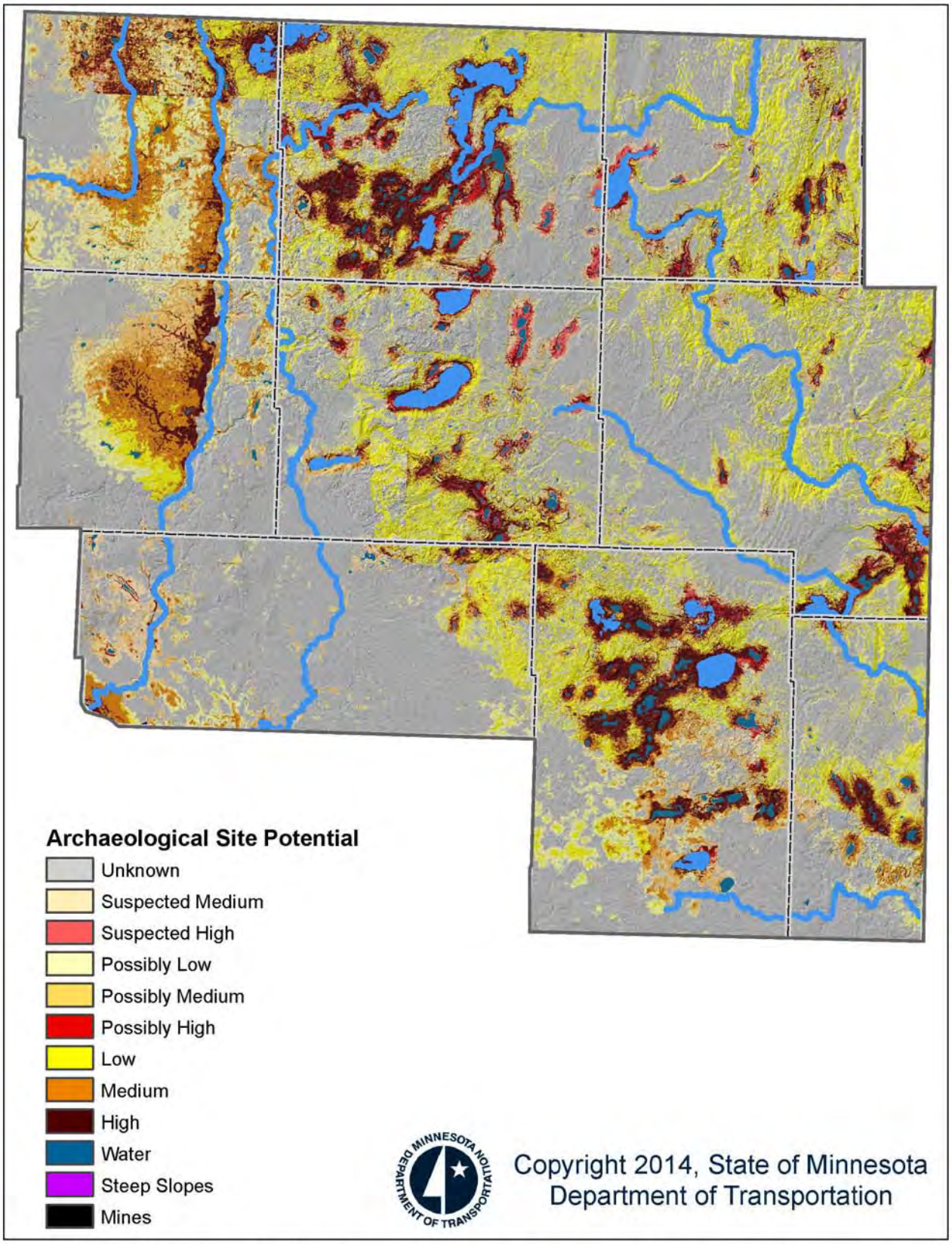


Figure 12. MN/Model for archeological site potential in the west-central Minnesota study area (courtesy of Elizabeth Hobbs, MNDOT).

PALEOENVIRONMENTAL CONTEXT

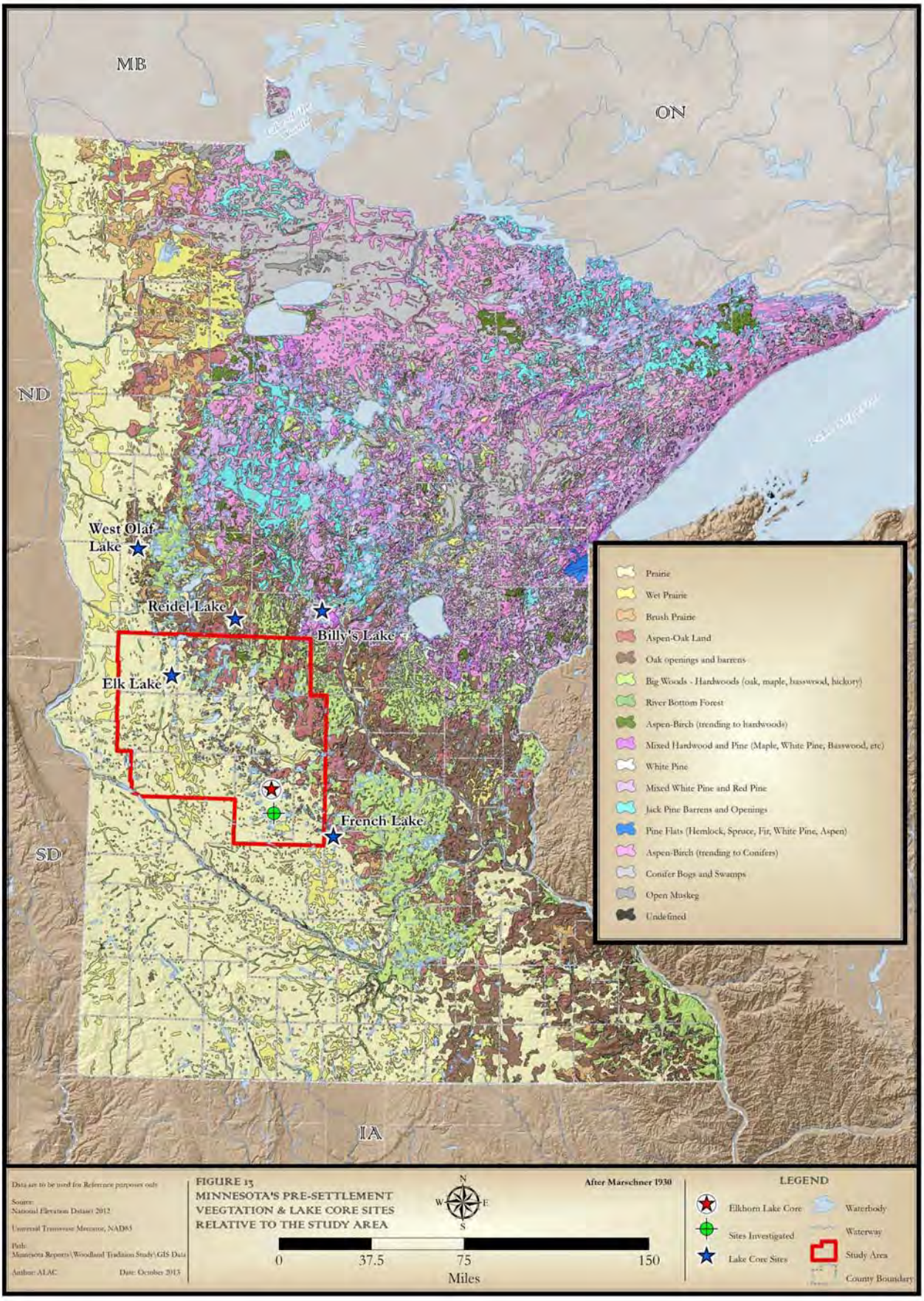
Eric C. Grimm

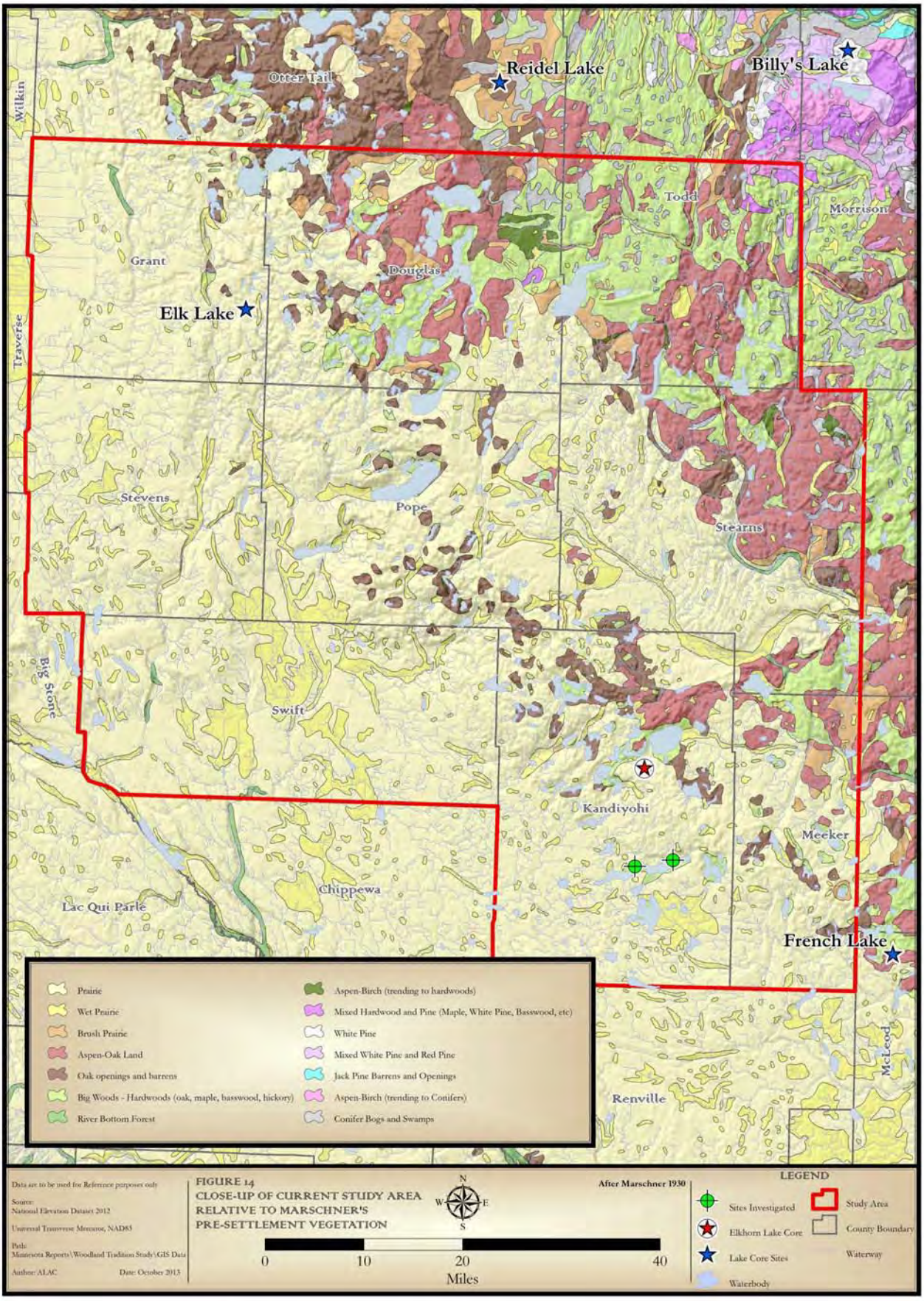
The study area straddles the prairie-forest border in central Minnesota. This is an area of heterogeneous physiography and vegetation where prairie merges into forest. The entire area was covered by the late Wisconsin Des Moines lobe, which flowed from northwest to southeast. The Minnesota River lowland occupies the western and southern part of the study area. This area is level ground moraine, parts of the Altamont and Big Stone Moraine Associations (Hobbs and Goebel 1982), and sediments of Glacial Lake Benson, mainly in Swift County (Rittenour et al. 1998). The strongly rolling Alexandria Moraine runs through the center of the study area from the north to south, bending to the southeast. On Figure 13, the moraine is marked by a large number of glacial lakes. Northeast of the Alexandria Moraine, level outwash plain and ground moraine cover the northeastern portion of the study area. On the Alexandria Moraine north of the archeological sites studied in this project, lies a small lake called Elkhorn Lake (Figures 14 and 15). As part of the current study, a lakebed sediment core was extracted from Elkhorn Lake in February of 2013. The basal radiocarbon date obtained from the core is 12,320 ± 35 ^{14}C yr B.P.; the 2σ calibrated range is 14,085-14,566 cal yr B.P. (CALIB 7.0, IntCal13 calibration curve [Reimer et al. 2013)]). Thus, deglaciation occurred sometime before 14,000 cal yr B.P., as basal lake dates are minimum dates (Clayton and Moran 1982).

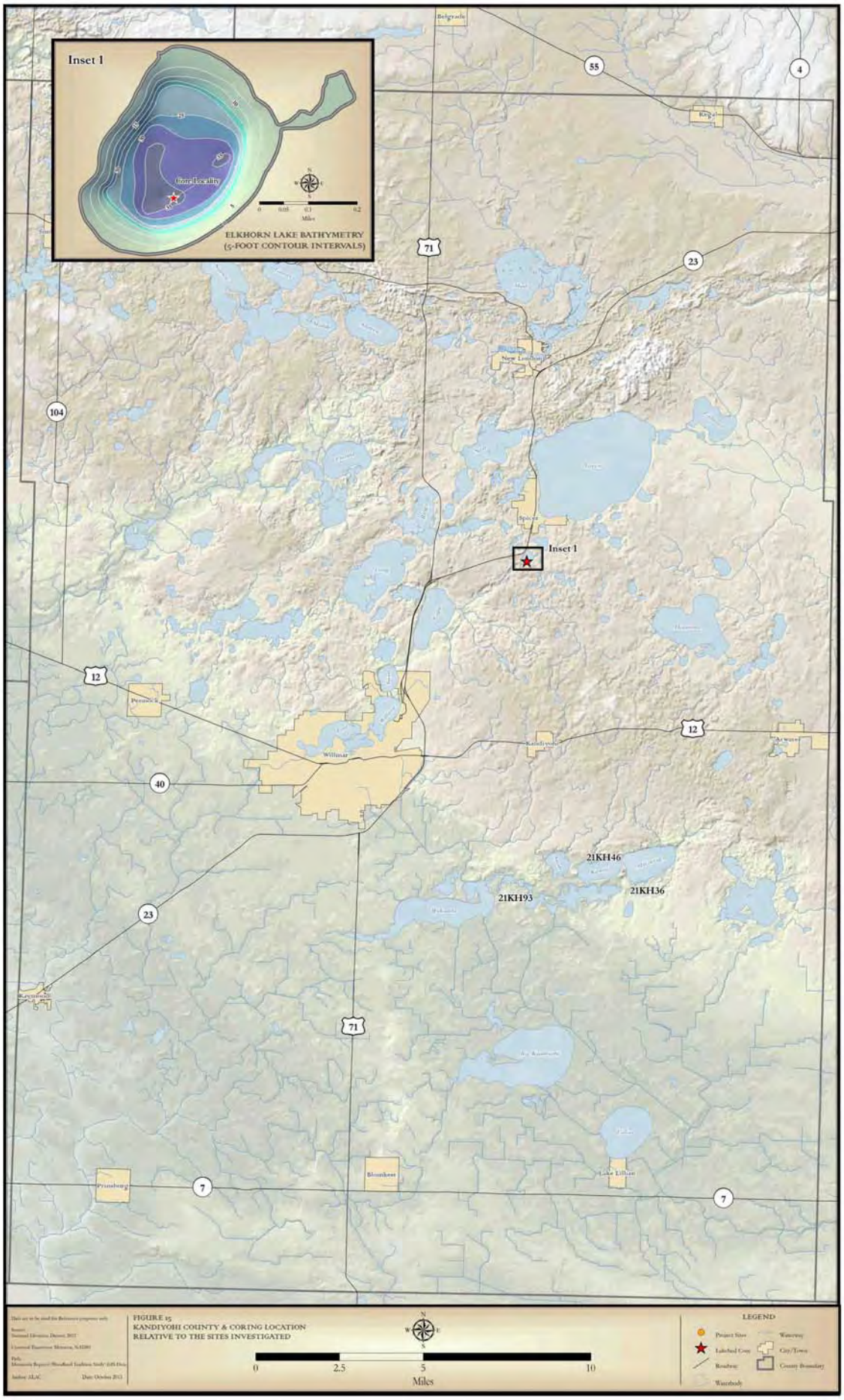
At the time of European settlement, tall-grass prairie dominated the level topography of the Minnesota River lowland in the western and southern portions of the study area (see Figure 14). Vegetation on the Alexandria Moraine was a mosaic of oak-aspen woodland and prairie. Patches of woodland lie mainly north and east of lakes, showing the effects of fires emanating from the southwest. The level outwash plain and ground moraine lying northeast of the Alexandria Moraine was also covered by tall-prairie. The Sauk River sharply defines the main prairie-forest border in the east-central part of the study area. Clearly the river was an effective firebreak. Forest also occupied the Alexandria Moraine in the north-central part of the study area, where many lakes and rugged topography must have reduced the frequency of fire. The spatial relationships between water firebreaks, rugged topography, and the prairie-forest border are strikingly similar to those in the Big Woods southeast of the study area (Grimm 1984). More fire-tolerant oak-aspen woodland lay immediately east of the Sauk River, with more fire sensitive "Big Woods" type forest with *Acer saccharum* (sugar maple), *Tilia americana* (basswood), and *Ulmus* (elm), *Quercus rubra* (red oak), and *Quercus alba* (white oak) to its west (Marschner 1974).

The archeological study sites lay in prairie along the southwestern edge of the Alexandria Moraine, with level ground moraine stretching to the southwest. Some large patches of woodland lay a few km north of the archeological sites, primarily north of a string of lakes, especially Green Lake, which must have formed quite effective fire breaks. The Elkhorn Lake coring locality is in this area just southwest of Green Lake (see Figures 14 and 15).

The paleovegetation of the study area is essentially unknown. A number of other studies along the prairie-forest border to the south and north of the study area show that the Holocene history has been very dynamic. In general, the prairie-forest border retreated rapidly to the northeast between 10,000 and 8000 cal yr B.P., with the maximum eastward advance of prairie between 7000 and 6000 cal yr B.P. After 6000 cal yr B.P., forest began readvancing to the southwest (Williams et al. 2009). The rapid advance of prairie to the northeast in contrast to the gradual readvance of forest to the southwest has been termed asymmetric (Nelson and Hu 2008; Umbanhowar et al. 2006). The differences may lie in the relative speed of climate change, with more abrupt change in the early Holocene, or the difficulty that trees face in becoming established in highly flammable prairie. In any case, the precise history of late Holocene reforestation is highly variable along the prairie-forest border, depending on local physiographic, edaphic, and hydrologic factors.


MB
ON
ND
SD
IA
West Olaf Lake
Reidel Lake
Billy's Lake
Elk Lake
French Lake
Prairie
Wet Prairie
Brush Prairie
Aspen-Oak Land
Oak openings and barrens
Big Woods - Hardwoods (oak, maple, basswood, hickory)
River Bottom Forest
Aspen-Birch (trending to hardwoods)
Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)
White Pine
Mixed White Pine and Red Pine
Jack Pine Barrens and Openings
Pine Flats (Hemlock, Spruce, Fir, White Pine, Aspen)
Aspen-Birch (trending to Conifers)
Conifer Bogs and Swamps
Open Muskeg
Undefined
Data are to be used for Reference purposes only
Source:
National Elevation Dataset 2012
Universal Transverse Mercator, NAD83
Path:
Minnesota Reports\Woodland Tradition Study\GIS Data
Author: ALAC
Date: October 2013
FIGURE 13
MINNESOTA'S PRE-SETTLEMENT
VEGETATION & LAKE CORE SITES
RELATIVE TO THE STUDY AREA
After Marschner 1930
N
W
E
S
0
37.5
75
150
Miles
LEGEND
Elkhorn Lake Core
Sites Investigated
Lake Core Sites
Waterbody
Waterway
Study Area
County Boundary


Reidel Lake
Billy's Lake
Otter Tail
Wilkin
Todd
Morrison
Grant
Douglas
Elk Lake
Traverse
Stevens
Pope
Stearns
Big Stone
Swift
Kandiyohi
Meeker
Chippewa
Lac Qui Parle
French Lake
McLeod
Renville
Prairie
Wet Prairie
Brush Prairie
Aspen-Oak Land
Oak openings and barrens
Big Woods - Hardwoods (oak, maple, basswood, hickory)
River Bottom Forest
Aspen-Birch (trending to hardwoods)
Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc)
White Pine
Mixed White Pine and Red Pine
Jack Pine Barrens and Openings
Aspen-Birch (trending to Conifers)
Conifer Bogs and Swamps
Data are to be used for Reference purposes only
Source:
National Elevation Dataset 2012
Universal Transverse Mercator, NAD83
Path:
Minnesota Reports\Woodland Tradition Study\GIS Data
Author: ALAC
Date: October 2013
FIGURE 14
CLOSE-UP OF CURRENT STUDY AREA
RELATIVE TO MARSCHNER'S
PRE-SETTLEMENT VEGETATION
After Marschner 1930
N
W
E
S
0
10
20
40
Miles
LEGEND
Sites Investigated
Elkhorn Lake Core
Lake Core Sites
Waterbody
Study Area
County Boundary
Waterway


Inset 1
Core Locality
ELKHORN LAKE BATHYMETRY
(5-FOOT CONTOUR INTERVALS)
Belgrade
55
4
71
23
104
Inset 1
12
40
Willmar
21KH46
21KH93
21KH36
Prinsburg
Blomkest
Lake Lillian
7
FIGURE 15
KANDIYOHI COUNTY & CORING LOCATION
RELATIVE TO THE SITES INVESTIGATED
0
2.5
5
10
Miles
LEGEND
Project Sites
Lakebed Core
Roadway
Waterbody
Waterway
City/Town
County Boundary

One of the earliest radiocarbon-dated pollen diagrams from Minnesota was from Kirchner Marsh (Wright et al. 1963), which lies near the prairie-forest border south of St. Paul. At this site, oak forest or woodland replaced prairie about 6000 cal yr B.P. This date may be somewhat too old because radiocarbon dates are on bulk sediment, which may have an old carbon reservoir (Grimm et al. 2009), but the error in Minnesota lakes is usually no more than a few hundred years. In a now-classic study, McAndrews (1966) reconstructed the movement of the prairie-forest border along the "Itasca" transect of sites in northwestern Minnesota north of the area of study for this project. Reforestation along this transect generally occurred between 4,000 and 5,000 years ago. In the Big Woods region, southeast of the study area, the timing of reforestation varies widely: ~3600 cal yr B.P. at Wolsfeld Lake in the northeastern Big Woods (Grimm 1983), ~3500 cal yr B.P. at Sharkey Lake in the southwestern Big Woods (Umbanhowar et al. 2006), ~2500 cal yr B.P. at Kimble Pond along the southeast edge of the Big Woods (Umbanhowar et al. 2006), and ~2400 cal yr B.P. at French Lake in the northwestern Big Woods, just southeast of the study area. All of these sites have significant tree pollen during the middle Holocene, suggesting that the vegetation was a mosaic of forest and prairie, perhaps not unlike that on the Alexandria Moraine prior to European settlement, with patches of forest, some quite extensive, on the lee sides of lakes, which served as firebreaks.

Almendinger (1992) studied the reforestation of five sandy outwash plains north of the study area and south of the Itasca transect. Today these outwash plains are covered with *Pinus banksiana* (jack pine) forest, but they were prairie during the middle Holocene. Initial reestablishment of forest or woodland began with aspen-oak brush prairie, which persisted 1,000-2,500 years before *Pinus banksiana* became established. Reforestation by aspen-oak began 5,000-2,700 years ago, while development of jack pine forest occurred 3,000 to as late as 300 years ago.

In addition to French Lake, the nearest sites to the study area are West Olaf Lake (Nelson and Hu 2008) on the Alexandria Moraine northwest of the study area, Reidel Lake (Almquist-Jacobson et al. 1992) on the Parker's Prairie outwash plain just north of the study area, and Billy's Lake (Jacobson and Grimm 1986) on the St. Croix Moraine northeast of the study area. At Reidel Lake (Figure 16), reforestation occurred just prior to 4000 cal yr B.P. However, at Billy's Lake (Figure 17), today located farther from the modern prairie-forest border than Reidel Lake, reforestation occurred about 1,000 years later. West Olaf Lake (Figure 18) is located in a patch of forest or woodland separated from, and west of, the main prairie-forest border. *Quercus* (oak) increased somewhat about 4000 cal yr B.P.; *Betula* (birch) and *Ostrya*-type (hornbeam) increased somewhat later. The middle Holocene appears quite dynamic at West Olaf Lake, with high sample-to-sample variability in prairie types, such as *Ambrosia*, and *Quercus*. Thus, it appears that the patch of woodland around West Olaf Lake may have persisted throughout the middle Holocene, but varied in size, possibly in response to moisture variations such as those seen on the Great Plains (Grimm et al. 2011). The most recent reforestation near the study area was at French Lake (Figure 19) along the northwestern edge of the Big Woods.

The pollen data show that forest generally readvanced from northeast to southwest; however, not smoothly. Some areas apparently separated from the main prairie-forest border were reforested before areas behind them were. The vegetation pattern in the study area that existed just prior to European settlement is suggestive of this process. Fairly extensive patches of forest exist on the Alexandria Moraine, west of the main prairie forest border, while prairie occupies the level outwash and glacial till plain between the Alexandria Moraine and the Sauk River to the northeast. Of particular interest to the archeological sites investigated for this study is the timing of forest establishment on the Alexandria Moraine to the north. On one hand, woodland patches appear to have persisted and expanded farther north on the Alexandria Moraine around West Olaf Lake about 4,000 years ago. On the other hand, forest did not become re-established around French Lake just southeast of the study area until ~2,400 years ago. We might speculate that the expansion of woodlands north of the archeological sites corresponded with the occupation of these sites. As climate became wetter in the late Holocene, lake levels rose, forming more effective firebreaks, while at the same time providing resources for humans. However, in the absence of direct paleoecological evidence, this hypothesis remains speculative.

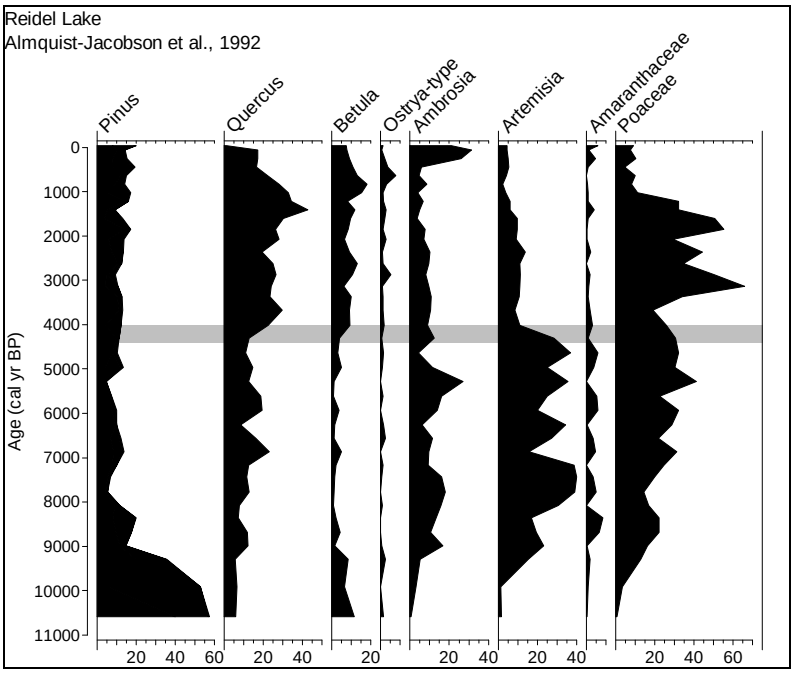


Figure 16. Summary pollen diagram from Reidel Lake (Almquist-Jacobson et al. 1992). The high percentages of Poaceae (grass) pollen in the late Holocene are believed to be derived from local aquatic grasses (e.g., *Zizania aquatica*); consequently, Poaceae was not included in the pollen sum. The gray bar indicates the period of reforestation.

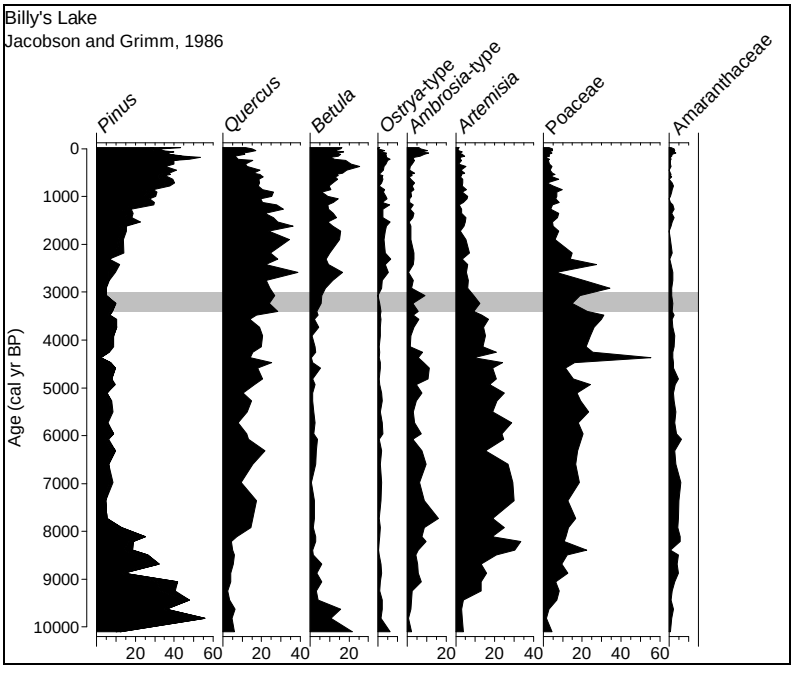


Figure 17. Summary pollen diagram from Billy's Lake (Jacobson and Grimm 1986). The gray bar indicates the period of reforestation.

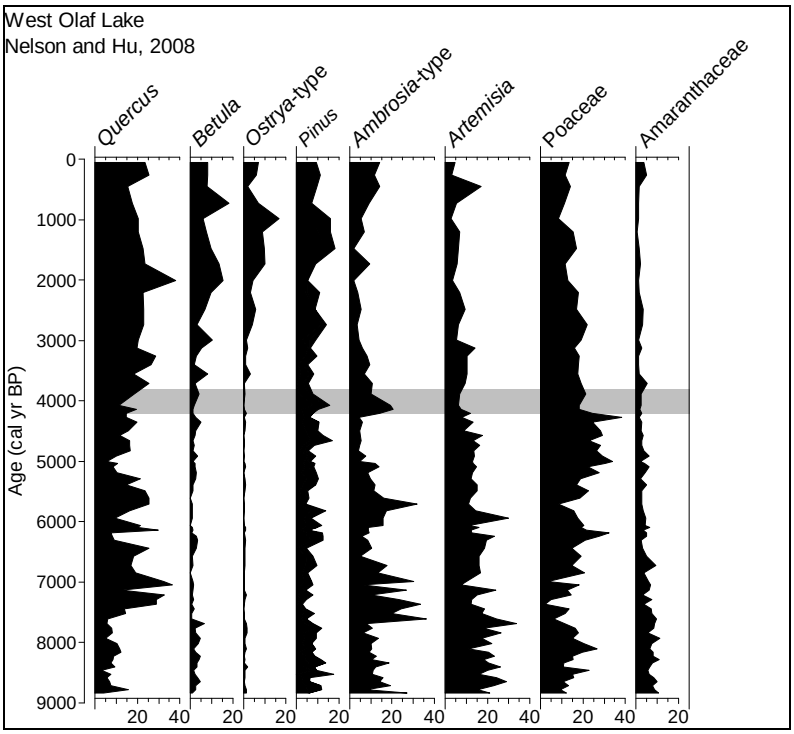


Figure 18. Summary pollen diagram from West Olaf Lake (Nelson and Hu 2008). The gray bar indicates the period of reforestation.

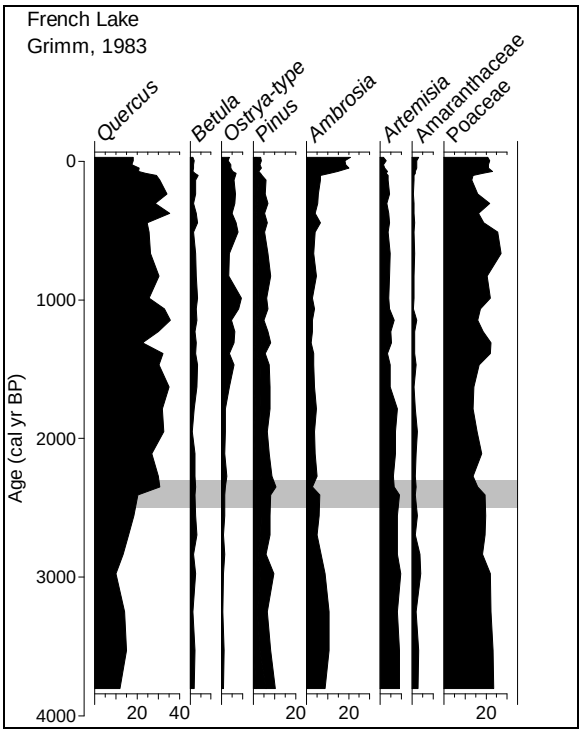


Figure 19. Summary pollen diagram from French Lake (Grimm 1983). The gray bar indicates the period of reforestation.

METHODOLOGY & FIELD INVESTIGATIONS

SITE SELECTION

The project RFP initially identified four sites with Woodland components in Kandiyohi County as potential targets for testing: 21KH36, 21KH44, 21KH48, and 21KH93. These sites are located in close proximity to one another on a chain of lakes just southeast of Willmar. Each of the sites has been frequented by local collector Larry Levin over the course of the past 30+ years. During December of 2012, ALAC traveled to the Willmar area to meet Levin, who had agreed to show investigators the sites, as well as his collection of artifacts from each. During the on-the-ground visits, it became apparent that the entirety of sites 21KH44 and 21KH48 had been previously cultivated. The likelihood of either site retaining intact, undisturbed Woodland cultural deposits was considered very low. Therefore, ALAC decided to eliminate sites 21KH44 and 21KH48 from further testing consideration.

Significant portions of sites 21KH36 and 21KH93 had also been heavily disturbed by previous cultivation; however, other portions of these sites appeared to remain relatively undisturbed. According to accounts by the respective landowners, wooded areas of each site had not been disturbed (Roy McLain and William Reid, personal communication 2013). Also, a small pasture clearing at site 21KH36 reportedly had never been plowed (William Reid, personal communication 2013). During the site visits, ALAC was made aware of an additional nearby site with Woodland deposits, 21KH46. This site, also collected from by Levin, was the subject of recent testing for a DNR-related public water access project (Tumberg et al. 2009). A preliminary analysis of ceramics recovered during testing there suggests a possibility that the site may retain chronologically stratified pottery. Following discussions with OSA and DNR archeologists, as well as Mr. Levin, ALAC decided to include site 21KH46 along with 21KH36 and 21KH93 as a candidate for evaluation. Because so little testing had been conducted at these sites previously, ALAC investigators felt that it would be more prudent to test multiple sites rather than focusing on a single locality.

The selection of these three sites was also influenced by the cooperation of local resident Larry Levin. Levin's good relationship with the site landowners, his familiarity with the site areas, and his willingness to assist the investigation were viewed as instrumental in the successful completion of the study. In addition, Levin retains a substantial collection of artifacts from these sites that affords researchers a more expansive dataset from which local and regional comparisons can be made, particularly with respect to prehistoric ceramics.

A final factor in the selection of sites 21KH36, 21KH46, and 21KH93 was their relatively close proximity to one other (Figure 20), and to Elkhorn Lake. Located less than 10 miles north of the sites near the community of Spicer (see Figure 15, above), Elkhorn Lake is considered to possess ideal depth and morphology for yielding lakebed sediment cores capable of producing high-resolution paleoenvironmental data (Eric C. Grimm, paleoecologist, personal communication 2012). In February of 2013, ALAC personnel, together with Illinois State Museum paleoecologist Eric Grimm, extracted two complete lakebed sediment cores from Elkhorn Lake. By extracting both pollen and datable carbon-based samples from the cores, a detailed reconstruction of the Woodland-period paleoenvironemnt will be possible. The proximity of Elkhorn Lake will allow for reliable comparisons of this paleoenvironment with all three of the selected sites (see Chapter 3 for further information concerning Elkhorn Lake and the local and regional paleoenvironment).

FIELD METHODOLOGY

Project fieldwork was conducted in three phases. The first phase consisted of a brief reconnaissance expedition from December 5–6, 2012. During this time, sites targeted for potential testing were visited, landowners and local collectors were greeted, and collections were briefly examined. From February 7–9, 2013, ALAC personnel returned to the study area with Dr. Eric Grimm to extract lakebed sediment cores from Elkhorn Lake. The remainder of fieldwork activities, which included the actual testing of sites 21KH36, 21KH46, and 21KH93, was carried out between August 1 and 28, 2013. Assisting in the testing of sites 21KH46 and 21KH93 were OSA archeologists Scott Anfinson and Bruce Koenen.

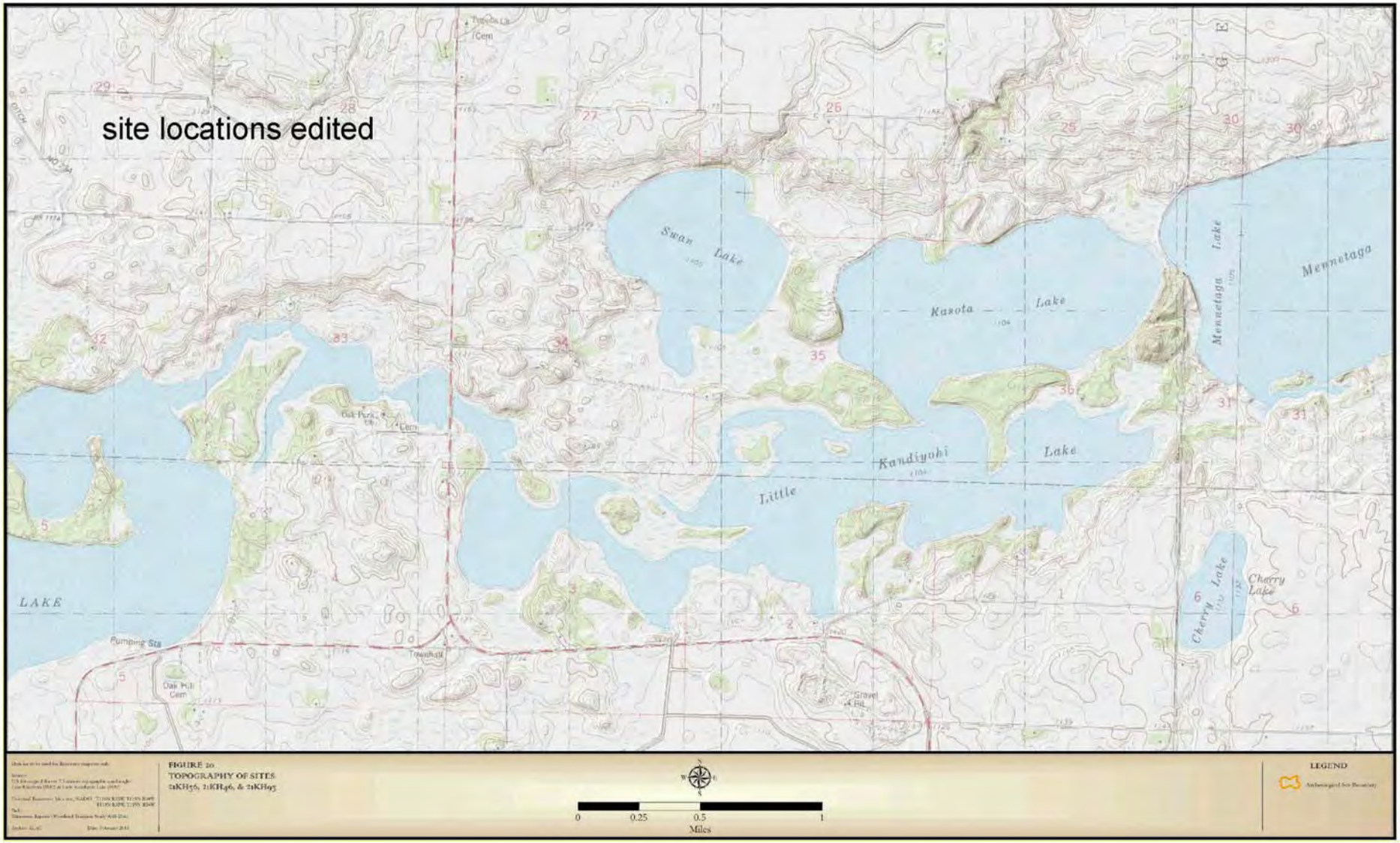


FIGURE 20.
TOPOGRAPHY OF SITES
21KH56, 21KH46, & 21KH95

Prior to excavations, portions of each site area were investigated by means of a pedestrian survey utilizing parallel, linear transects spaced at approximately 20-m intervals or less. Walk-overs were not conducted in portions of each site where ground surface visibility was very poor or non-existent. The pedestrian survey was augmented by the examination of rodent burrows and backdirt piles when such features were present. At each site, ALAC personnel were accompanied by Larry Levin, who identified the locations from which he had collected artifacts in the past. GIS shapefile data from previous work at site 21KH46 was also provided by MHS archeologist Tim Tumberg. This data, coupled with information provided by Levin, was utilized in deciding where subsurface tests would ultimately be placed at each of the sites.

Standardized documentation procedures were utilized during field investigations. Digital photographs were obtained for overviews of each site, as well as for any specific features or localities identified. The positions of surface artifacts and cultural features initially observed during pedestrian reconnaissance were demarcated with high-visibility pin flags, and site mapping was accomplished with the use of a Trimble *Pro XR*® model, differentially corrected sub-meter accuracy GPS unit.

Descriptions of documented cultural resources along with general environmental descriptions of each site area were recorded in field journals. This included artifact specimen inventories identifying type, modification, raw material utilized, and count, as well as additional site feature descriptions and measurements. In most instances, cultural material documented surficially was left in situ; only those artifacts determined to hold culturally diagnostic value (*i.e.*, ceramic rims or projectile points) were collected from the surface. Minnesota archeological site forms were updated for all three of the sites revisited during this study.

Subsurface test excavations were conducted at each of the three targeted sites as part of the current study. Within each site, test locations were determined based on a combination of factors, including landform position, surface artifact/feature distribution, and the location and results of previous excavations. Tests included standard shovel tests, 50-cm-x-50-cm exploratory units, and formal 1-m-x-1-m excavation units. In total, 25 square meters and nine additional shovel tests were excavated among the three sites. All test localities were mapped with the GPS. A reading was taken at one corner of each formal unit or at one designated point in a block grid; block grid baselines were established from this point. All square units were oriented along the cardinal axes. Excavations were carried out through a combination of shovel-skimming and hand-troweling. All tests were excavated in arbitrary 10-cm levels through disturbed deposits; at 21KH46, 5-cm levels were adopted at greater depths below surface when units ceased to yield historic material. All tests were terminated in sterile subsoil when the majority of one arbitrary level was found to be devoid of artifacts. Shovel test and unit level forms were completed for each test excavated, and profile and plan view drawings were executed when appropriate. All test units opened were subsequently backfilled.

With two exceptions, all excavated soil matrix was sieved through standard ¼-inch wire mesh screen on-site. All soil matrix comprising Features 1 and 2 at site 21KH93 was collected from the site and processed by means of flotation at ALAC's laboratory. Heavy fraction from these features was subsequently sieved through $^{1}/_{8}$-inch wire mesh screen. Secondly, all soil matrix comprising Features 1 and 2 at site 21KH46, as well as a soil sample recovered from one 5-cm level in the east half of Unit 17 at 21KH46, was water-screened at the OSA facility in the Twin Cities; $^{1}/_{16}$-inch window screen was used during this process. All soils data was described utilizing Munsell Soil Color Charts® (Munsell Color 2000).

All artifacts recovered from subsurface contexts were collected for laboratory analysis and processed to MHS curation standards. The artifact assemblage from site 21KH36 was returned to the property owner following completion of this project. Assemblages from sites 21KH46 and 21KH93 are curated at the MHS under Accession Nos. 2013.113 (21KH46) and 2013.114 and 2013.115 (21KH93). Laboratory analyses of recovered cultural material were conducted between October of 2013 and March of 2014. Standardized procedures aimed at the production of readily comparable datasets were utilized in the analyses. Diagnostic artifacts were subjected to both macroscopic and microscopic identification procedures for the purposes of determining material typology, manufacture techniques, use-wear patterning, and source material locations. Lithic and bone tools, as well as ceramic rims, were photographed to-scale. Artifact specimens were subjected to various dimensional measurements based upon ascribed individual typology, and technical descriptions were provided (see Chapters 5 and 6 for information concerning the analysis of recovered artifacts).

DOCUMENTED ARCHEOLOGICAL PROPERTIES

Site 21KH36 (Mennetaga Site)

Site Number: 21KH36	**Site Name:** Mennetaga Site
Site Type/Function: Habitation	**Legal Location:** edited
Landscape Position: Uplands and Lake Terrace	**Site Area (ac):** 7.77
Elevation Above Mean Sea Level (ft): 1,114-1,136	**ALAC Excavations:** Eight 1-m-x-1-m Units
Cultural Affiliation: Archaic through Historic (reported Paleoindian component)	**Site Condition:** Disturbed
USGS 7.5' Quadrangle: Little Kandiyohi Lake (1982)	**Archaeological Subregion:** 2n

Site 21KH36, the Mennetaga site, is a multi-component habitation containing artifacts associated with the Archaic period through historic times. The site is situated on a hilltop and lake terrace overlooking the shores of Mennetaga Lake in Kandiyohi County (see Figure 20, above).

Approximately three-quarters of the site, on the southernmost end, is located atop a high morainal ridge above the lake in what, at the time of the investigation, was a cultivated soybean field. Ground surface visibility in the bean field averaged 50 percent at the time of the study. The northern edge of the cultivated field is bordered by a wooded hill slope that descends northward onto a lower lake terrace. Much of this lower terrace is also wooded; however, a small clearing exists near the north end of the site that, at the time of the investigation, was in high brome grass interspersed with Canadian thistle (Figures 21-23). The dense vegetation in the clearing limited ground surface visibility there to only 5 percent—scattered gopher burrows and their adjacent backdirt piles offered the only glimpse of the surface or subsurface in this area. The site landowner, Dr. William Reid, stated that, despite the presence of brome and thistle, the pasture clearing was undisturbed ground (William Reid, landowner, personal communication 2013).

Figure 21. View of a portion of the clearing at site 21KH36, eastern orientation. Prior to removal of vegetation, the brome and thistles were nearly four feet high in this area.

Soils in the majority of the site area are described as having been formed in loamy and clayey lacustrine sediments mantling glacial till. The Kandiyohi County Soil Survey classifies these soils as Kilkenny clay loams (Giencke 1987:24-25). Soils mapped in a smaller area in the northernmost portion of the site formed in outwash plains; these soils relate to the Estherville-Hawick complex (Giencke 1987:53-54).

Research History

Professional archeological investigations at site 21KH36 were first conducted during a county-wide survey of Kandiyohi County as part of the larger MNSAS initiative (see MHS 1981). According to site records and field notes, the site was visited on May 28, 1980 by a crew led by then MHS archeologist Tom Trow (21KH36 site file). However, the following excerpt from Trow's field notes of May 6, 1980 indicates that the site was already well-known by local collectors:

> They called Marion Bosch to ask if we could come visit their collection. She and husband Walter ( ) have collected their area, especially the west side of Cherry Lake and the W. side of Mennetaga. They have an extensive collection which includes obsidian from 21KH (9-1) [field number 9-1 was later assigned number 21KH36], Archaic pts., Knife River flint, large g-temp. rim sherds. She was very generous and precise about where each piece came from. She suggests we speak with Larry Levin of Gennessee twnsp [Trow 1980:3-4].

When ALAC visited the site with Larry Levin, he identified the places he had collected from over the years—a period of time extending from 1969 to the present. He also noted that the site has been collected on a semi-regular basis since the early 1930s and that many of the earliest finds were large, 4- and 5-inch-long, spear points (Larry Levin, personal communication 2013). Levin collected from the cultivated field most frequently; however, he also described walking the pasture clearing on the lower terrace and finding artifacts in the gopher burrow backdirt piles. Levin never did any digging at this site (Larry Levin, personal communication 2013). Site records indicate that MHS archeologists conducted a surface survey of the site and excavated four shovel tests as well as two 1-m-x-1-m units (Olson 1980; Trow 1980). A subsequent entry in Trow's field notes describes, in part, the activities:

> We returned to (9-1) [21KH36] at Mennetaga to photograph and test the site. Four shovel tests were dug, three of which were positive. Numerous gopher mound backfill piles were checked; John found a side-notched pt. and sherds in one, dug his shovel test there. In a backfill pile near the dugout (5 m to the S.W.) was a single obsidian flake. The site extends westward to the road; a shovel test in the woods beyond was negative.
>
> A 1 x 1 in the pasture north of the field would be a very good idea. This site is endangered by the remarkably heavy collecting of at least 5 steady collectors: Larry Levin, Walter Bosch & family, Bob & Dean Wall, Ray Svobodny (retired), and his son-in-law, "Hirman," near Willmar. Others are probable. Mr. Hirman has a flintlock from here, Ray Sv. has other historic material [Trow 1980:7].

Little information is provided with regard to the two 1-m-x-1-m test units excavated. Brent Olson's (1980:1-2) field notes include the following information:

Mennetaga Site
25 June 80
TP #1 295° 107 m to SE
corner of ex. unit
Negative
50 c=B
55=End

Mennetaga Site
TP #2 220° 35 m From TP #1 " "
10 cm – flake, bone?
20 cm – flake, bone
28 cm – quartz flake
35 cm – quartzite flake
47 cm – "B" horizon
51 cm – end

Although information concerning the size and depth of the excavation units, as well as a general idea of the artifacts discovered, is provided, what remains uncertain is *where* the units were placed within the site. Distance and bearing measurements are supplied; however, these do not include a point-of-reference from which the measurements were recorded.

Additional notes of Olson's (1980:3-5) provide limited information concerning three of the four shovel tests excavated:

May 28, SH T. #1
40 m, 243° from SW corner of foundation
gopher md. found pt., pottery, flakes
10 cm – pottery, pt, burnt bone
20 cm – pottery, flakes, fr cracked rock
30 cm – pottery, charcoal
40 cm – pottery
45 cm – flake, bone

80 cm="B" horizon

(9-1) west side of road on highest rise 20 m from edge & last rise before slough

0-25=sandy loam
35=start of "B" (sandy)
45=flake
70=CLAYEY hard compacted sand

St 2

ST 4

charcoal
charcoal
charcoal
35 flake
45 "B"

55 clay
60 END

No information concerning Shovel Test 3 was found in either set of field notes and, similar to the excavation units, Shovel Test 4 notes provide no locational information. It is, however, possible to identify general locations for Shovel Tests 1 and 2 at the site. Shovel Test 1 is listed as being 40 m from the southwest corner of the foundation on a compass bearing of 240 degrees (or slightly west of southwest). This would place the test somewhere near the northwestern edge of the current clearing, about 15 to 20 m north of ALAC's excavation blocks. Shovel Test 2 is described as being *west* of the road (presumably 120th Street SE as it is the only road of note in the area) on the highest rise above the slough. There is only one prominent rise west of 120th Street; it overlooks the eastern edge of Little Kandiyohi Lake to the south. ALAC was denied permission to access this property and was unable to investigate the area further. If it can be confirmed that a positive shovel test was excavated atop this rise, then the 21KH36 site boundary should be extended westward to encompass it.

site location edited

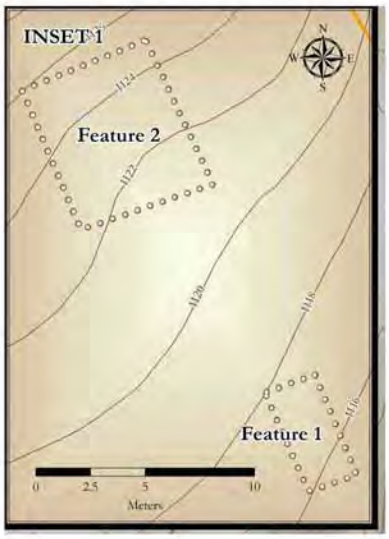
Data are to be used for Reference purposes only.
Source:
National Agricultural Imagery Program (2010)
Universal Transverse Mercator (NAD83) T119N, R33W
T119N, R34W
Path:
Minnesota Reports\Woodland Tradition Study\GIS Data
Author: ALAC Date: February 2014

FIGURE 22
SATELLITE IMAGERY OF
SITES 21KH36 & 21KH46

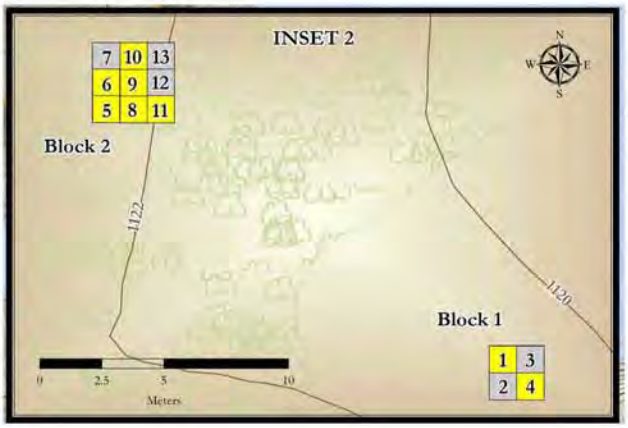
N
W E
S

0 0.125 0.25 0.5
Miles

LEGEND
Archeological Site Boundary
Section Lines
Contour (10 ft Interval)



site location edited



Data are to be used for Reference purposes only

Source:
National Elevation Dataset (2010)

Universal Transverse Mercator, NAD83 T119N, R33W
T119N, R34W

Path:
Minnesota Reports\Woodland Tradition Study\GIS Data

Author: ALAC Date: February 2013

FIGURE 23
BARE EARTH LiDAR
IMAGERY OF SITE 21KH36

N
W
E
S

Note: Gray Units in Inset 2 are Unexcavated

0 37.5 75 150
Meters

LEGEND

Excavation Block
Foundation
Site Boundary
Section Line
Field Clearing
Waterbody

No additional field notes related to work at this site were found, although some additional information can be gleaned through an examination of the site form. The site form includes a general list of artifacts recovered during excavations and controlled surface collections. Items noted in the list include: "grit-tempered pottery, 1 chert knife, 1 side-notched gray chert projectile point, 1 chert scraper, 1 knife river flint scraper, 1 utilized red obsidian flake, oolitic chert, quartsite [*sic*] & knife river flint utilized flakes, broken chalcedony biface, black obsidian, oolitic chert, quartz, quartzite, 2 bison teeth, fish & bird bones" (21KH36 site file). The site form describes 21KH36 as a Woodland habitation and makes no mention of an historic component despite field notes citing the presence of a dugout and a flintlock having been collected from the area (Trow 1980:7).

Larry Levin maintains a sizable collection of artifacts from the site, including numerous ceramic specimens and projectile points (see Appendix B). Material recovered from the MNSAS excavations is curated at MHS under Accession No. 183-25.

2013 Investigation Description and Results

ALAC's investigations at site 21KH36 took place from August 14–19, 2013. Eight 1-m-x-1-m formal units were excavated at the site during this time. The units were established within two separate grid blocks laid-out along east-west baselines on the lower lake terrace north of the cultivated field. Block 1 was set on a 2-m-x-2-m grid in the pasture clearing, while Block 2 was set on a 3-m-x-3-m grid northwest of Block 1 in a wooded portion of the site. One-meter excavation units (XUs) within the grids were numbered sequentially beginning with 1 and ending with 13, such that Block 1 contained XUs 1–4 and Block 2 contained XUs 5–13. In Block 1, XUs 1 and 4 were excavated. In Block 2, XUs 5–6 and 8–11 were excavated (see Figure 23, above). In addition to the excavations, two historic fieldstone foundations, designated Features 1 and 2 (F-1 and F-2), were minimally documented at the site.

Fieldstone Foundations

The two historic foundations, designated F-1 and F-2, are located northeast of the clearing in the woods near the Mennetaga Lake shore (see Figure 23, Inset 1, above). Each is comprised of stacked fieldstones, which are visible along the ground surface; a portion of a larger wall is exposed at F-2. They are each oriented approximately 70 degrees east of north. Given the scope of the current study, the features were only minimally documented—each was photographed, mapped with the GPS unit, and measured. The smaller of the two features, F-1, is rectangular in shape, measuring 4.7 m long by 2.5 m wide. It is located approximately 9.5 m south-southeast of F-2. The second, larger feature, F-2, is dug into the southeastern side of a hill; its rectangular outline is visible on 1-m LiDAR hillshade models of the site area. It measures 7.0 m long by 6.0 m wide. At its deepest, along the northwestern edge, F-2 measures about 1.8 m in depth.

Block Area 1

Excavation Block 1 was established on an east-west baseline in the southwestern part of the pasture clearing (Figure 24; see Figure 23, above). Two formal 1-m-x-1-m units, XU-1 and XU-4, were opened in this block. Both of these units were sterile through 7 centimeters below surface (cmbs), though they ultimately produced a total of 358 artifacts (Table 3). The units were each excavated to a depth of 30 cmbs; excavations were terminated at this depth in sterile subsoil. Below 7 cmbs, XU-1 yielded a moderate amount of cultural material until a depth of 23 cmbs was reached. Also observed in XU-1 was a light scatter of charcoal flecks confined to the approximate northwest quarter of the unit. XU-4 yielded a slightly lower number of artifacts than XU-1; these were discovered at depths of between 8 and 20 cmbs. No charcoal was observed in XU-4. Historic artifacts were discovered stratigraphically below prehistoric material in both units. In XU-1, an iron nut was unearthed at a depth of approximately 14 cmbs, while a fragment of glass was discovered at 20 cmbs in XU-4—the lowest depth from which cultural material was extracted in this unit. Table 4 lists the distribution and count of artifact types recovered from Block 1 by depth.

As Table 4 illustrates, the majority of the cultural material was recovered from 11–20 cmbs. The 228 specimens recovered from this level represent nearly 64 percent of the total number derived from the block. It should also be noted that, in the lowest level, all 53 artifacts were recovered from a depth of 21–23 cmbs; the block was sterile below 23 cmbs.

Figure 24. Overview of Block 1 area, site 21KH36, southeastern orientation.

Table 3. Distribution and Count of Recovered Materials by Unit, Block 1, Site 21KH36.

Unit No.	Artifact Material Type						
	Lithic	Ceramic	Faunal	FCR	Charcoal	Historic	Total*
1	20	18	65	88	Yes	1	**192**
4	33	12	20	98	—	3	**166**
Total	**53**	**30**	**85**	**186**	**N/A**	**4**	**358**

*** Does not include charcoal**

Table 4. Distribution and Count of Recovered Materials by Depth Below Surface, Block 1, Site 21KH36.

Depth (cmbs)†	Artifact Material Type						
	Lithic	Ceramic	Faunal	FCR	Charcoal	Historic	Total*
0–7	—	—	—	—	—	—	**0**
8–10	13	6	13	44	—	1	**77**
11–20	39	23	54	109	Yes	3	**228**
21–30	1	1	18	33	Yes	—	**53**

*** Does not include charcoal**
† Although units were excavated in 10-cm levels, the uppermost 7 cmbs was sterile in Block 1; it is shown separately above.

Prior to backfilling the Block 1 units, a soil profile drawing of the east wall of XU-1 was completed (Figure 25). Soils observed in the two units of Block 1 were uniform and closely mirror the description of the previously mapped Kilkenny series soils (see Giencke 1987:89). The most notable issue concerning the soils in Block 1 is the definitive presence of a plowzone. The presence of a plowzone in the clearing is not in-and-of-itself surprising considering the proliferation of brome and Canadian thistle throughout the field; however, it is interesting that the current landowner believed the clearing had never been cultivated (William Reid, personal communication 2013). Indeed, a desire to test

this notion was part of the reason behind placing units in the clearing at the site. Unfortunately, the results revealed a condensed series of commingled prehistoric and historic cultural deposits with no discernable stratigraphy.

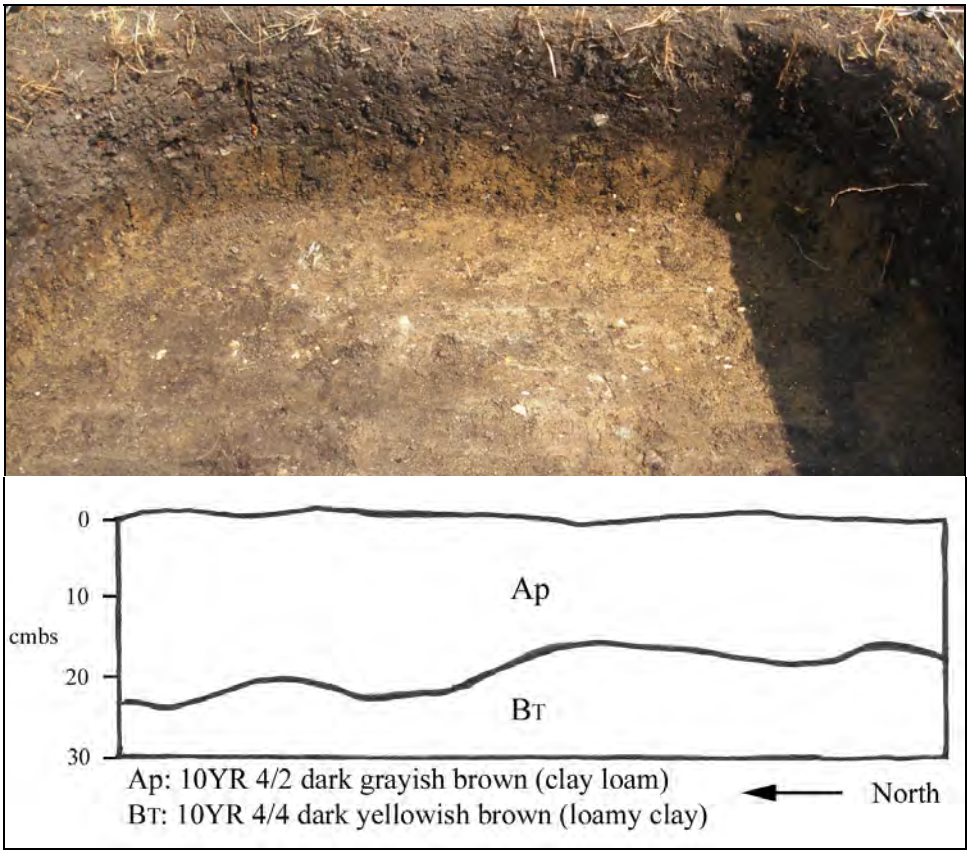


Figure 25. East wall profile, XU-1, Block 1, site 21KH36.

Block Area 2

Excavation Block 2 was established on an east-west baseline in a wooded portion of the site 19.45 m northwest of Block 1 (Figure 26; see Figure 23, above). ALAC excavated six formal 1-m-x-1-m units within the 3-m-x-3-m grid. Units excavated were XU-5, XU-6, and XU-8–XU-11. All Block 2 units were sterile through the uppermost 3 cmbs; the block ultimately yielded 1,575 artifacts (Table 5). Each unit in this area was excavated to a depth of 40 cmbs, at which point excavations were terminated in sterile subsoil.

The horizontal distribution of artifacts across units in the block was fairly even with the exception of XU-10; XU-10 yielded a substantially lower number of artifacts compared to the other units. It is noteworthy that XU-10 also happens to be the northernmost unit in the block; perhaps the location of this unit is approaching the northern site limits. XU-9 and XU-10 were devoid of charcoal; all other units contained diffuse scatters of flecks throughout at depths below 11 cmbs. Historic artifacts were present in all units except XU-10; however, only nine total specimens—most of which were round-headed wire nails—were unearthed from the block. No features were observed within the Block 2 excavation grid, nor were any localized activity areas (such as concentrations of lithic reduction detritus characteristic of a knapping station) detected.

The vertical distribution of artifacts in Block 2 was relatively similar to that observed in Block 1; the majority of specimens were recovered from 11–20 cmbs (Table 6). This level ultimately yielded 758 items, or over 48 percent of the total number recovered from the block. Most of the units in the block were sterile below 35 cmbs; however, XU-6 and XU-8 contained a light scatter of FCR and a few charcoal flecks below this depth. Historic artifacts were discovered at or below the depth of prehistoric material throughout the upper 25 cm in the block. In XU-8, a steel

animal trap pressure plate was discovered at a depth of approximately 25 cmbs; no historic specimens were discovered below this depth.

Figure 26. Overview of Block 2 area, site 21KH36, northern orientation.

Table 5. Distribution and Count of Recovered Materials by Unit, Block 2, Site 21KH36.

Unit No.	Artifact Material Type						
	Lithic	Ceramic	Faunal	FCR	Charcoal	Historic	Total*
5	66	22	82	99	Yes	1	**270**
6	52	15	81	117	Yes	2	**267**
8	66	17	79	109	Yes	2	**273**
9	72	16	29	165	—	1	**283**
10	19	24	25	81	—	—	**149**
11	108	17	104	101	Yes	3	**333**
Total	**383**	**111**	**400**	**672**	**N/A**	**9**	**1,575**

*** Does not include charcoal**

Table 6. Distribution and Count of Recovered Materials by Depth Below Surface, Block 2, Site 21KH36.

Depth (cmbs)†	Artifact Material Type						
	Lithic	Ceramic	Faunal	FCR	Charcoal	Historic	Total*
0–3	—	—	—	—	—	—	**0**
4–10	64	40	53	127	—	3	**287**
11–20	156	57	229	311	Yes	5	**758**
21–30	123	8	59	180	Yes	1	**371**
31-40	40	6	59	54	Yes	—	**159**

*** Does not include charcoal**
† Although units were excavated in 10-cm levels, the uppermost 3 cmbs was sterile in Block 2; it is shown separately above.

A soil profile drawing of the west wall of Block 2 (which consisted of XUs 5 and 6) was completed subsequent to excavation (Figure 27). To obtain a clearer view of the lake terrace deposits, a 1-inch-diameter Oakfield probe was used to extract a soil core from the base of XU-5 to a depth of 101 cmbs. Like Block 1, the soils comprising Block 2 are representative of the mapped Kilkenny series (see Giencke 1987:89). Comparatively speaking, the Block 2 soils retained a deeper A-horizon than that observed in Block 1, which likely explains the slightly greater depth to sterile subsoil in the block. More significantly, no plowzone was detected in the Block 2 area. If one is present, it is old and far more subtle. An examination of 1938 and 1963 aerial photographs of the site area reveals a far sparser distribution of woodlands than exists today; however, in each image, the immediate site area north of the cultivated hill still appears to be in pasture (Figure 28). The images suggest that the majority of the lower lake terrace was devoid of trees during those times, so it *is* possible that the area was cultivated in the early 1930s just prior to when the 1938 image was taken.

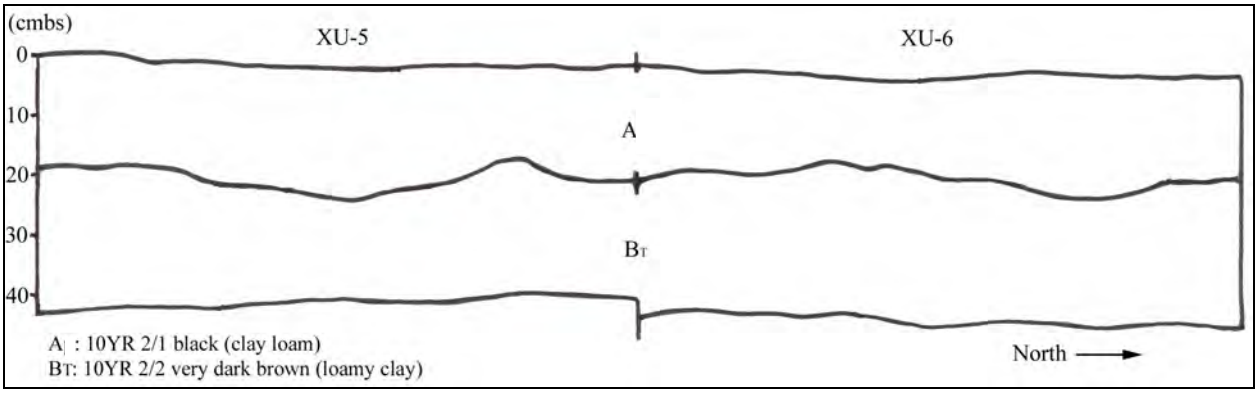


Figure 27. West wall profile, XU-5 and XU-6, Block 2, site 21KH36.

The Block 2 excavation results are quite similar to the results from Block 1. Archeological deposits are relatively shallowly buried in the lower lake terrace landform at the site. ALAC recovered nothing from below approximately 38 cmbs during the current investigations, and the MNSAS testing discovered only a very few specimens from 45 cmbs (Olson 1980:1-5). No stratigraphic separation of artifacts exists, no intact features were observed, and, while not as pronounced as in Block 1, previous disturbance to the archeological deposits is present in the form of animal burrowing, root action, and possible cultivation.

Excavation Results

The results of subsurface testing at Blocks 1 and 2 affirmed the presence of buried cultural deposits similar to those that were previously documented at the site (see Olson 1980; Trow 1980). All units excavated at site 21KH36 during the current study yielded both prehistoric and historic-period cultural material except XU-10; XU-10 was devoid of historic artifacts.

Collectively, 1,933 artifacts were recovered from site 21KH36 during the current investigation. The following material types were identified: historic refuse (n=13); lithics (n=436—including 15 tools); prehistoric ceramics (n=141—including 36 rim or rim fragments); FCR (n=858); and faunal remains (n=485). Small charcoal flecks were also identified during the course of excavations; however, because these were not associated with an intact feature, they were neither counted nor submitted for AMS-dating. While a substantial amount of cultural material was recovered, no prehistoric features, such as hearths, pits, or house floors, were encountered while testing the site. Despite the significant quantity of FCR recovered from the site—over 44 percent of the total artifact assemblage—the majority was a collection of very small and fragmentary pieces and no discernable concentrations were noted.

An analysis of ceramic rimsherds recovered from the current excavations, as well as specimens in Levin's private collection from the site, identified prehistoric cultural components associated with Prairie Village, Terminal Woodland (Sandy Lake), Late Woodland (Kathio or Onamia, Lake Benton), Early Late Woodland (St. Croix), Middle Woodland (Fox Lake, Malmo, Pokegama Smooth or Punctated, and Havanoid), and Early Woodland (Brainerd)

manifestations (see Johnson, this report, pages 79, 82, and 91-98). The identifiable wares recovered during the current investigation were not arranged stratigraphically in a manner consistent with their previously defined chronological order (e.g., Middle Woodland, Late Woodland, and Prairie Village rims were all recovered from the same depth below surface while another Prairie Village specimen was extracted from greater depths than these) (see Appendix C, Table C2).

site location edited

Figure 28. 1938 (top) and 1963 (bottom) aerial photographs of site 21KH36 depicting the extent of tree cover on the lower lake terrace (as identified by red arrows) portion of the site (courtesy of Minnesota Department of Natural Resources 2014a).

Site 21KH46 (Kasota Lake Site)

Site Number: 21KH46	**Site Name:** Kasota Lake
Site Type/Function: Habitation	**Legal Location:** edited *
Landscape Position: Lake Terrace	**Site Area (ac):** 1.60
Elevation Above Mean Sea Level (ft): 1,108-1,126	**ALAC Excavations:** Six 1-m-x-1-m Units & four 40-cm-diameter Shovel Tests
Cultural Affiliation: Woodland through Historic; possible pre-ceramic component(s)	**Site Condition:** Disturbed
USGS 7.5' Quadrangle: Little Kandiyohi Lake (1982)	**Archaeological Subregion:** 2n

The Kasota Lake site, 21KH46, is a prehistoric/historic multi-component habitation. Late Woodland (Kathio and Onamia), transitional Early to Late Woodland (St. Croix Dentate Stamp), and Middle Woodland (Havanoid) contexts are represented, together with foundations and depressions associated with an historic-period farm. Muñiz et al. (2012:3) also cite a Plains Village and Mississippian presence at the site, as well as one or more possible pre-ceramic components. The site, located north of site 21KH36, overlooks the shores of Kasota Lake.
(Figure 29; see Figures 20 and 22, above)
.

The entirety of the site is situated on a wooded lake terrace with rolling upland hills immediately to the south and wrapping around the eastern and northeastern edge in a horseshoe-like shape that opens to the northwest (Figure 30). Vegetation consists of a canopy of second-growth mixed hardwoods above a moderately dense understory. At the time of the study, ground surface visibility averaged 40 percent, although this varied considerably throughout the site area—some areas offered good exposure while others were quite obscured by undergrowth and fallen leaf cover.

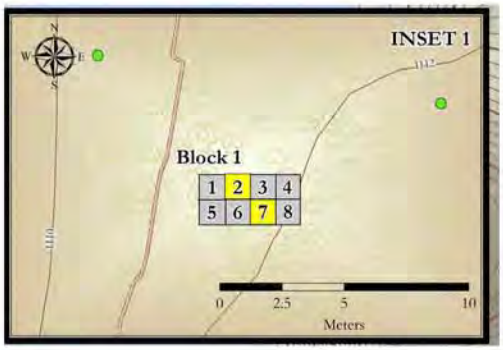
Figure 29. View across Kasota Lake from the western shore towards site 21KH46 (approximate location identified by red arrow), eastern orientation.

Soils in the majority of the site area are described as having been formed on glacial outwash plains either in or below a thin, discontinuous mantle of loamy lacustrine material. Soils mapped across the approximate northern half of the site relate to the Regal-Hawick complex (Giencke 1987:49); those mapped in the approximate southern half of the site relate to the Estherville-Hawick complex (Giencke 1987:53-54).

Research History

Site 21KH46 was first documented in May of 1980 during the same MnSAS investigation that led to the documentation of the Mennetaga site (21KH36, see above). According to site records, site 21KH46 was visited prior to May 14, 1980 by a crew consisting of then MHS archeologists Tom Trow and John Hunn (21KH46 site file). Like site 21KH36, this site had also been frequented by collectors prior to formal documentation (Larry Levin, personal communication 2012). Local resident Larry Levin, who has intermittently collected from site 21KH46 since 1979, retains a small collection of ceramics and other artifacts from the site. In 1980, Levin also excavated an approximately 1-m-x-1-m test unit in the southeastern part of the site. In describing the excavation of this unit, Levin noted reaching a "pavement" of prehistoric ceramics at one point (Larry Levin, personal communication 2013).

site location edited



Data are to be used for Reference purposes only.
Source:
National Elevation Dataset (2010)
Universal Transverse Mercator, NAD83 T119N, R33W
T119N, R34W
Path:
Minnesota Reports\Woodland Tradition Study\GIS Data
Author: ALAC Date: February 2013

FIGURE 30
BARE EARTH LiDAR
IMAGERY OF SITE 21KH46

N
W E
S
Note: Gray Units in Insets are Unexcavated

0 25 50 100
Meters

LEGEND
ALAC Excavation Block
Previous Excavation Unit
Negative Shovel Test
Positive Shovel Test
Two-track
Site Boundary
Section Line
Waterbody

Copies of MNSAS field notes from the 1980 Kandiyohi County survey were provided by the OSA (Olson 1980; Trow 1980); unfortunately, the notes revealed no information concerning the site designated Field Number 10-1 (subsequently assigned site number 21KH46). As a result, the only information to be gleaned from this early work at the site derives from the one-page site form (21KH46 site file).

The original site form notes three extant historic foundations at the site, including a nearly intact root cellar and a nearby well, but no additional information concerning these features is provided (21KH46 site file). A detailed examination of the historic component of this site is beyond the scope of the current study; however, a 2011 rural landscape study of the Reid Woods and Kasota chain of lakes provides additional information on the historic elements of site 21KH46, as well as a general historical background on the larger chain of lakes and Kandiyohi County areas (Gronhovd and Buck 2011:35-46).

Site records indicate that, as part of the MNSAS initiative, MHS archeologists conducted a surface survey of the site and excavated an unspecified number of shovel tests (21KH46 site file). Prehistoric material recovered from the site during this investigation included: "Numerous body sherds, grit-tempered, cord-wrapped dowel impressed. Rim sherd: cord wrapped stick on top, dentate stamped at near-rim. 3 utilized oolitic chert flakes, 4 utilized knife river flint flakes, 1 unifacially worked oolitic chert flake, 7 chert flakes, 4 oolitic flakes, 1 quartzite flake, 1 jasperlite flake, 1 canine mandible, fish, turtle, rodent, bird & small mammal bones" (21KH46 site file). Material recovered from the MNSAS investigation is curated at the MHS under Accession No. 183-35.

In 2007, the Minnesota Department of Natural Resources (DNR), which had recently acquired the land, proposed to construct a public water access ramp and associated loop road with vehicle parking spaces within the site boundaries. In response to the proposed project, MHS archeologists conducted a pedestrian survey and evaluative testing at the site between August 27 and October 5, 2007. In total, 16 shovel tests, one 1-m-x-1-m unit, and one 50-cm-x-50-cm unit were excavated during the study (Tumberg et al. 2009:2; see Figure 30, above). The survey also identified six historic structure features including a dry-laid stone foundation, a well, an intact root cellar, and three dugout foundations (Tumberg et al. 2009:2-3). All but three of the subsurface tests yielded prehistoric cultural material; the three westernmost shovel tests, located on the lower lake terrace, yielded only modern refuse and a few fragments of faunal remains believed to be unrelated to the site (Tumberg et al. 2009:3).

The 2007 testing yielded a total of 1,948 precontact artifacts, including 209 lithics, 590 ceramics, and 1,149 faunal specimens (Tumberg et al. 2009:4). Of particular interest in this collection is the ceramic assemblage—specifically the 18 rimsherds recovered. Three observations concerning the ceramics are considered especially germane to the present investigation. First, Tumberg et al. (2009:5) were able to identify six distinct ceramic ware types based on preliminary analyses: Cambria (Village), Blue Earth and Orr (Oneota), Clam River and Kathio (Late Woodland), and Brainerd (Early Woodland). Also recovered was a rim with unfamiliar decoration. At the time, it was posited that this unique rim might represent a hitherto unidentified west-central Minnesota ceramic type (Tumberg et al. 2009:5) or, alternatively, an extreme southern manifestation of northern Minnesota's Laurel culture (Muñiz et al. 2012:4). Secondly, all of the precontact ceramics recovered from the formal 1-m-x-1-m unit derived from the upper 55 cmbs; the majority of these (nearly 75 percent) were discovered between 20 and 40 cmbs (Tumberg et al. 2009:3). Finally, and most significantly, Muniz et al. (2012:3) indicate that the pottery recovered from the site was "…stratified in chronological order…" In a subsequent discussion about this stratigraphy, Tim Tumberg cautioned that, while some of the evidence points in that direction (i.e., earlier period ceramics recovered from lower excavation levels), artifacts recovered from the site during the 2007 testing have only been subjected to preliminary analyses—intensive analyses of the artifacts have yet to be undertaken (Tim Tumberg, personal communication 2013).

2013 Investigation Description and Results

ALAC initiated fieldwork at site 21KH46 on August 19, 2013; work continued at the site through August 21. From August 27–28, 2013, OSA personnel conducted additional excavations there. In total, six 1-m-x-1-m formal units and four ca. 40-cm-diameter shovel tests were excavated at the site. Shovel tests (STs) were numbered sequentially in the order in which they were excavated; they are labeled OSA STs 1–4 on Figure 30 to differentiate them from the previous MHS tests. The formal units were established within two separate grid blocks laid-out along east-west baselines. Block 1 was set on a 2-m-x-4-m grid while Block 2 was set on a 2-m-x-5-m grid. One-meter-square XUs in the

grids were numbered sequentially beginning with 1 and ending with 18; Block 1 contained XUs 1–8, while Block 2 contained XUs 9–18. In Block 1, XUs 2 and 7 were excavated. In Block 2, XUs 11 and 16–18 were excavated (see Figure 30, above).

Historic Structure Features

The position of each of the six historic structure features was previously mapped with GPS equipment during the 2007 survey of the site (see Figure 30, above). The features were minimally addressed during that investigation (Tumberg et al. 2009:2–3) and were not further documented by ALAC as part of the current study.

Shovel Test Findings

Four 40-cm-diameter shovel tests, designated OSA STs 1–4, were excavated during the current study. Each test was positive, yielding both prehistoric and historic-period cultural material (Table 7; see Figure 30, above). OSA ST-1 was excavated atop a prominent hill near the eastern edge of the site. It was positioned approximately 13 m west of County Road 134 and 41 m north of the dugout features. The test was excavated to a depth of 45 cmbs. The remaining three tests were excavated in the southern portion of the site on the lower lake terrace landform. OSA ST-2 was placed 5 m west of the westernmost point on ALAC's Block 2 baseline. It was excavated to a depth of 60 cmbs. OSA ST-3 was placed 15 m east of ALAC's excavation Block 2. The deepest of the four STs, OSA ST-3 was excavated to a depth of 90 cmbs. This test yielded over 53 percent of all artifacts recovered from the four STs; however, the vast majority of these were historic-period specimens. OSA ST-4 was positioned 12 m north of ALAC's Block 2 and excavated to a depth of 75 cmbs.

Table 7. Cultural Material Recovered from 2013 Shovel Tests, Site 21KH46.

Shovel Test No.	Artifact Material Type						
	Lithic	**Ceramic**	**Faunal**	**FCR**	**Charcoal**	**Historic**	**Total***
1	—	3	18	4	—	1	**26**
2	2	8	14	6	Yes	1	**31**
3	2	9	32	21	—	53	**117**
4	5	8	13	13	Yes	7	**46**
Total	**9**	**28**	**77**	**44**	**N/A**	**62**	**220**

*** Does not include charcoal**

Although detailed profiles were not obtained from the four shovel tests, soils observed in the three excavated on the lower lake terrace landform (OSA STs 2–4) are quite similar to those documented in the nearby Block 2 excavation (see below) and mapped as part of the Estherville-Hawick complex (Giencke 1987:53-54). Soils atop the ridge in OSA ST-1 appear consistent with those mapped in the Estherville-Hawick complex (Giencke 1987:53-54). Specifically, soils in OSA ST-1 grade from a black (10YR 2/1) sandy loam surface soil into a dark brown (10YR 3/3) sandy loam with depth. This description, coupled with the landform setting, corresponds well to that of the mapped Hawick series (Giencke 1987:88).

Block Area 1

Excavation Block 1 was established on an east-west baseline in the western part of the site approximately 2.5 m east of an abandoned, north-south-oriented two-track (Figure 31; see Figure 30, above). Two formal 1-m-x-1-m units, XU-2 and XU-7, were opened in this block. These units each yielded an array of historic-period artifacts commingled with a lesser quantity of prehistoric specimens. In total, 213 artifacts were recovered from the block area, 118 of which (over 55 percent) were historic (Table 8). Very little soil development has occurred in this portion of the site and each of the two excavated units was abandoned at a shallow depth in a gravelly sand subsoil. Excavations in XU-2 were terminated at a depth of 20 cmbs, while those in XU-7 ceased at 30 cmbs. The decision to terminate excavations in the block was the combined result of a precipitous drop in artifacts below 20 cmbs and the emergence of heavy gravel deposits just

above the base of XU-7. Although no plowzone was detected, cultural component mixing was observed in all excavated levels of each unit. No cultural features or activity areas were identified in the block. Despite its shallower excavated depth, XU-2 yielded nearly 73 percent of the total number of artifacts recovered from Block 1; XU-7 produced a greater number of lithics, prehistoric ceramics, and FCR. Table 9 shows the distribution and count of cultural material types recovered from Block 1 by depth.

Figure 31. Overview of Block 1 area, site 21KH46, eastern orientation.

Table 8. Distribution and Count of Recovered Materials by Unit, Block 1, Site 21KH46.

Unit No.	Artifact Material Type						
	Lithic	Ceramic	Faunal	FCR	Charcoal	Historic	Total*
2	—	3	53	5	Yes	94	**155**
7	7	7	9	11	Yes	24	**58**
Total	**7**	**10**	**62**	**16**	**N/A**	**118**	**213**

*** Does not include charcoal**

Table 9. Distribution and Count of Recovered Materials by Depth Below Surface, Block 1, Site 21KH46.

Depth (cmbs)	Artifact Material Type						
	Lithic	Ceramic	Faunal	FCR	Charcoal	Historic	Total*
0–10	3	4	4	1	—	77	**89**
11–20	4	6	57	10	Yes	40	**117**
21–30	—	—	1	5	Yes	1	**7**

*** Does not include charcoal**

Nearly all of the cultural material from this block (almost 97 percent) was recovered from 0–20 cmbs. Although the distribution comparisons between the upper two levels seem fairly even, what appears most significant is the prevalence of historic artifacts relative to prehistoric specimens recovered. Over 55 percent of the Block 1 artifact

assemblage consists of historic artifacts—and this figure does not take into consideration the number of potentially historic faunal specimens recovered. It is also noteworthy that, of the only seven artifacts recovered from the lowest excavated level of the block, one is historic.

Soils observed in the two units of Block 1 are consistent with those of the mapped Regal-Hawick complex (see Giencke 1987:49). The soils correspond particularly well with those of the sandy and gravelly Hawick series (Giencke 1987:88). Specifically, soils comprising the block fill consisted of a very dark grayish brown (10YR 3/2) loamy sand with a substantial gravel content. In the floor of Level 3 at 30 cmbs—the very base of the block—a subtle transition into a dark brown (10YR 3/3) loamy sand with increased gravels was detected (Figure 32). Because this transition between soils was not visible in the wall of the block, a profile drawing was not completed. Similar to the blocks excavated at site 21KH36, no stratigraphic segregation of artifacts is present here.

Figure 32. Close-up of the heavy gravel distribution across the base of Level 3, XU-7, site 21KH46.

Block Area 2

Excavation Block 2 was established on an east-west baseline in the southern portion of the site approximately 65 m southeast of Block 1 (Figure 33; see Figure 30, above). ALAC and OSA personnel excavated four formal 1-m-x-1-m units within the 2-m-x-5-m grid. Units excavated were XU-11, and XU-16–XU-18. The units in Block 2 were each excavated to a minimum depth of 60 cmbs. Excavations in XU-16 were extended to 65 cmbs while those in XU-11 were extended to 70 cmbs. In XU-17, excavations in all but the NE¼ of the unit were brought to 65 cmbs—the NE¼ was excavated to a depth of 75 cmbs. Excavations in XUs 16 and 17 were carried-out in 5-cm levels below 40 cmbs; arbitrary 10-cm levels were used otherwise. Artifacts were recovered from the surface of Block 2 to as deep as the 70-75 cmbs level. A total of 2,069 artifacts were recovered from the block (Table 10).

Figure 33. Overview of Block 2 area, site 21KH46, eastern orientation.

The horizontal distribution of artifacts across units in the block was fairly even with the exception of XU-17; XU-17 yielded, on average, 545 more artifacts than the other units, or nearly 45 percent of the total number of recovered specimens. Excavations in XU-17 did extend slightly deeper than in the other Block 2 units; however, very little material was ultimately recovered from these lower levels. All units contained diffuse scatters of charcoal flecks throughout, although no defined concentrations were observed. Five seeds were recovered from the fill of F-1 and F-2; however, none are charred. Historic artifacts were present in all units of Block 2, although over 79 percent of the historic assemblage (231 specimens) was recovered from XUs 16 and 17. While XU-16 yielded the majority of historic specimens, it contained comparatively little in the way of prehistoric items. The disparity between lithics and ceramics in this block is also interesting. Very few lithics were recovered from this portion of the site, whereas the block yielded a comparatively large quantity of pottery—a result consistent with the findings from the 2007 testing project (see Tumberg et al. 2009:3). Two ephemeral features were observed within the Block 2 grid (see below); however, no localized activity areas (such as concentrations of lithic reduction detritus characteristic of a knapping station) were detected.

Table 10. Distribution and Count of Recovered Materials by Unit, Block 2, Site 21KH46.

Unit No.	Artifact Material Type						
	Lithic	**Ceramic**	**Faunal**	**FCR**	**Botanical**	**Historic**	**Total***
11	23	116	123	98	Charcoal (Yes)	14	**374**
16	19	48	75	98	Charcoal (Yes)	146	**386**
17	60	230	345	201	Charcoal (Yes) Seed (5)	85	**926**
18	13	121	85	117	Charcoal (Yes)	47	**383**
Total	**115**	**515**	**628**	**514**	**5***	**292**	**2,069**

*** Does not include charcoal**

Table 11 provides the vertical distribution of artifacts in Block 2. The majority of specimens were recovered between 11 and 60 cmbs; specimen counts above 11 cmbs and below 60 cmbs are extremely sparse. The two most prolific levels were 11–20 cmbs (yielded 441 artifacts) and 41–50 cmbs (yielded 473 items), respectively. However, of the 441 specimens recovered from 11–20 cmbs, 203 items, or over 46 percent, were historic. By contrast, no historic-period items were recovered from the 41–50 cmbs level.

Historic artifacts were discovered stratigraphically with, or below, prehistoric material throughout the upper 40 cmbs in the block. With one exception, the entire block was devoid of historic artifacts below 40 cmbs. The exception is five tiny fragments of plaster recovered from Level 9 (60–65 cmbs) of XU-16. However, these fragments were discovered in the northwest corner of the unit adjacent to an old rodent run and were almost certainly redeposited from shallower depths. Over 45 percent (52 items) of all the lithics recovered from Block 2 derived from 41–50 cmbs. Lithic distribution by depth was otherwise fairly consistent; one flake was discovered as deep as Level 11 (70–75 cmbs) in XU-17. Faunal material was fairly evenly distributed between 11 and 60 cmbs in the block. The greatest quantities of faunal material were recovered from 11–20 cmbs (though a substantial portion of this may be historic) and 41–60 cmbs. In terms of pottery, prehistoric specimens were recovered from the surface down through Level 9 (60–65 cmbs) in the block. However, over 64 percent of the prehistoric ceramic assemblage (332 specimens) was recovered from 31–50 cmbs. Compared to the 2007 testing (see Tumberg et al. 2009:3), the main ceramic-bearing deposits in Block 2 are, on average, 10 cm deeper.

Table 11. Distribution and Count of Recovered Materials by Depth Below Surface, Block 2, Site 21KH46.

Depth (cmbs)†	Artifact Material Type						
	Lithic	Ceramic	Faunal	FCR	Botanical	Historic	Total*
0–10	1	12	25	8	Charcoal (Yes)	11	**57**
11–20	12	48	136	42	Charcoal (Yes)	203	**441**
21–30	12	55	95	58	Charcoal (Yes)	59	**279**
31–40	16	158	84	110	Charcoal (Yes)	14	**382**
41-50	52	174	136	111	Charcoal (Yes)	—	**473**
51-60	16	65	137	126	Charcoal (Yes) Seed (3)	—	**347**
61-70	5	3	15	59	Charcoal (Yes) Seed (2)	5‡	**89**
71-75	1	—	—	—	—	—	**1**

*** Does not include charcoal.**
† The final excavated level was a 5-cm level.
‡ plaster fragments likely redeposited via rodent run.

A soil profile drawing of the north wall of XU-11 was completed subsequent to excavation of the unit (Figure 34). The soils in Block 2 are representative of the mapped Estherville series (see Giencke 1987:85). Comparatively speaking, the Block 2 soils are deeper and far more developed than those observed in Block 1. No plowzone was detected in the Block 2 area. Soil horizon transitions in Block 2 were quite subtle, grading from a black (10YR 2/1) fine sandy silt loam into slightly grayer (10YR 3/1) and browner (10YR 3/2) shades with depth. In terms of texture, soils in the block seemed to increase in silt content and decrease in loam content with depth. Very few gravels were noted during excavations in the block, although root casts were prolific and some krotovina were present.

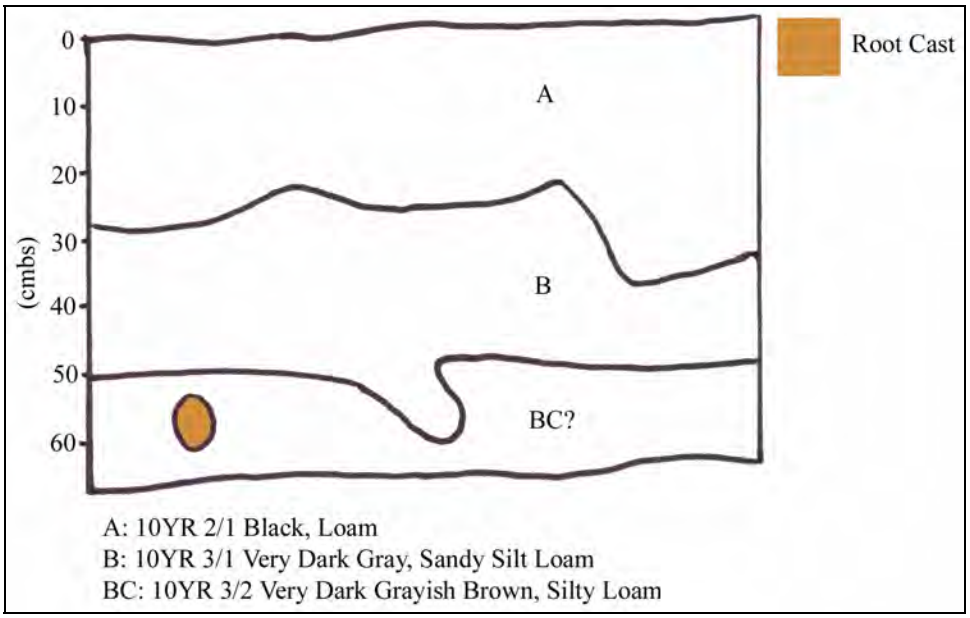


Figure 34. North wall profile, XU-11, Block 2, site 21KH46.

Features 1 and 2

Two features, F-1 and F-2, were identified in Block 2 by OSA personnel. Both features were uncovered in Level 8 (55–60 cmbs) of XU-17 (Figures 35 and 36). F-1 was located in the approximate NE¼ of the unit while F-2 was discovered along the unit's south wall (Figures 37 and 38). Both features consisted of discrete clusters of small rocks and bone. They were discovered at the same depth below surface; four additional pieces of FCR were also mapped at the same depth (see Figure 35). F-1 measures 30 cm east-west by 20 cm north-south. F-2 measures 10 cm east-west by 20 cm north-south. Each feature was excavated and retained in soil sample bags for water-screening.

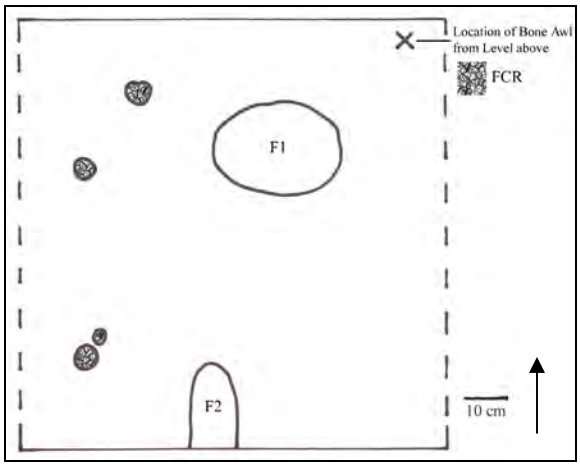


Figure 35. Plan view of F-1 and F-2, Level 8 (55-60 cmbs), XU-17, Block 2, site 21KH46.

The features were very ephemeral, closely resembling occupation surfaces identified at the Fox Lake (21MR2) and Pedersen (21LN2) sites in southwestern Minnesota (Scott Anfinson, personal communication 2014). No additional discrete features were identified in other areas of the block at the same depth below surface; however, a bone awl was recovered from Level 7 (50-55 cmbs), just above F-1 and F-2 in the extreme NE¼ of XU-17 (see Figure 35).

Figure 36. View of Features 1 and 2, Level 8 (55-60 cmbs), XU-17, Block 2, site 21KH46.

Figure 37. Close-up of Feature 1, Level 8 (55-60 cmbs), XU-17, Block 2, site 21KH46.

Figure 38. Close-up of Feature 2 extending from the south wall of the unit, Level 8 (55-60 cmbs), XU-17, Block 2, site 21KH46.

Cultural material recovered from water-screening the F-1 and F-2 fill is very limited. Combined, the features yielded a total of 68 artifacts plus limited charcoal flecks and numerous tiny bone crumbs. Specific items recovered include lithic flakes (n=2), ceramic bodysherds (n=1), faunal fragments (n=14), FCR (n=46), and uncharred seeds (n=5). Additional artifacts documented from the same depth below surface elsewhere in the block include lithic flakes (n=2), ceramic bodysherds (n=17), faunal fragments (n=22), and FCR (n=16). Although the two features are primarily comprised of FCR and also contain limited quantities of charcoal, they were not documented in association with ash deposits or burned earth, nor were they confined to any sort of identifiable basin.

Excavations in Block 2 were more productive archeologically than those in Block 1 in the sense that soils were better developed and more cultural material was recovered. However, modern disturbance to the archeological deposits in the upper 40 cm is substantial in this portion of the site. This disturbance is manifested in the commingling of historic and prehistoric material to 40 cmbs in both the STs and block excavations; Tumberg et al. (2009:3) also recorded historic artifacts as deep as 35–40 cmbs. Prehistoric artifacts were recovered from as deep as 70–75 cmbs; however, the general artifact density decreased rapidly below 55 cmbs throughout the block. No stratigraphic separation of artifacts was observed, nor were any settlement features, such as hearths, cache pits, or structural post molds.

Excavation Results

ALAC and OSA personnel excavated four STs and six 1-m-x-1-m formal units at site 21KH46 during the current study. All tests excavated (including STs and XUs) yielded both prehistoric and historic-period cultural material. Historic material was intermixed with prehistoric specimens in the upper 40 cmbs throughout the site. Prehistoric deposits were discovered as deep as 70–75 cmbs in Block 2; however, the majority of cultural deposits were confined to a zone extending from 11–55 cmbs.

Collectively, 2,502 artifacts were recovered from site 21KH46 during the current investigation; nearly 83 percent of these (2,069 items) were recovered from Block 2. Block 1, near the western edge of the site above the Kasota Lake shore, was fairly unproductive, yielding only 8.5 percent of the total recovered artifact assemblage. Much of this circumstance is likely the result of heavy modern disturbance and/or poorly developed soils in this area. The following material types were identified: historic/modern refuse (n=472); lithics (n=131—including 7 tool/tool fragments); prehistoric ceramics (n=553—including 56 rim/rim fragments); FCR (n=574); botanical specimens (n=5 seeds); and faunal remains (n=767). Various small charcoal flecks and numerous tiny bone crumbs were also identified during the course of excavations.

Despite the substantial amount of cultural material recovered, no prehistoric settlement features, such as hearths, cache pits, or dwelling structure remnants, were encountered while testing the site. Two features, F-1 and F-2, were identified in Block 2; however, these are most probably artifacts clustered (likely as a result of sheetwash) on occupation surface remnants.

An analysis of recovered ceramic rimsherds identified prehistoric cultural components associated with Late Woodland (Kathio and Onamia), transitional Middle to Late Woodland (St. Croix), and Middle Woodland (Havanoid) site occupations (see Johnson, this report, pages 79-80; see also Appendix C, Tables C3 and C4). Unlike previous excavations, no Village or Oneota pottery was recovered, nor was any Woodland-period Clam River or Brainerd ware (Tumberg et al. 2009:5). Additionally, and perhaps more significantly, while preliminary analyses of pottery from the 2007 excavations suggest the possibility that some ceramic deposits may be stratigraphically separated and in chronological sequence (Tim Tumberg, personal communication 2014), the current study detected no such trends in vertical deposition (see Johnson, this report, pages 79-80; see also Appendix C, Tables C3 and C4). The extent to which ceramics from the 2007 testing are stratigraphically and chronologically intact will remain unknown until a more detailed analysis of the material is complete. If it is ultimately determined that ceramic deposits from the 2007 testing block are, indeed, stratigraphically intact and in chronological order, then it is recommended that future evaluative efforts be directed towards the immediate vicinity of that testing block as none of the locations tested during the present study retain stratigraphically intact deposits.

Site 21KH93 (Levin Site)

Site Number: 21KH93	**Site Name:** Levin
Site Type/Function: Habitation	**Legal Location: edited** *
Landscape Position: Lake Terrace	**Site Area (ac):** 28.94
Elevation Above Mean Sea Level (ft): 1,110-1,142	**ALAC Excavations:** Ten 1-m-x-1-m units, four 50-cm-x-50-cm units, and five 40-cm-diameter shovel tests
Cultural Affiliation: Late Paleoindian through Historic	**Site Condition:** Disturbed
USGS 7.5' Quadrangle: Little Kandiyohi Lake (1982)	**Archaeological Subregion:** 2n

Site 21KH93, the Levin site, is a multi-component habitation containing artifacts associated with the Late Paleoindian through historic periods. The site is situated, primarily, on what is now a peninsula that extends into the Lake Wagonga in Kandiyohi County. A small portion of the site extends from the peninsula across a low-lying isthmus (Figures 39-44; see Figure 20, above). Through time, the landform has likely fluctuated between being an island and a peninsula based on local and/or regional climatic oscillations.

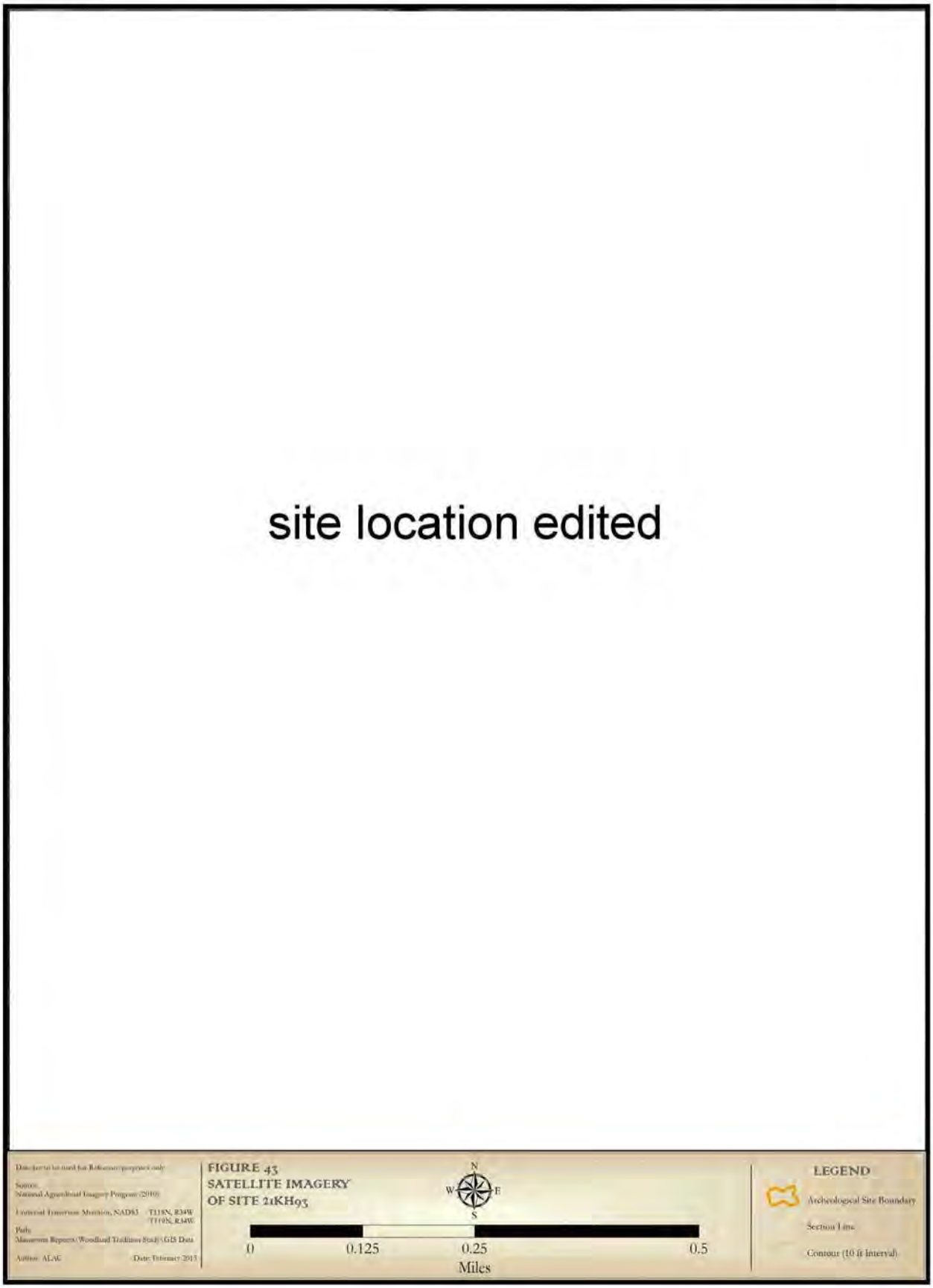
The majority of site 21KH93 is wooded, lying beneath a relatively young, moderately dense-to-dense deciduous canopy north of the peninsular isthmus (see Figures 39 and 43). Although the understory throughout this portion of the site was quite sparse, ground surface visibility was still generally poor, ranging from 0 to 20 percent. Those portions of the site that are presently not wooded include the southernmost, cultivated end and a few widely scattered pasture clearings on the peninsula (see Figure 43). Two cultivated fields—one immediately north of the isthmus and one immediately south—comprise the southernmost end of the site. The cultivated field south of the isthmus was planted to soybeans at the time of the current investigation (see Figure 40). Ground surface visibility in this portion of the site averaged 15 percent. The recently plowed field north of the isthmus was unplanted and clear; ground surface visibility was 100 percent in this area during the current study (see Figure 41). The largest of the clearings at the site was a long, narrow north-south strip of land that had been previously cultivated. At the time of the investigation, it was largely vegetated with high grass that afforded no ground surface visibility (Figure 42). The other, much smaller clearings afforded equally poor visibility.

Figure 39. View of the wooded portion of site 21KH93, northeastern orientation.

Figure 40. The cultivated, southernmost portion of site 21KH93 from the isthmus, south-southeastern orientation.

Figure 41. The cultivated portion of site 21KH93 north of the isthmus, east-southeastern orientation.

Figure 42. The previously cultivated pasture clearing at site 21KH93, northern orientation.


site location edited
Data layer(s) to be used for Reference/projection only:
Source:
National Agricultural Imagery Program (2010)
Universal Transverse Mercator, NAD83
T118N, R34W
T119N, R34W
Path:
Manuscript Reports\Woodland Tradition Study\GIS Data
Author: ALAC
Date: February 2013
FIGURE 43
SATELLITE IMAGERY
OF SITE 21KH93
N
W
E
S
0
0.125
0.25
0.5
Miles
LEGEND
Archeological Site Boundary
Section Line
Contour (10 ft Interval)

site location edited

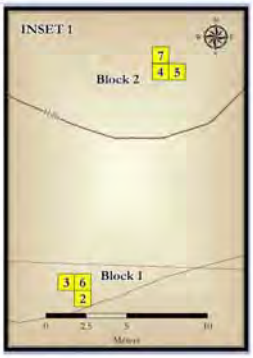


FIGURE 4.4
BARE EARTH LIDAR
IMAGERY OF SITE 21KH93

0 50 100 200
Meters

LEGEND

Soils throughout the site area, described as predominantly loamy and silty in composition, were formed in glacial till on till plains. Soils mapped in all areas but the isthmus and the extreme southernmost portion of the site are classified as Lester loam (Giencke 1987:18-19). Along the isthmus, mapped soils relate to the Regal-Hawick complex (Giencke 1987:49), while those in the southernmost site area are classified as Normania loam (Giencke 1987:29-30).

Research History

In the fall of 1977, the landowner cleared about 20 acres of trees from property adjacent to the lake. After the trees were downed, a D-9 Caterpillar was used to push the timber into a pile and to uproot the remaining stumps in the field. The piled timber was then burned to allow for the planting of alfalfa in the field (Levin 1987:37). Larry Levin began collecting at this site shortly thereafter, in the summer of 1980, and has continued to do so ever since. Levin also excavated a small unit near the lakeshore at the southern end of the site several years ago, although the majority of his finds are the result of walking the freshly plowed fields. Levin mentioned that, with the consent of the landowner, he himself, on multiple occasions in the past, hired someone to plow the fields for the express purpose of uncovering additional artifacts (Larry Levin, personal communication 2013). Not surprisingly, almost all of Levin's finds were confined to the southernmost, cultivated portion of the site on either side of the isthmus. Interestingly, the narrow north-south strip of previously plowed land further north on the peninsula, that is now a pasture clearing, was examined by Levin shortly after it was originally plowed but nothing was discovered there (Larry Levin, personal communication 2013).

Over the years, a limited number of other individuals have collected from the site; however, the vast majority of the collected artifacts were recovered by Levin, who now houses the material in his private Raptor Ridge Museum near Spicer. Among this collection are hundreds of prehistoric ceramic and projectile point specimens (see Appendix B).

The 21KH93 site file indicates that the site has never been investigated by professional archeologists; this was later confirmed by Levin.

2013 Investigation Description and Results

Investigations at the Levin site were carried out from August 1–8 and 13–14, 2013. A total of 10 1-m-x-1-m units, four 50-cm-x-50-cm units, and five ca. 40-cm-diameter shovel tests were excavated at the site during this time; these were numbered sequentially in the order in which they were excavated. Because of their more exploratory nature, the 50-cm-x-50-cm units were designated as *shovel tests* and labeled STs 1–4, accordingly. The five additional shovel tests, excavated by OSA personnel, were labeled OSA STs 1–5. Formal 1-m-x-1-m units were labeled XUs 1–10. Only one test excavated during the current study, ST-4, was devoid of cultural deposits; all additional tests were positive. Formal excavation units, including two isolated units and three grid blocks, were ultimately placed in five separate localities at the site. XU-1 and XU-8 were isolated; XU-2, XU-3, and XU-6 comprise Block 1; XU-4, XU-5, and XU-7 make-up Block 2; and XUs 9 and 10 comprise Block 3 (see Figure 44, above).

Shovel Test Findings

Five 40-cm-diameter shovel tests, dug by OSA personnel and designated OSA STs 1–5, were excavated at site 21KH93. Each test was positive, although only OSA ST-5 yielded more than five total artifacts (Table 12; see Figure 44, above). OSA STs 1 and 2 were excavated along a prominent ridgeline in the wooded, northernmost portion of the site. Both tests were excavated to a total depth of 40 cmbs; the tests were terminated in sterile subsoil. The remaining three tests were excavated in the western portion of the site closer to the Wagonga Lake shore. OSA STs 3 and 4 were placed on the edge of the same lake terrace landform in the extreme westernmost portion of the site, whereas OSA ST-5 was placed further south and adjacent to XUs 9 and 10 in excavation Block 3. OSA ST-3 was excavated to a depth of 60 cmbs. Nearby OSA ST-4 was only brought down to a depth of 48 cmbs because the previous test was sterile below that depth. OSA ST-5 was excavated to a depth of 55 cmbs, and again, was terminated in sterile subsoil.

Only OSA ST-5 yielded any significant amount of cultural material (over 89 percent of the total specimens recovered from the five tests); artifacts in the other four tests were extremely sparse—in fact, OSA STs 2 and 4 each yielded only a single piece of FCR. In OSA STs 1–4, all artifacts were recovered from between 10 and 30 cmbs. With the exception

of a single flake recovered from 45–50 cmbs, OSA ST-5 yielded cultural material from the same depth range as the other four tests.

Table 12. Cultural Material Recovered from 2013 OSA Shovel Tests, Site 21KH93.

Shovel Test No.	Artifact Material Type						
	Lithic	Ceramic	Faunal	FCR	Botanical	Historic	Total
1	2	—	3	—	—	—	**5**
2	—	—	—	1	—	—	**1**
3	1	—	1	1	—	1	**4**
4	—	—	—	1	—	—	**1**
5	6	15	37	34	—	—	**92**
Total	**9**	**15**	**41**	**37**	**0**	**1**	**103**

Although detailed profiles were not obtained from the five OSA shovel tests, soils observed in all five are coincident with soils mapped in the site area as part of the Lester series (Giencke 1987:90)—specifically, those designated as Lester loam (Giencke 1987:18-19). Soils in these tests grade from a black (10YR 2/1) loam surface soil into a dark brown (10YR 4/3) or dark yellowish brown (10YR 4/4) clay loam that becomes increasingly yellow (10YR 5/4) with more gravels at depth.

ALAC personnel excavated four 50-cm-x-50-cm exploratory units, designated STs 1–4, during the current investigation. All of the tests except ST-4 were positive; ST-4 yielded only a few small flecks of charcoal that could not be definitively linked to cultural events at the site (Table 13; see Figure 44, above). ST-1 was placed in a wooded portion of the site just north and west of the plowed field. It was located 9.7 m east of a two-track and 1.7 m south of an east-west-oriented fenceline, which also happens to be the township line and section line. It was excavated to a depth of 50 cmbs, where it was terminated in sterile subsoil. STs 2 and 3 were placed about 40 m to the east-southeast of ST-1 in the cultivated field. These two tests were placed in the field for the purpose of determining whether intact deposits existed below the plowzone in this portion of the site. ST-2 was excavated to a depth of 70 cmbs, while ST-3 was brought down to 50 cmbs; excavations were terminated in both units in sterile subsoil. ST-4 was placed approximately 100 m to the northwest of ST-1 in the woods west of the two-track and near the southern end of the ridgeline. ST-4 was excavated to a depth of 30 cmbs; the unit was sterile.

Although ST-4 was sterile, the other three tests each yielded a moderate amount of prehistoric cultural material; no historic artifacts were recovered from these STs. Overall, very few ceramics were recovered from these tests, and though most (n=6) were discovered at 0-10 cmbs, specimens were recovered from between the surface and 40 cmbs. STs 1–4 yielded only one rim, a horizontal cordmarked specimen from 0-10 cmbs in ST-1.

Table 13. Cultural Material Recovered from 2013 50-cm-x-50-cm Shovel Tests, Site 21KH93.

Shovel Test No.	Artifact Material Type						
	Lithic	Ceramic	Faunal	FCR	Botanical	Historic	Total*
1	13	8	8	51	Charcoal (Yes)	—	**80**
2	15	2	3	30	Charcoal (Yes)	—	**50**
3	5	3	22	13	—	—	**43**
4	—	—	—	—	Charcoal (Yes)	—	**0†**
Total	**33**	**13**	**33**	**94**	**N/A**	**0**	**173**

*** Does not include charcoal**
† ST-4 designated as *negative* because the charcoal flecks were not confirmed to be cultural.

Similar to the five OSA shovel tests, soils observed in STs 1–4 correspond with those mapped as Lester loam (Giencke 1987:18-19). In STs 1 and 4, soils grade from a black (10YR 2/1) loam surface soil into a brown (10YR 4/3) clay loam subsoil with increased sand and gravels. In STs 2 and 3 in the cultivated field, soils grade from a very dark gray (10YR 3/1) plowzone into a yellowish brown (10YR 5/4) loamy clay subsoil. Between the plowzone and the B-horizon, the soil is a dark brown (10YR 3/3) and very dark brown (10YR 2/2) clay loam. It is suspected that this transition zone may represent an older, deeper plowzone, although this cannot be confirmed. The definitive, more modern plowzone extends to a depth of 26-27 cmbs in the field. In ST-1, an uneven, wavy soil boundary from 15-19 cmbs is somewhat abrupt. Between the surface and this boundary, numerous small pieces of straw or chaff are visible protruding from the wall of the unit. Although this unit is within a wooded portion of the site, it is likely that the boundary represents a relict plowzone, suggesting that the original extent of the cleared field was larger than it is presently.

Just below the disturbed zone in ST-1, at a depth of 20-22 cmbs, a collection of eight FCR, four pieces of debitage, and one ceramic bodysherd was documented (Figure 45). This distribution of cultural material was mapped as a potential occupation surface remnant and, based on this designation, a formal excavation unit grid block was placed in the vicinity. The hope was that this zone could be traced from the ST-1 locality into one or more units in the formal grid block nearby. This grid block, designated Block 1, was ultimately placed about 9 m east-southeast of ST-1 (see Block Area 1 description, below).

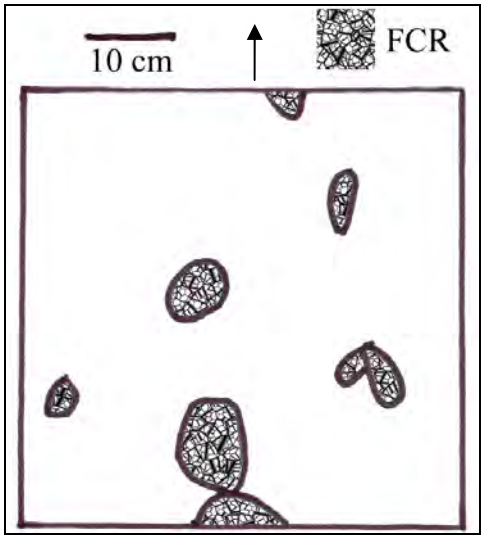


Figure 45. Plan view of FCR scatter across possible occupation surface remnant (20–22 cmbs), ST-1, site 21KH93.

Excavation Unit 1 Locality

A solitary 1-m-x-1-m unit, designated XU-1, was established in a wooded portion of the site approximately 33 m north of ST-1 and 13 m east of the two-track (Figure 46; see Figure 44, above). The unit was excavated to a depth of 40 cmbs, where it was terminated in sterile subsoil. Excavations were carried-out in arbitrary 10-cm levels. Artifacts were recovered only from the 11–20 and the 21–30 cmbs levels, and the distribution of cultural material in these levels was extremely scant. Only 12 artifacts were ultimately recovered from XU-1 (Tables 14 and 15).

Table 14. Distribution and Count of Recovered Materials, Unit 1, Site 21KH93.

Unit No.	Artifact Material Type						
	Lithic	Ceramic	Faunal	FCR	Botanical	Historic	Total
1	1	6	—	5	—	—	**12**

Table 15. Distribution and Count of Recovered Materials by Depth Below Surface, Unit 1, Site 21KH93.

Depth (cmbs)	Artifact Material Type						
	Lithic	Ceramic	Faunal	FCR	Botanical	Historic	Total
0–10	—	—	—	—	—	—	**0**
11–20	—	—	—	5	—	—	**5**
21–30	1	6	—	—	—	—	**7**
31–40	—	—	—	—	—	—	**0**

Figure 46. Overview of XU-1 area, site 21KH93, northeastern orientation.

The unit was devoid of faunal, botanical, and historic-period artifacts. The five pieces of FCR encountered in the unit all derive from Level 2 (11–20 cmbs). The remaining artifacts recovered from the unit, one secondary flake and six ceramic bodysherds, were all discovered in Level 3 (21–30 cmbs). XU-1 was closed after excavations were extended through a sterile Level 4. Because of the paucity of cultural material recovered from XU-1, additional units were not opened in this locality.

A soil profile drawing of the north wall of XU-1 was completed subsequent to its excavations (Figure 47). The soils comprising XU-1, like all soils at the site, are representative of the mapped Lester loam (Giencke 1987:18-19). No plowzone was detected in this area of the site. Soil horizon transitions in XU-1 were fairly subtle, grading from a very dark grayish brown (10YR 3/2) loam into a brown (10YR 4/3) loam with some clay in the majority of the lowest level. The transition zone consists of a mottled very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) loam. In terms of texture, soils in the unit were predominantly loamy, only increasing slightly in clay content with depth. Very few gravels were noted during excavations in the unit, although roots were prolific.

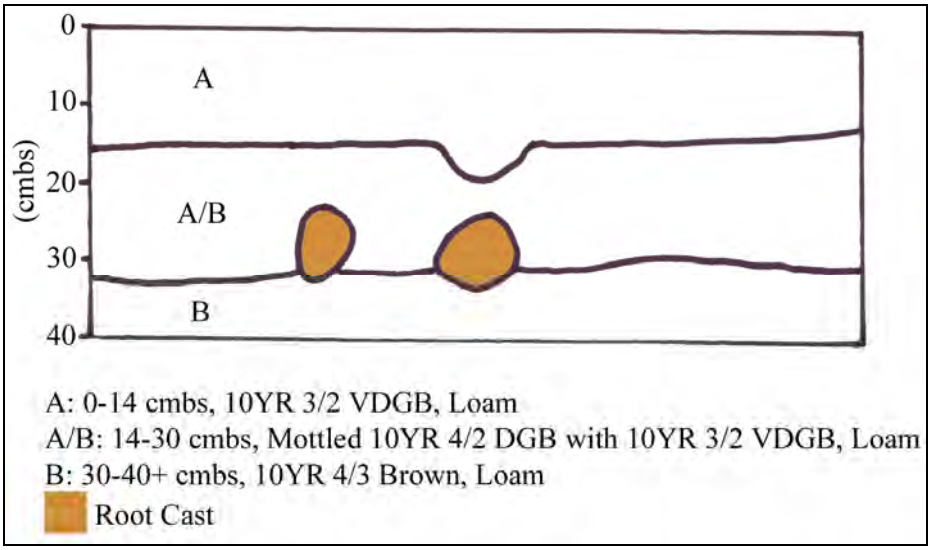


Figure 47. North wall profile, XU-1, site 21KH93.

Block Area 1

Excavation Block 1 is a 2-m-x-2-m grid that was established approximately 8.5 m east of ST-1 in an area of the site located on the edge of the woods and about 1 m west of the cultivated field edge (Figure 48; see Figure 44, above). Three contiguous 1-m-x-1-m units were excavated within the block: XU-2, XU-3, and XU-6. The units in Block 1 were each excavated to a minimum depth of 40 cmbs. Excavations in the approximate W½ of XU-3 were extended to 50 cmbs because the ground surface in this portion of the block was 10 cm higher than in the units to the east. This portion of XU-3 was first excavated separately (labeled Level 1a) in order to bring it level with the surface of the adjoining units in the block. Excavations in Block 1 were carried-out in arbitrary 10-cm levels. Artifacts were recovered from the 0–10 cmbs level of Block 1 to as deep as the 40–50 cmbs level. Ultimately, 451 artifacts were recovered from the block (Table 16). In addition to the artifacts, one well-defined FCR feature, designated F-1, was identified in the NE¼ of XU-3 and a scatter of FCR and other artifacts was recorded throughout the block at a consistent depth of 28 cmbs.

Figure 48. Overview of the Block 1 area and XUs 2, 3, and 6, site 21KH93, western orientation.

Table 16. Distribution and Count of Recovered Materials by Unit, Block 1, Site 21KH93.

Unit No.	Artifact Material Type						
	Lithic	**Ceramic**	**Faunal**	**FCR**	**Botanical**	**Historic**	**Total***
2	14	22	10	28	—	1	**75**
3	44	39	74	97	Charcoal (Yes) Seed (1)	—	**255**
6	17	15	47	42	Charcoal (Yes)	—	**121**
Total	**75**	**76**	**131**	**167**	**1***	**1**	**451**

*** Does not include charcoal**

The horizontal distribution of artifacts across units in the block was generally uneven. XU-3 was clearly the most prolific, yielding nearly 57 percent (255 artifacts) of the total number of recovered specimens from the block. XU-2, on the other hand, produced only 75 specimens (or less than 17 percent of the total recovered artifacts); XU-6 fell in the middle, yielding less than 27 percent (121 items) of the artifacts from the block. The quantity of lithics and ceramics recovered from the block is, unfortunately, fairly limited; the majority of these items were recovered from XU-3. Faunal specimens were more common and, again, most prevalent in XU-3. Charcoal flecks, while present in small, diffuse scatters throughout XUs 3 and 6, were absent from XU-2. No defined concentrations of charcoal were observed in the block. One seed was recovered from the fill of F-1; however, it is uncharred and recognized as wild buckwheat, an invasive species introduced to North America. Thus, it is not associated with the site's prehistoric components. Only a single historic artifact, a clear bottle glass fragment, was recovered from XU-2 in the block; XUs 3 and 6 were devoid of historic material. F-1 was identified in the NE¼ of XU-3, Level 4 (see below). A scatter of cultural debris encountered at 28 cmbs in the block and consisting primarily of FCR may represent a remnant occupation surface; however, no localized activity areas (such as concentrations of lithic reduction detritus characteristic of a knapping station) were detected.

Table 17 provides the vertical distribution of artifacts in Block 1. The majority of specimens were recovered between 11 and 40 cmbs, with the clearest spike noted at the 21–30 cmbs level (over 32 percent of the assemblage was recovered from this level). This depth coincides with the presence of the possible occupation surface noted above. Specimen counts above 11 cmbs are fewer, although not appreciably so, and the only historic-period artifact was discovered in this level. In contrast, a marked drop-off in cultural material was observed below 40 cmbs, though it was this level that produced F-1. It is also noteworthy that no ceramics were recovered from below 40 cmbs. Charcoal flecks were encountered throughout the block below 20 cmbs. Lithics, faunal specimens, and FCR were discovered at all depths in the block, although only one lithic reduction flake was recovered below 40 cmbs.

Table 17. Distribution and Count of Recovered Materials by Depth Below Surface, Block 1, Site 21KH93.

Depth (cmbs)	Artifact Material Type						
	Lithic	**Ceramic**	**Faunal**	**FCR**	**Botanical**	**Historic**	**Total***
0–10	11	18	13	31	—	1	**74**
11–20	27	16	23	31	—	—	**97**
21–30	20	32	39	56	Charcoal (Yes)	—	**147**
31–40	16	10	25	41	Charcoal (Yes)	—	**92**
41-50	1	—	31	8	Charcoal (Yes) Seed (1)	—	**41**

*** Does not include charcoal.**

The entire block was nearly devoid of historic artifacts—the lone exception being a piece of clear bottle glass discovered in the uppermost 10 cmbs in XU-2. With the notable exception of the 41–50 cmbs level, lithic, ceramic, faunal, and FCR specimens were fairly evenly distributed by depth across the block. Slightly higher proportions of pottery, FCR, and bone were recovered from 21–30 cmbs but, in each case, the increase in numbers is not substantive. The majority of the lithics derive from 11–20 cmbs although, again, the differences in quantity are not considerable. F-1 was discovered at a depth below that of the deepest ceramic-bearing deposits in the block and it was initially expected that it would predate the site's Woodland occupations (see below). Perhaps the most intriguing find in Block 1 is the possible occupation surface remnant discovered at 28 cmbs (Figure 49). It is possible that this surface may be a continuation of that identified just to the west in ST-1. There is a 6-cm inconsistency in depth between the two scatters (28 cmbs in Block 1 and 22 cmbs in ST-1), possibly due, in part, to elevational differences between the two localities. One would need to open units in-between the two areas to determine whether the surface can be traced from one locality to the other.

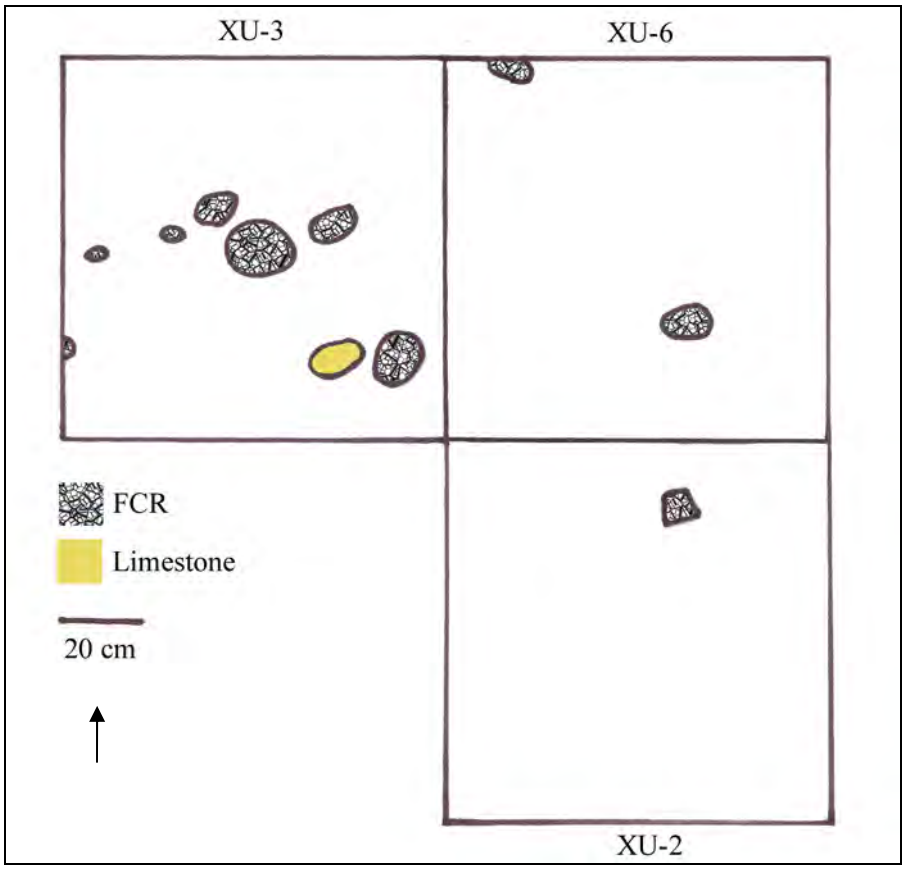


Figure 49. Plan view of FCR distribution across Block 1, Level 3 (28 cmbs).

A soil profile drawing of the north wall of XU-3 and XU-6 was completed following excavations (Figure 50). The soils comprising Block 1 are representative of the mapped Lester loam (Giencke 1987:18-19). Despite its location beyond the edge of the plowed field, a plowzone was, indeed, detected in this area of the site; it extended to a depth of roughly 26 cmbs. Soil horizon transitions in the block were fairly subtle, grading from a very dark brown (10YR 2/2) loam into a dark grayish brown (10YR 4/2) blocky clay loam subsoil. The plowzone and the undisturbed A-horizon are distinguished by the transition of the loam from loose to blocky. Soils in the block were predominantly loamy; an increase in clay content was detected with depth. Similar to XU-1, very few gravels were noted during excavations in the unit, although roots were prolific.

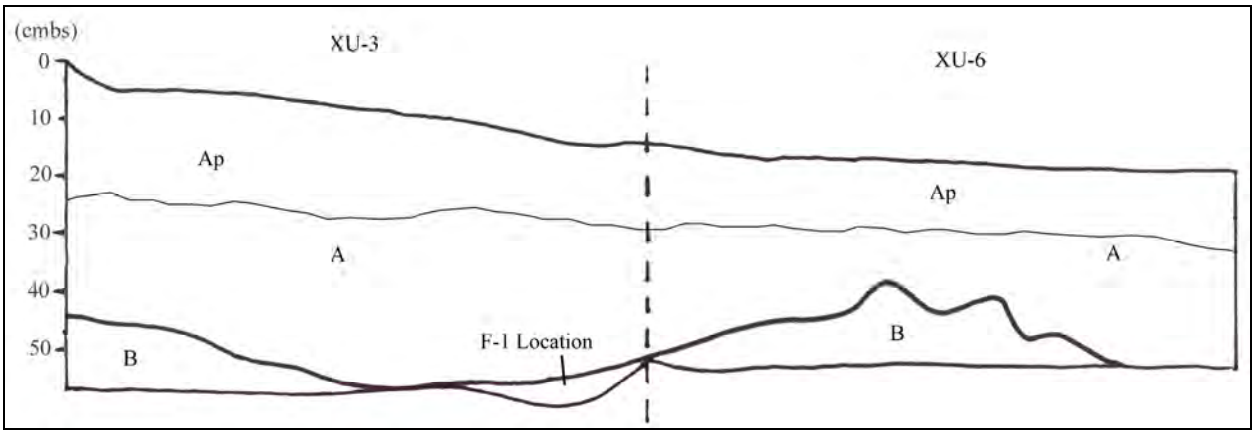


Figure 50. North wall profile, XUs 3 and 6, Block 1, site 21KH93.

Feature 1

F-1 was identified in the NE¼ of XU-3, Level 4/Level 5 (Figures 51–53). The feature consisted of a discrete cluster of eight granitic small-to-medium-sized (ca. 8–12-cm-diameter) rounded FCR cobbles located at a depth of 33–46 cmbs. It measures 17.5 cm east-west by 33 cm north-south by 13 cm high. Seven additional pieces of FCR were also mapped at this same depth in the block (see Figure 51); they may or may not have been displaced from the main feature prehistorically. All feature fill was excavated and retained in soil sample bags for later flotation processing (see pages 127–129, below).

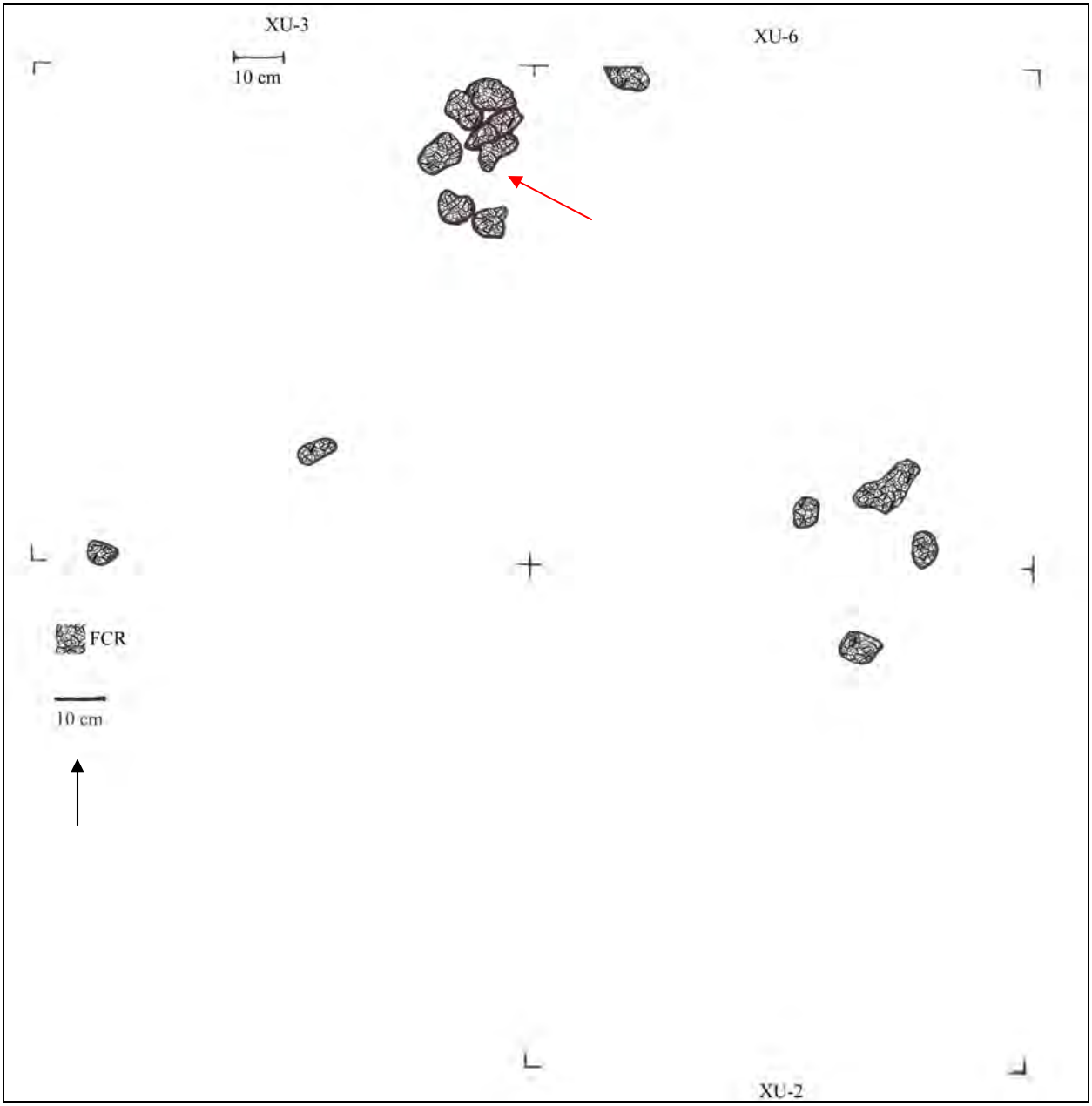


Figure 51. Plan view of Level 4 (46 cmbs) depicting Feature 1 (red arrow), XUs 2, 3, and 6, Block 1, site 21KH93.

Figure 52. Close-up of Feature 1, Level 4 (46 cmbs), XU-3, Block 1, site 21KH93.

Figure 53. Close-up profile view of Feature 1, Level 4 (50 cmbs), Block 1, site 21KH93.

The feature was well-defined; however, other elements typically associated with hearth or cooking features were not observed such as a clearly discernable basin lined with ash and charcoal deposits beneath the FCR, or an oxidation zone or burned earth surrounding the basin. No stains were observed in the soils surrounding or above the feature that would be suggestive of a basin or pit feature. Cultural material recovered from water-screening the F-1 fill is very limited. The feature yielded a total of 41 artifacts plus a very small amount of charcoal flecks. Material types recovered include lithic flakes (n=1), faunal fragments (n=31), FCR (n=8), and uncharred seeds (n=1). Additional artifacts documented from the same depth below surface elsewhere in the block include only FCR (n=7). The depth of the feature, which is below that of the deepest ceramic-bearing deposits in the block, implied a preceramic site component, and subsequent AMS dating of associated charcoal confirmed this suspicion (see below). The lack of evidence for in

situ burning directly associated with F-1 suggests it is a secondary deposition likely related to hearth/oven cleaning or a stone boil cooking event.

Similar FCR concentrations have been documented throughout the Northern Plains in association with Archaic-period stone boiling practices (see for example Anderson and Semken, Jr. 1980; Fishel et al. 2003:27-29; Frison 2001:134; Jackson 1998a:5, 1998b; Kornfeld et al. 2010:344-346; Winham et al. 2007:25-35). Though hearth/oven cleaning is a possibility, these events typically result in far greater quantities of FCR coupled with larger amounts of ash and/or charcoal. The smaller, rounded, non-porous granite cobbles would have been preferred for stone boiling as their size would have made them easier to transfer to and from the water container (which was often a skin, bladder, or clay vessel) and, unlike sandstone, they would not absorb as much water or lose individual grains in the container, which would have introduced grit to the boiling food (see Jackson 1998b:45).

Excavations in Block 1 resulted in the discovery of modern disturbance to the archeological deposits in the upper 26 cm in this portion of the site. Although only a single historic artifact was discovered in the 0–10 cmbs level, a relict plowzone extended to approximately 26 cmbs in the block. Below this depth, deposits did not exhibit disturbance. On the contrary, a possible remnant of an occupation surface was identified across the block at 28 cmbs and an intact FCR feature was recorded below the greatest depth of ceramic deposits. Prehistoric material was recovered from as deep as 50 cmbs; however, most artifacts were recovered from 11–40 cmbs and the general artifact density decreased rapidly below 40 cmbs throughout the block. Unfortunately, no stratigraphic separation of artifacts was observed among the ceramic-bearing deposits.

Block Area 2

Excavation Block 2 was established on an east-west baseline in a wooded, southern portion of the site approximately 12.5 m north-northeast of Block 1 and some 5 m north of the plowed field (Figure 54; see Figure 44, above). ALAC personnel excavated three 1-m-x-1-m units, XU-4, XU-5, and XU-7, within the 2-m-x-2-m grid. The units in Block 2 were excavated to a minimum depth of 20 cmbs. Excavations in XU-4 were extended to 30 cmbs in order to expose a larger portion of the B soil horizon for profiling. Due to the discovery of an extensive distribution of cultural material at 15–16 cmbs, excavations in the block were carried-out in 5-cm levels between 10 and 20 cmbs; arbitrary 10-cm levels were used otherwise. Artifacts were recovered from a narrow band in Block 2 between 10 and 25 cmbs, although only a negligible amount of material was discovered below 20 cmbs. In total, the block yielded 444 specimens—or seven fewer than Block 1 (Table 18).

Figure 54. Overview of the Block 2 area and XUs 4, 5, and 7, site 21KH93, southwestern orientation.

Table 18. Distribution and Count of Recovered Materials by Unit, Block 2, Site 21KH93.

Unit No.	Artifact Material Type						
	Lithic	Ceramic	Faunal	FCR	Botanical	Historic	Total*
4	17	80	101	40	Charcoal (Yes)	—	**238**
5	6	44	30	29	Charcoal (Yes)	—	**109**
7	28	28	15	26	Charcoal (Yes)	—	**97**
Total	**51**	**152**	**146**	**95**	**N/A**	**0**	**444**

*** Does not include charcoal**

The horizontal distribution of artifacts across units in the block is largely consistent with respect to charcoal, FCR, and (the absence of) historic material. The recovered lithic, faunal, and ceramic assemblages are less consistent, although, admittedly, the sample size is extremely low. XU-4 yielded over 69 percent of the total faunal assemblage in the block (101 items), as well as nearly 53 percent of the ceramic assemblage (80 specimens). All units contained diffuse scatters of charcoal flecks throughout, although no defined concentrations were observed. Historic artifacts were not present in the block. Very few lithics were recovered from this portion of the site (n=51); no formal tools were discovered. Of the recovered lithics, nearly 55 percent (28 items) derive from XU-7. No features were observed within the Block 2 grid, nor were any localized activity areas (such as concentrations of lithic reduction detritus characteristic of a knapping station). However, a likely occupation surface remnant was uncovered in all three units at a depth of 15–16 cmbs (see below).

Table 19 provides the vertical distribution of artifacts in Block 2. Over 96 percent (428 items) of specimens were recovered between 11 and 20 cmbs. The upper 10 cmbs was virtually sterile—the only two specimens discovered in this level, two bodysherds, came from 10 cmbs. Below 20 cmbs, artifact counts decreased rapidly and below 25 cmbs, the block was sterile. Not surprisingly, the likely occupation surface is located within the prolific 11–20 cmbs level, specifically at 15–16 cmbs. The block was devoid of historic artifacts.

Table 19. Distribution and Count of Recovered Materials by Depth Below Surface, Block 2, Site 21KH93.

Depth (cmbs)	Artifact Material Type						
	Lithic	Ceramic	Faunal	FCR	Botanical	Historic	Total*
0–10	—	2	—	—	—	—	**2**
11–20	44	148	141	95	Charcoal (Yes)	—	**428**
21-30	7	2	5	—	Charcoal (Yes)	—	**14**

*** Does not include charcoal.**

Artifacts documented across the likely occupation surface were pedestalled when encountered and left in situ until the entire block was exposed to depth (Figures 55 and 56). Cultural material discovered within this surface included lithics, bone, FCR, charcoal, and ceramic bodysherds that displayed a combination of cord-roughened and smoothed surface treatment. It is difficult to definitively link this surface with other potential occupation zones in ST-1 and Block 1. The depths below surface of these zones are inconsistent between units and it is uncertain whether they represent different occupation surfaces or whether they represent portions of the same surface at different depths due to micro-variations in site topography and elevation. As with the zones in the other units, this could only be tested by opening a large, contiguous area between blocks and attempting to trace the surface from one locality to another.

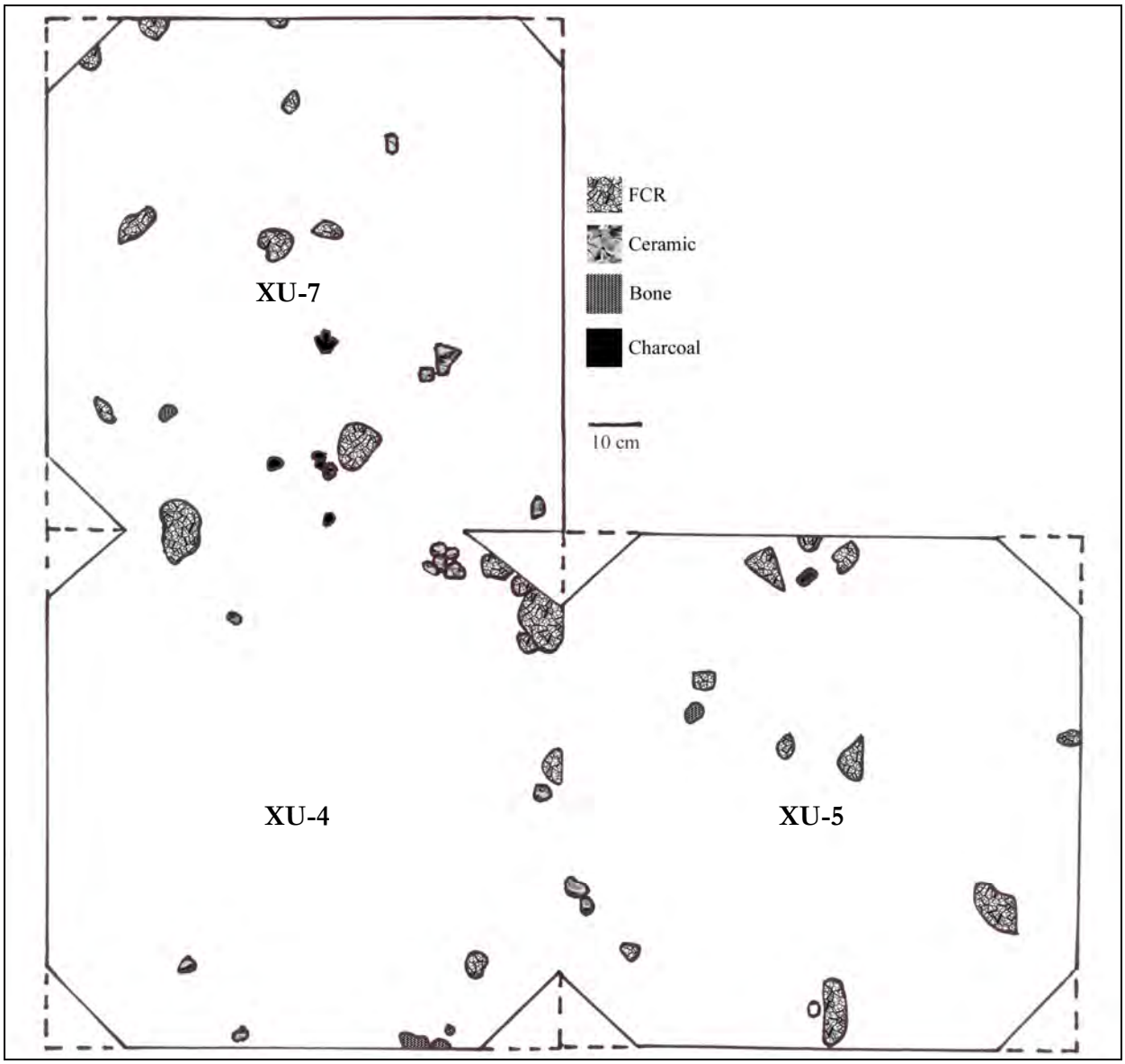


Figure 55. Plan view of likely occupation surface, Level 2 (15–16 cmbs), Block 2, site 21KH93.

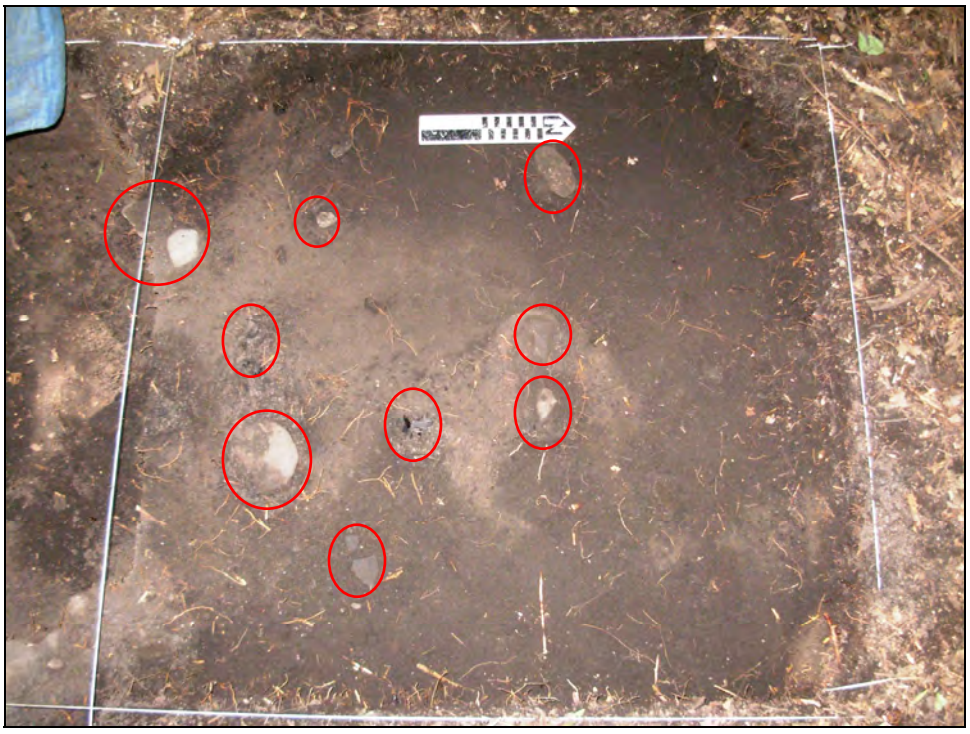


Figure 56. View of portion of occupation surface with pedestalled artifacts (outlined in red) in XU-7, Level 2 (15 cmbs), Block 2, site 21KH93.

A soil profile drawing of the west wall of XU-4 and XU-7 was completed subsequent to excavations in the block (Figure 57). The soils comprising Block 2 are representative of the mapped Lester loam (see Giencke 1987:18-19). Comparatively speaking, the Block 2 soils are shallower but less disturbed than those observed in Block 1. No plowzone was detected in Block 2. The soil horizon transition in Block 2 was subtle, grading from a very dark grayish brown (10YR 3/2) loam into a slightly lighter, dark grayish brown (10YR 4/2) loam subsoil at approximately 20 cmbs. This transition is coincident with a noted decrease in artifact density throughout the block. Very few gravels were noted during excavations in the block; roots, of course, were abundant.

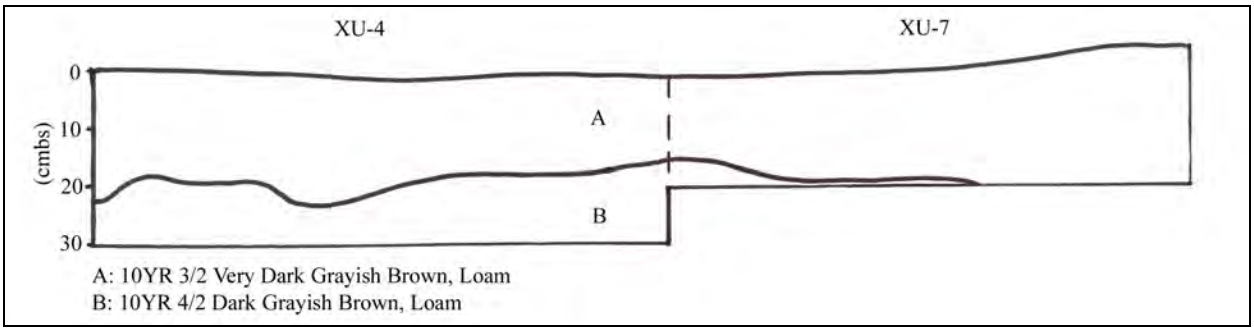


Figure 57. West wall profile, XU-4 and XU-7, Block 2, site 21KH93.

Block 2 excavations yielded a similar number of artifacts when compared to Block 1; however, modern disturbance to the archeological deposits is far less extensive in this portion of the site. The primary mechanism of disturbance in this portion of the site is root action; animal burrowing and freeze-thaw displacement of artifacts is exhibited, albeit, to a lesser extent. Prehistoric deposits in Block 2 are restricted to a very narrow band—nothing was discovered below 25 cmbs and the units in the block were sterile through the upper 9 cmbs as well. The vertical distribution of artifacts, particularly ceramics, in the block is compressed in such a way that it is impossible to distinguish stratigraphic separation of the materials. Although substantially more pottery was recovered from this block than from Block 1, the

vast majority of specimens are bodysherds that hold limited analytical value (see Johnson, this report). The potential occupation surface at 15–16 cmbs may be traceable to other portions of the site but further excavations would be required to test this hypothesis.

Excavation Unit 8 Locality

Excavation Unit 8 (XU-8), was established apart from a grid block in a portion of the cultivated field at the site approximately 22 m east-southeast of Block 1 and 8.5 m northwest of ST-2 (Figure 58; see Figure 44, above). The unit was placed in this particular location in response to the discovery of burned earth and charcoal on the surface of the newly plowed field. The charcoal and burned earth appeared to have been dragged to the surface by the plow. Investigators were uncertain whether the material observed on the surface was part of a disturbed prehistoric hearth feature or a relic of modern-era stump and brush burning. The area around the scatter was first probed with a 1-inch-diameter Oakfield core in an attempt to determine whether any of this material remained below surface in at least a partially intact state. Remnants were, indeed, discovered with the soil probe and a 1-m-x-1-m unit was then established. The unit was excavated to a total depth of 40 cmbs. Excavations were carried-out in arbitrary 10-cm levels through the uppermost 2 levels (20 cmbs); a shift was then made to 5-cm-levels because the outline of the feature (F-2) was discerned in the approximate W½ of the unit. Prehistoric artifacts were recovered from the surface to 40 cmbs in the unit. A total of 226 artifacts were ultimately recovered from XU-8 (Tables 20 and 21).

Figure 58. Overview of XU-8 area (foreground), site 21KH93, western orientation. Block 1 is visible in the background.

Table 20. Distribution and Count of Recovered Materials, Unit 8, Site 21KH93.

Unit No.	Artifact Material Type						
	Lithic	Ceramic	Faunal	FCR	Botanical	Historic	Total*
8	14	26 (+3)†	142	39	Charcoal (Yes) Seed (2)	—	**223 (226)†**

*** Does not include charcoal**
† Three conjoining ceramic pipe stem fragments were discovered at 10-20 cmbs; these are likely protohistoric.

Table 21. Distribution and Count of Recovered Materials by Depth Below Surface, Unit 8, Site 21KH93.

Depth (cmbs)	Artifact Material Type						
	Lithic	Ceramic	Faunal	FCR	Botanical	Historic	Total*
0–10	1	2	15	16	Charcoal (Yes)	—	**34**
11–20	4	5 (+3)†	12	9	Charcoal (Yes)	—	**30 (33)†**
21-30	10	10	104	13	Charcoal (Yes)	—	**137**
31-40	—	9	10	1	Charcoal (Yes) Seed (2)	—	**22**

*** Does not include charcoal.**
† Three conjoining ceramic pipe stem fragments were discovered at 10-20 cmbs; these are likely protohistoric.

Although the unit was devoid of historic material, three refit pieces of a ceramic pipestem were recovered that may be associated with a protohistoric component. Comparatively few lithic, ceramic, and FCR specimens were recovered. The XU-8 artifact assemblage was dominated by faunal remains—nearly 63 percent (142 items) of the recovered specimens were bone and 104 of those items (73 percent) were recovered from the 21–30 cmbs level. Copious quantities of charcoal and burned earth were present throughout the unit and these became more concentrated as the outline of the feature was exposed. From just below 25 cmbs in the approximate W½ of the unit, the outline of F-2 became visible (see below). Two seed specimens were recovered from the fill of F-2, although, curiously, neither specimen was charred.

A soil profile drawing of the south wall of XU-8 was completed following excavation (Figure 59). The soils comprising XU-8 are representative of the mapped Lester loam (Giencke 1987:18-19). The plowzone extended down through the majority of the unit, until approximately 30 cmbs. Because most of the soils in the unit were part of the plowzone, very little transition between soil horizons was detected. Soils below about 30 cmbs exhibited a blockier structure and a slightly browner color (it is not certain whether this change is, at least in part, the result of thermal alteration). Soils in the unit grade from a black (10YR 2/1) silty loam into a very dark brown (10YR 2/2) loam near the base of the E½ of the unit. Very few gravels were noted and roots were absent from the unit. Soils descriptions for the portion of the unit associated with F-2 are discussed below.

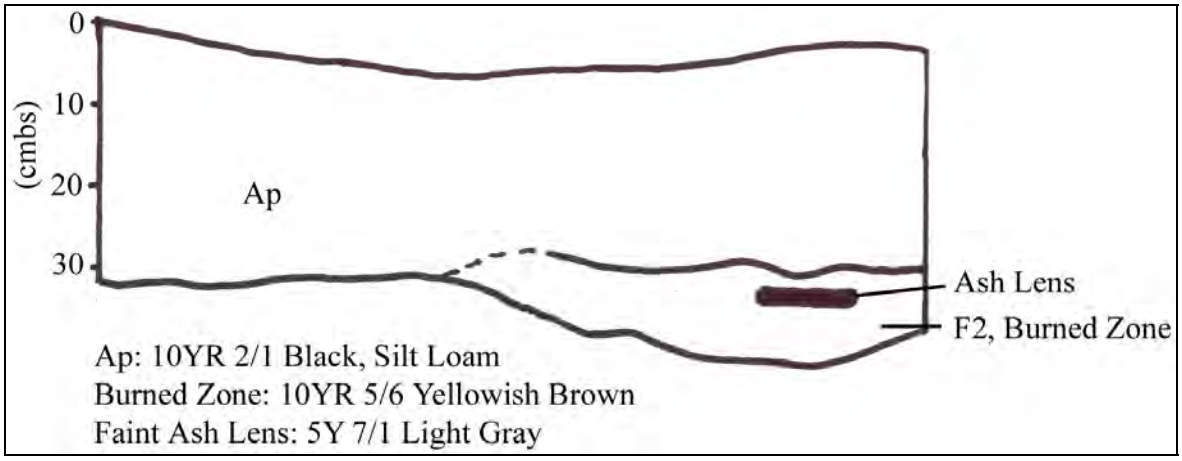


Figure 59. South wall profile depicting F-2, XU-8, site 21KH93.

Feature 2

F-2 is a large burn zone consisting of substantial amounts of wood charcoal and ash deposits surrounded by an area of oxidized earth. Small pieces of FCR were discovered in association with the feature, as were bone, lithics, and a ceramic bodysherd. However, FCR neither filled nor lined the feature. Though portions of F-2 were initially identified on the surface in XU-8, the first clearly defined outline of the burn zone was uncovered just above 30 cmbs in the approximate W½ of the unit (Figures 60 and 61). The feature retained a primary basin area, as well as a larger, splayed-out burn zone extending beyond the walls of the unit to the north and west. Because the main basin area appeared to extend slightly south of the unit as well, this area was probed with a 1-inch-diameter Oakfield core in an attempt to determine its extent. Probes were placed 20 cm, 75 cm, and 150 cm south of the unit; no probe contained any evidence of the feature. The primary basin of F-2 measures 45–50 cm east-west by 40 cm north-south by 13 cm thick. The feature was excavated and retained in soil sample bags for flotation processing. Fill from both the primary basin as well as the burn zone extending to the north was collected for processing (Figure 62). A charcoal sample from the bottom of the main basin area was subsequently submitted for AMS dating (see Appendix A).

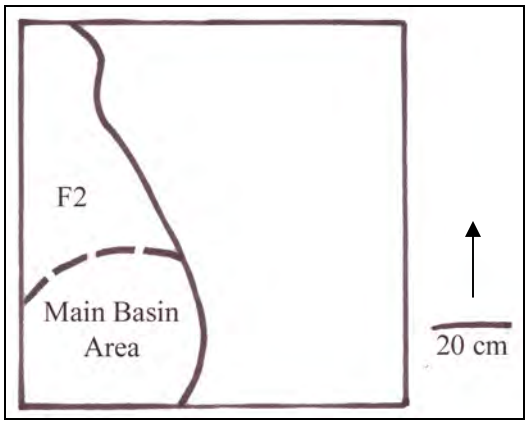


Figure 60. Plan view of F-2, Level 3 (30 cmbs) and excavated basin (40 cmbs), XU-8, site 21KH93.

The feature was well-defined, albeit, amorphous. Although the main basin area was somewhat more defined and roughly circular in shape, it still lacked many of the characteristics of a well-developed hearth. No additional artifact concentrations were discovered elsewhere in the unit at the same depth below surface. The disturbed nature of the deposits immediately above the feature, coupled with its amorphous form and lack of directly associated FCR, call into question the feature's antiquity—although unlined, unprepared, ephemeral hearths have certainly been documented archeologically elsewhere (see for example Alperson-Afil et al. 2007; Wheeler 1995).

Figure 61. View of F-2, Level 4 (34 cmbs), XU-8, site 21KH93.

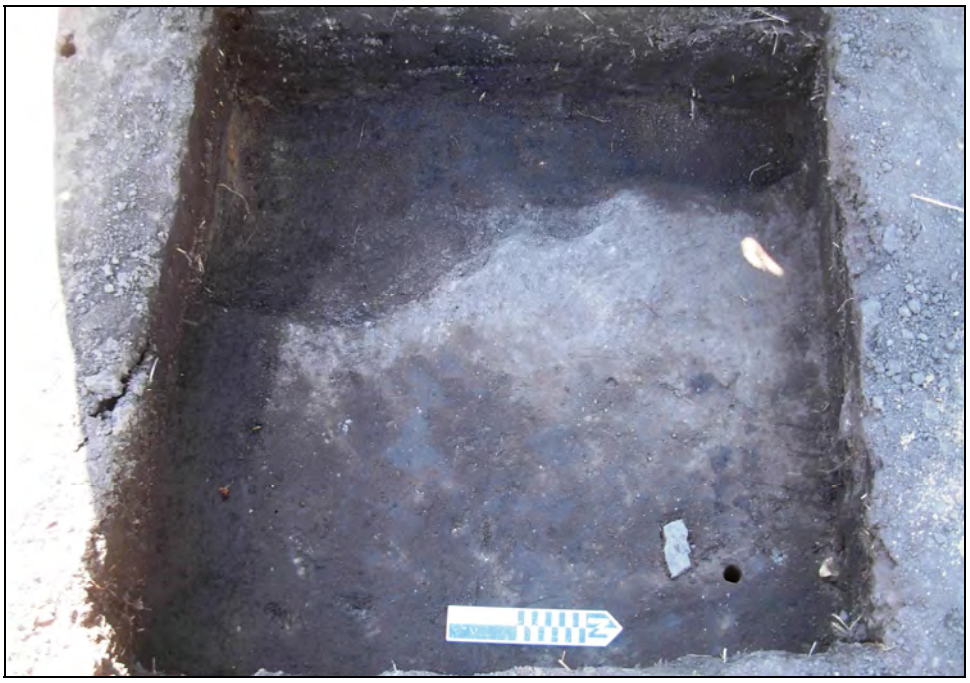


Figure 62. View of base of F-2 following removal of fill, Level 4 (40 cmbs), XU-8, site 21KH93.

Block Area 3

Excavation Block 3 was established in the western portion of the site approximately 71 m southwest of Block 1 and immediately adjacent to OSA ST-5 (Figure 63; see Figure 44, above). It is located about 8 m north-northeast of the Wagonga Lake shore. ALAC personnel excavated two 1-m-x-1-m units, XU-9 and XU-10, in Block 3. Excavations in XU-9 extended to 30 cmbs while those in XU-10 were terminated at 20 cmbs. Excavations in the block were carried-out in arbitrary 10-cm levels. As in the adjacent OSA ST-5, the upper 10 cmbs of both units in Block 3 was sterile. Artifacts were recovered from 11–30 cmbs; however, a sharp drop in artifact density was noted below 20 cmbs. In general, the block was prolific, yielding a total of 1,007 artifacts (Table 22).

Figure 63. Overview of the Block 3 area and XUs 9 and 10, site 21KH93, southern orientation.

Table 22. Distribution and Count of Recovered Materials by Unit, Block 3, Site 21KH93.

Unit No.	Artifact Material Type						
	Lithic	Ceramic	Faunal	FCR	Botanical	Historic	Total*
9	9	80	43	128	Charcoal (Yes)	1	**261**
10	30	56	366	294	Charcoal (Yes)	—	**746**
Total	**39**	**136**	**409**	**422**	**N/A**	**1**	**1,007**

*** Does not include charcoal**

The horizontal distribution of artifacts across units in the block was markedly uneven; XU-10 yielded 485 more artifacts than XU-9, or over 74 percent of the total number of recovered specimens. Both units contained diffuse scatters of charcoal flecks, although no defined concentrations were observed. A single historic artifact, an expended shotgun shell, was present in the block. Although no features were observed within the Block 3 grid, a defined scatter of artifacts, including multiple partially articulated bison leg bones, was uncovered in XU-10 (see below).

Table 23 illustrates the vertical distribution of artifacts in Block 3. The majority of specimens (85 percent) were recovered between 11 and 20 cmbs; only 151 specimens (15 percent) were discovered below 20 cmbs. In the adjacent OSA ST-5, one flake was discovered between 45 and 50 cmbs. Otherwise, the vertical distribution of artifacts mirrored that observed in the two Block 3 units.

Table 23. Distribution and Count of Recovered Materials by Depth Below Surface, Block 3, Site 21KH93.

Depth (cmbs)	Artifact Material Type						
	Lithic	Ceramic	Faunal	FCR	Botanical	Historic	Total*
0–10	—	—	—	—	—	—	**0**
11–20	35	85	385	350	Charcoal (Yes)	1	**856**
21-30	4	51	24	72	—	—	**151**

*** Does not include charcoal.**

Of particular interest was a group of artifacts uncovered in situ at a depth of 15 cmbs in XU-10. This material included a number of partially articulated bison leg bones together with two ceramic rimsherds and multiple pieces of FCR. Material documented across this surface was pedestalled when encountered and left in situ until the entire block was exposed to this depth (Figures 64 and 65). Interestingly, while excavating the nearby OSA ST-5, three large refit pieces of a ceramic rim were recovered in situ from the wall of the shovel test at the same 15 cmbs depth. Initially, it was felt that a remnant occupation surface might be represented; however, an examination of ceramic rims recovered from the block at this depth revealed that Prairie Village, Late Woodland, and Middle Woodland types are all present (see Johnson, this report and Appendix C). Additionally, the shotgun shell was recovered from the 10–20 cmbs level in the block. If the 15 cmbs level was, indeed, an occupation surface, then this surface did not aggrade over the course of a fairly substantial period of time from the Middle Woodland through at least the Prairie Village period.

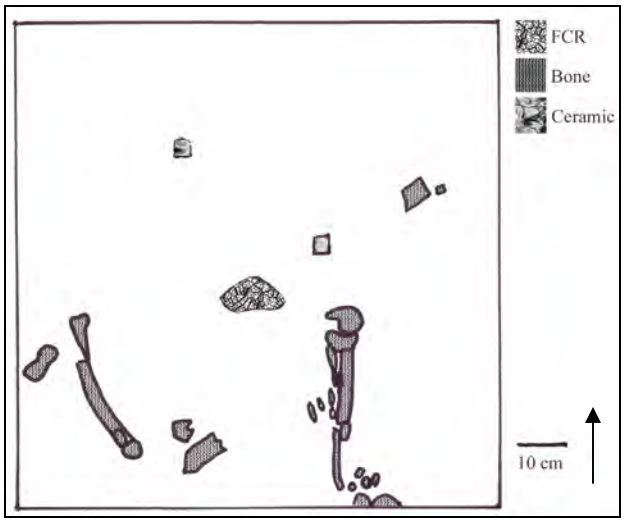


Figure 64. Plan view of artifact distribution in Level 2 (15 cmbs), XU-10, Block 3, site 21KH93.

Figure 65. View of in situ artifacts at 15 cmbs, Level 2, XU-10, site 21KH93.

A soil profile was not drawn for either of the Block 3 units because of the shallow depth at which excavations were terminated. Instead, soils data from the two units were recorded in field notebooks. As with other portions of the site, soils comprising Block 3 are representative of the mapped Lester loam (see Giencke 1987:18–19). No plowzone was detected in Block 3. Soils observed in the block consisted of a black (10YR 2/1) loam that seemed to grade slightly grayer (10YR 3/1) with depth. In terms of texture, soils in the block seemed to increase slightly in clay content near the base of the units. Very few gravels were noted during excavations in the block, although root casts were prolific.

Excavation Results

The results of subsurface testing at site 21KH93 affirmed the presence of buried cultural deposits similar to the materials that are represented in Larry Levin's extensive private collection from the site. Artifacts previously collected from the site reflect a lengthy historic-period occupation dating from early settlement times into the twentieth century. However, the current investigation recovered only two historic-period artifacts from buried contexts at the site—a shotgun shell from Block 3 and a glass bottle fragment from Block 1. Cultural material was documented across a fairly large surface area at the site; however, results of testing and previous surface collecting clearly suggest that the primary occupation area at 21KH93 was focused on either side of the narrow isthmus.

ALAC and OSA personnel excavated nine shovel tests and 10 1-m-x-1-m formal units at 21KH93 during the current study. ST-4 was sterile. All other test excavations yielded prehistoric cultural material; only two historic artifacts were recovered during testing at the site. In both instances, historic material was intermixed with prehistoric specimens in the upper 10 cmbs of deposits. Prehistoric deposits were fairly shallow throughout the site area. A single tertiary flake was discovered in the 60–70 cmbs level in ST-2 in the plowed field. In the Block 3 area, a flake was discovered as deep as 45–50 cmbs in OSA ST-5. The deepest deposits in Block 1 were also from the 40–50 cmbs level, where the preceramic F-1 was discovered. Material from Block 2 was shallower still, extending only to depths between 20 and 30 cmbs. However, the vast majority of cultural deposits at the site were confined to a narrow band between approximately 10 and 30 cmbs.

The current excavations at site 21KH93 yielded a total of 2,416 artifacts. The majority of this material, nearly 42 percent (1,007 items), was recovered from Block 3. Blocks 1 and 2 yielded an average of 448 artifacts, or about 18.5

percent of the total recovered artifact assemblage. With the exception of ST-4, the shovel tests and XU-8 also yielded a fair amount of cultural material. XU-1, on the other hand, produced only 12 specimens. The following material types were identified: historic/modern refuse (n=3); lithics (n=222—including 5 tool/tool fragments); prehistoric ceramics (n=424—including 37 rim/rim fragments); FCR (n=859); botanical specimens (n=3 seeds/seed casings); and faunal remains (n=902). Various small charcoal flecks and three additional ceramic pipestem fragments (likely protohistoric) were also identified during the course of excavations.

In addition to the substantial amount of cultural material recovered, two cultural features, F-1 and F-2, were documented at the site. Charcoal samples recovered from these features, which were identified in Block 1 and XU-8, respectively, were subsequently AMS-dated. Unfortunately, neither feature dates to the Woodland-period site occupations (see Appendix A).

An analysis of ceramic rimsherds from site 21KH93, including recently recovered pieces as well as specimens from Levin's collection, identified prehistoric cultural components associated with Prairie Village, Late Woodland (Kathio, Onamia, Clam River, and Lake Benton), transitional Middle to Late Woodland (St. Croix), Middle Woodland (Fox Lake, Malmo/Kern, Pokegama Smooth, Havanoid), and Early Woodland (Brainerd) occupations at the site (see Johnson, this report, pages 79-81, 83, and 89-98; see also Appendix C, Tables C5 and C6). The current study detected no stratigraphic trends in vertical deposition of ceramics at site 21KH93. This circumstance is likely largely the result of heavy modern disturbance coupled with frequently occupied, slowly aggrading surfaces at the site.

CERAMIC ANALYSIS

Craig M. Johnson

INTRODUCTION

This chapter consists of three sections, each focusing on a specific aspect of local and regional ceramic variation designed to describe the ceramics from the west-central Minnesota area and place them within the broader Woodland tradition of Minnesota and the upper Midwest. In section one, a description of the ceramic assemblages excavated in 2013 from sites 21KH36, 21KH46, and the Levin site (21KH93) is accomplished within the context of traditionally defined ceramic types and decoration techniques. This effort not only defines various characteristics of the ceramic assemblages but also explores the horizontal and vertical distribution of key ceramic variables throughout the sites. Section two focuses on a number of ceramic assemblages from the central and southwest areas of Minnesota in order to place the ceramics from 21KH36 and 21KH93 into broader cultural-historical contexts (site 21KH46 is not included due to the small sample size of the assemblage). Sites included in this analysis range from amateur surface collections to those excavated by professional archeologists. The third and final section addresses future research topics and questions that need to be answered before researchers can gain a more complete understanding of the Woodland manifestations in the west-central part of the state, their origins, how they developed, and what they evolved into.

2013 EXCAVATIONS

The 2013 excavations recovered a small amount of Middle and Late Woodland pottery from sites 21KH36, 21KH46, and 21KH93. Also present are a few rimsherds that can be assigned to Late Prehistoric Prairie or Plains Village occupations. Because of the small sample sizes and the inability to assign provenience units to specific occupations, the following is a brief analysis of the distribution of ceramics focusing on stratigraphic trends. Detailed distributions of rim and bodysherds by provenience unit appear in Appendix C, Tables C1–C6. Selected illustrations of rimsherds recovered from the 2013 excavations are included in Figure 66.

Figure 66. Rimsherds from the 2013 excavations at 21KH36 (K), 21KH46 (A-F, L, N) and 21KH93 (G-J, M): A, C, E – cordwrapped object impressed; B – dentate stamped; D, G-I, M – cord impressed; F – horizontal cordmarked; J – vertical cordmarked; K – bossed; L, N – Havanoid. From left to right: rim exteriors, rim profiles, rim interiors.

Site 21KH36

The ceramic assemblage from this site consists of 117 bodysherds and 18 rimsherds and rimsherd fragments lacking a lip (Figure 66K; see Appendix C, Tables C1 and C2). The majority of bodysherds assigned a surface treatment are cord roughened (i.e., cordmarked) (n=74) with a small amount of smooth (n=13) sherds present (Table 24). Bodysherds with indeterminate surface treatments are excluded from Table 24. There is not a detectable trend in surface treatment by level, although the numbers are small and depth of recovered pottery is confined to the upper 40 cm of matrix.

Given the small and fragmentary nature of the rimsherds, they were not assigned to traditional types but classified by decoration technique (Table 25). There are 18 rimsherds and rimsherd fragments from 21KH36, three being assigned to the Prairie Village occupation of the site. There are three Late Woodland rims that are decorated with cordwrapped object impressions (Kathio or Onamia), two that are Early Late Woodland comb stamped (St. Croix), five that are thicker Middle Woodland rims bearing exterior rim tool impressions, punctates, or bosses (Malmo, Pokegama Smooth or Punctated), and one Havana-like or Havanoid rim. Given the small numbers and shallow deposits, there are no detectable stratigraphic changes. It is apparent that the sherds with punctates or tool impressions are thicker than the others and it is reasonable to conclude that they, along with the Havanoid rims, probably represent a Middle Woodland occupation at the site.

Table 24. Bodysherd Surface Treatment by Level and Maximum Thickness for 2013 Excavated Assemblages from 21KH36, 21KH46, and 21KH93.

	21KH36					21KH46					21KH93				
Level (cmbs)	Cord Roughened		Smooth			Cord Roughened		Smooth			Cord Roughened		Smooth		
	N	%	N	%	Total	N	%	N	%	Total	N	%	N	%	Total
0-10	24	82.8	5	17.2	29	7	63.6	4	36.4	11	8	61.5	5	38.5	13
10-20	39	84.8	7	15.2	46	31	81.6	7	18.4	38	122	69.3	54	30.7	176
20-30	7	100.0	-	-	7	25	58.1	18	41.9	43	59	76.6	18	23.4	77
30-40	4	80.0	1	20.0	5	67	83.8	13	16.2	80	8	88.9	1	11.1	9
40-50	-	-	-	-	-	95	83.3	19	16.7	114	-	-	-	-	-
50-60	-	-	-	-	-	23	67.6	11	32.4	34	-	-	-	-	-
Total	74		13		87	248		72		320	197		78		275
Maximum Thickness (mm)															
N	25	-	2	-	-	85	-	31	-	-	59	-	29	-	-
Mean	7.28	-	6.25	-	-	4.84	-	6.77	-	-	5.62	-	7.27	-	-
S.D.	1.11	-	0.61	-	-	1.43	-	1.64	-	-	1.40	-	1.54	-	-

Site 21KH46

The ceramic assemblage from 21KH46 is the largest of the three sites excavated, consisting of 56 complete or partial rimsherds and 451 bodysherds (see Tables 24 and 25; Figure 66A-F, L, N; see Appendix C, Tables C3 and C4). The majority of bodysherds are cord roughened (n=248) while a smaller number are smoothed (n=72). Bodysherds with indeterminate surface treatments are excluded from Table 24. Despite a depth of 60–65 cmbs for the ceramic-bearing deposits, there is no detectable stratigraphic trend in surface treatment as might be expected if Middle Woodland vessels were more frequently smoothed compared to their Late Woodland counterparts. Maximum thicknesses of size grade 1 and 2 bodysherds (greater than ½ inch) indicates that smooth sherds are thicker than their cord roughened counterparts (4.84 mm vs. 6.77 mm), possibly reflecting differences between Middle and Late Woodland vessels.

Table 25 indicates that 37.5 percent of the classified rimsherds are decorated with cordwrapped object impressions. These rimsherds can be assigned to various Late Woodland Kathio and Onamia types based on maximum thickness, which averages 5.5 mm. Transitional Middle to Late Woodland (St. Croix Dentate Stamp) and Havanoid rimsherds are equally represented by 22.5 percent of the assemblage and are thicker with mean thicknesses of 7.2 mm and 8.9

mm, respectively. Smaller amounts of cord impressed, comb stamped, horizontal cordmarked, and vertical cordmarked rimsherds complete the assemblage. Despite its greater depth down to 60–65 cmbs, there are no consistent stratigraphic trends in these ceramic types.

Table 25. Frequencies, Percentages, and Thicknesses of Excavated Complete and Fragmentary Rimsherds by Decoration Technique and Surface Treatment for 2013 Excavated Assemblages from 21KH36, 21KH46, and 21KH93.

	Exterior Rim Decoration Technique							Exterior Rim Surface Treatment			
Site/Vertical Distribution/ Maximum Thickness	Cordwrapped Object Impressed	Dentate Stamped	Comb Stamped	Cord Impressed	Bossing Tool Impressed or Punctate		Havanoid	Vertical Cordmarked	Horizontal Cordmarked	Prairie Village	Indeterminate
21KH36											
0–10 cm	-	-	1	-	-	-	-	-	-	1	-
10–20 cm	3	-	1	-	1	3	1	-	1	2	1
20–30 cm	-	-	-	-	-	1	-	-	-	1	1
Total	3		2	-	1	4	1	-	1	4	2
Percent	27.2		18.2		9.1	36.4	9.1		9.1	-	-
Maximum Thickness											
N	3	-	2	-	-	7	-	-	1	-	4
Mean	5.6	-	6.2	-	-	9.8	-	-	5.5	-	5.3
Standard Deviation	0.96	-	0.42	-	-	0.84	-	-	-	-	1.41
21KH46											
0–10 cm	-	-	-	-	-	-	2	-	-	-	-
10–20 cm	4	1	-	2	-	-	1	-	-	-	3
20–30 cm	1	4	-	-	-	-	3	-	-	-	3
30–40 cm	2	3	-	1	-	-	1	-	-	-	2
40–50 cm	4	1	1	-	-	-	-	1	-	-	3
50–60 cm	1	--	-	-	-	-	1	-	2	-	2
60–70 cm	-	-	-	-	-	-	-	-	-	-	1
Unknown Depth	2	-	-	-	-	-	1	-	-	-	3
Total	14	9	1	3	-	-	9	1	2	-	17
Percent	37.5	22.5	2.5	7.5	-	-	22.5	2.5	5.0	-	-
Maximum Thickness											
N	14	8	1	3	-	-	7	-	2	-	10
Mean	5.5	7.2	6.1	7.5	-	-	8.9	-	4.2	-	5.6
Standard Deviation	1.14	1.15	-	1.35	-	-	1.63	-	0.07	-	1.50
21KH93											
0–10 cm	-	-	1	1	-	-	-	-	-	-	-
10–20 cm	1	2	3	2	1	-	5	1	-	2	-
20–30 cm	1	1	1	2	-	-	1	-	1	-	-
30–40 cm	-	-	1	1	-	-	-	-	-	-	1
Unknown Depth	-	4	1	3					1		
Total	2	7	7	9	1	-	6	1	2	2	1
Percent	5.7	20.0	20.0	25.7	2.9	-	17.1	2.9	5.7	-	-
Maximum Thickness (mm)											
N	3	5	6	2	1	-	7	1	2	-	1
Mean	5.3	6.8	5.5	6.9	7.3	-	8.0	4.8	6.7	-	4.6
Standard Deviation	1.04	0.80	1.78	0.28	-	-	0.81	-	0.42	-	-

Levin Site (21KH93)

The ceramic assemblage from this site consists of 375 bodysherds and 38 rimsherds (see Tables 24 and 25; Figure 66G-J, M; see Appendix C, Tables C5 and C6). Like the other two sites, most bodysherds are cord roughened (n=197), with a smaller number of smoothed sherds (n=78). Bodysherds with indeterminate surface treatments are excluded from Table 24. There is a trend for cord roughening to become more popular with depth (61.5 percent to 88.9 percent) at the expense of smoothed surfaces (38.5 percent to 11.1 percent), just the opposite of what may be expected if Havanoid pottery is more frequently smoothed compared to Late Woodland vessels. Maximum thicknesses of size grade 1 and 2 bodysherds (greater than ½ inch) indicate that smooth sherds are thicker than their cord roughened counterparts (5.62 mm vs. 7.27 mm), possibly reflecting differences between Middle and Late Woodland vessels.

Rimsherds decorated with cord impressions (25.7 percent), dentate stamping (20.0 percent), and comb stamping (20.0 percent) dominate the assemblage from 21KH93. Havanoid pottery is represented by moderate amounts (17.1 percent), with cordwrapped object impressing (5.7 percent), horizontal cordmarking (5.7 percent), vertical cordmarking (2.9 percent), and bossing (2.9 percent) completing the assemblage. Overall, the assemblage from the site appears to represent a stronger emphasis on earlier occupations compared to 21KH36 and 21KH46, which have more Late Woodland cordwrapped object impressing. Like the other sites, there are no compelling stratigraphic trends in the vertical distribution of these types at 21KH93. Havanoid pottery is thicker (8.0 mm) than the later Late Woodland types (5.3–6.9 mm).

REGIONAL COMPARISONS

There are various ways to place 21KH36 and 21KH93 into the broader Woodland developments in Minnesota. The assemblage from the current excavations at site 21KH46 is too small to formally include in the following analysis because it includes only small and fragmentary rimsherds. The comparative analysis relied heavily on larger rimsherds with more comprehensive sections of decorative motifs present and, therefore, the small, fragmentary pieces recovered from 21KH46 during the current study were insufficient. Archeologists frequently make statements about the relationships of ceramic assemblages based on their overall appearance without relying on actual frequencies of attributes, combinations of attributes, or types. Although the impressionistic approach is useful in providing a general outline of the relationships between ceramic assemblages, it is no substitute for a quantitative analysis that links actual numbers of attributes or types to the locations of sites distributed across the landscape. However, this approach requires relatively large sample sizes.

The approach taken in this section is to perform a quantitative analysis of ten Woodland sites or mixed site groups from central and southwestern Minnesota. These assemblages were chosen because they lie on east-west (21BS22/51 to 21WR17) and northeast-southwest (21ML11 to 21LN2) transects and contain sufficient quantities of pottery for statistical analysis (see Figure 2, page 8, above). Two of the ceramic assemblages are from professional excavations at the Petaga Point (21ML11) and Pedersen (21LN2) sites; the remaining assemblages are from amateur collections, usually from the surface of sites. Illustrations of a select number of rimsherds from many of these sites appear in Figures 67–72. Also included in a part of this analysis are a number of other professionally-excavated sites that contain moderate-sized assemblages of Late Middle and Late Woodland pottery decorated by cordwrapped object impressing, dentate/comb stamping, and cord impressing. Excluded from this analysis are many smaller amateur and professional collections because their size would yield inconclusive results. In addition, the pottery from the 2013 excavations at sites 21KH36, 21KH46, and 21KH93 is excluded because of small, fragmented samples and time constraints. Because many of the assemblages are from uncontrolled contexts or lack any definable stratigraphy, the emphasis is on defining broad spatial variations since it is impossible to separate much of the pottery by component, particularly from Late Middle to Late Woodland contexts. Even at excavated sites from Minnesota and adjacent states and Canadian proveniences, defining components and many of their constituent non-ceramic artifacts can be a challenge due to extensive mixing (Gibbon 2012a:102, 148-149) or collapsed stratigraphy (Syms 1977:2-5).

Figure 67. Rimsherds from 21KH36 (Levin collection): A-B, P – Lake Benton Vertical Cordmarked; C-E, T – Lake Benton Horizontal Cordmarked; F – Fox Lake Horizontal Cordmarked; G, K – St. Croix Comb Stamped; H – Pokegama Punctated; I, L, N – Kathio; J – Unidentified; M – Onamia Cordwrapped Stick Impressed; O, Q – Havanoid; R-S – St. Croix Dentate Stamped. Rim exteriors on left, rim interiors on right.

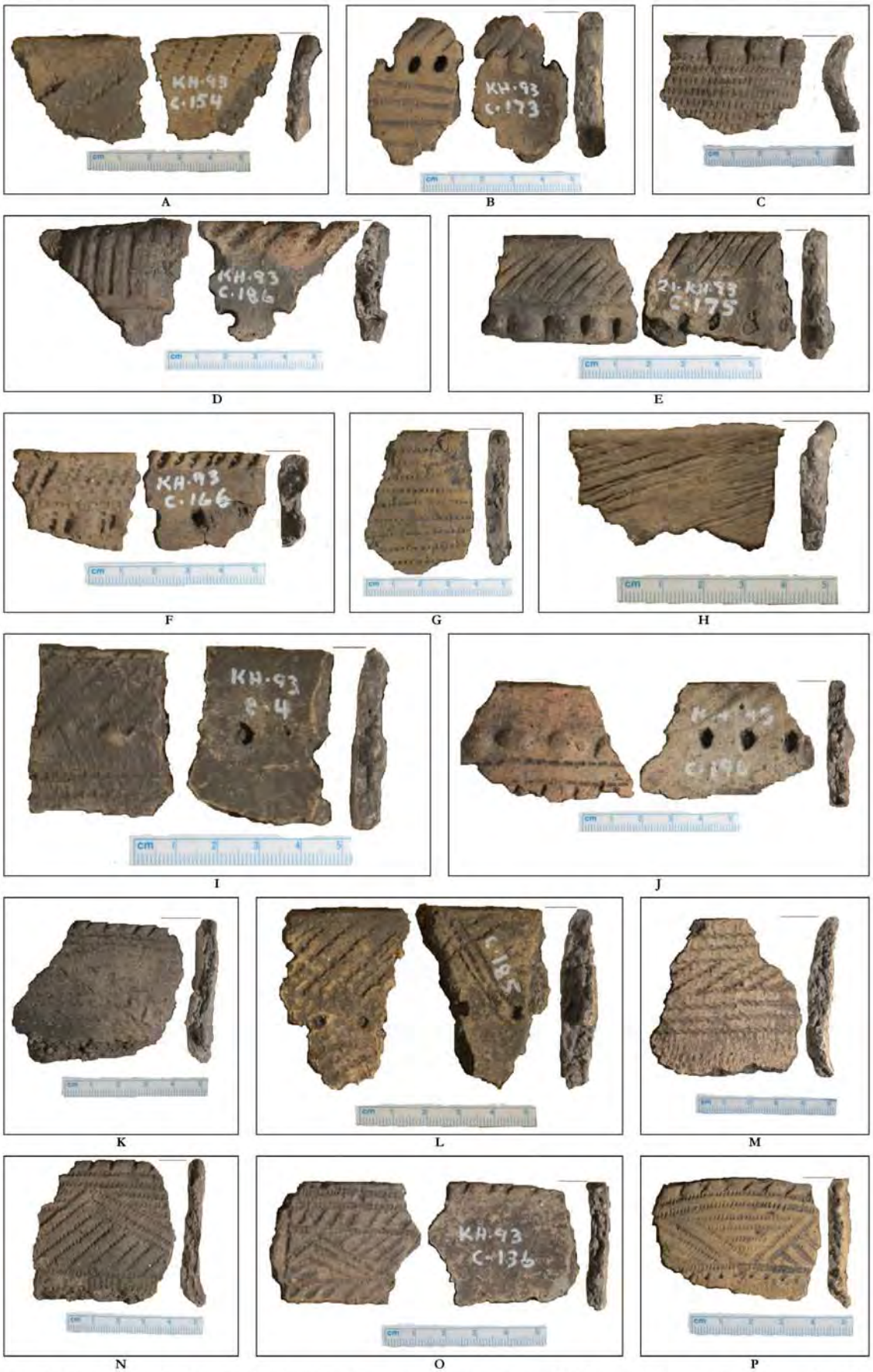


Figure 68. Rimsherds from the Levin site (21KH93) (Levin collection): A – Onamia Cordwrapped Stick Impressed; B – St. Croix Comb Stamped; C, N-P – Kathio; D – Havanoid; E – Malmo; F, G, I, J – St. Croix Dentate Stamped; H – Lake Benton Horizontal Cordmarked; K-M – Clam River Ware. Rim exteriors on left, rim interiors on right.

Figure 69. Rimsherds from the Lake Koronis East site (21ME1) (Jennegis collection): A-B, P, R – St. Croix Dentate Stamped; C, F – St. Croix Comb Stamped; D, E, O – Kathio; G, N – Snake River Incised; H – Lake Benton Vertical Cordmarked; I-K – Clam River Ware; L – Malmo; M, S-T – Onamia Cordwrapped Stick Impressed; Q – Havanoid. Rim exteriors on left, rim interiors on right, lip tops below rim exteriors.

Figure 70. Rimsherds from the Lake Koronis East site (21ME2) (Behr collection): A, C – Lake Benton Vertical Cordmarked; B - Unidentified; D, E – St. Croix Dentate Stamped; F-I – Kathio; J, L – Havanoid; K – Fox Lake Trailed; M-N – Snake River Incised; O – Unidentified; P-Q – Onamia Cordwrapped Stick Impressed. Rim exteriors on left, rim interiors on right.

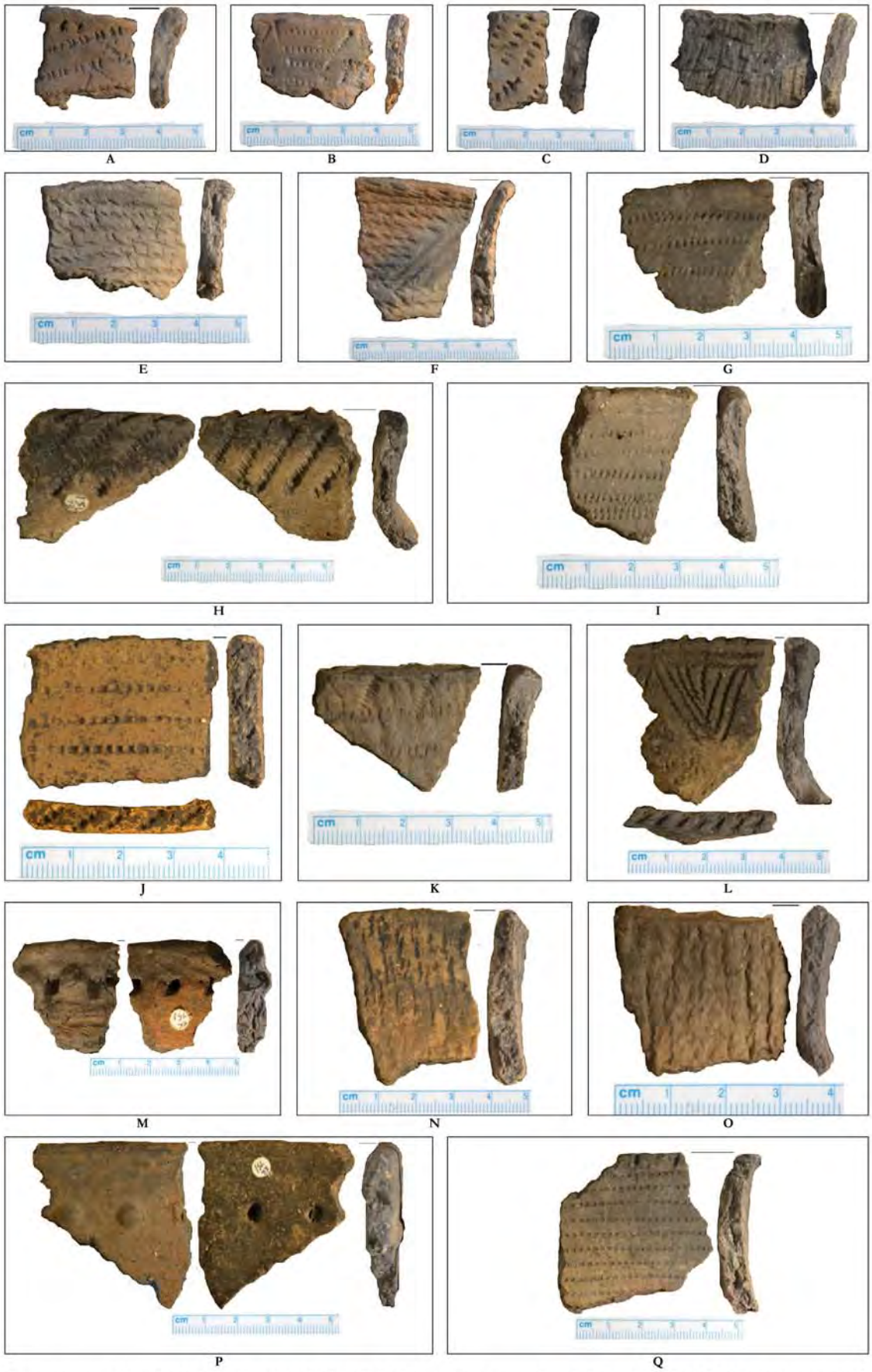


Figure 71. Rimsherds from the Artichoke Island site (21BS23) (H-Q) (Hanson collection) and Mink Lake site (21WR17) (A-G) (Andrew collection): A, C, H – Onamia Cordwrapped Stick Impressed; B – St. Croix Comb Stamped; D, N, O – Lake Benton Vertical Cordmarked; E-F, L – Clam River Ware; G, I – St. Croix Comb Stamped; J, Q – St. Croix Dentate Stamped; K – Kathio; M – Havanoid; P – Malmo. Rim exteriors on left, rim interiors on right, lip tops below rim exteriors.

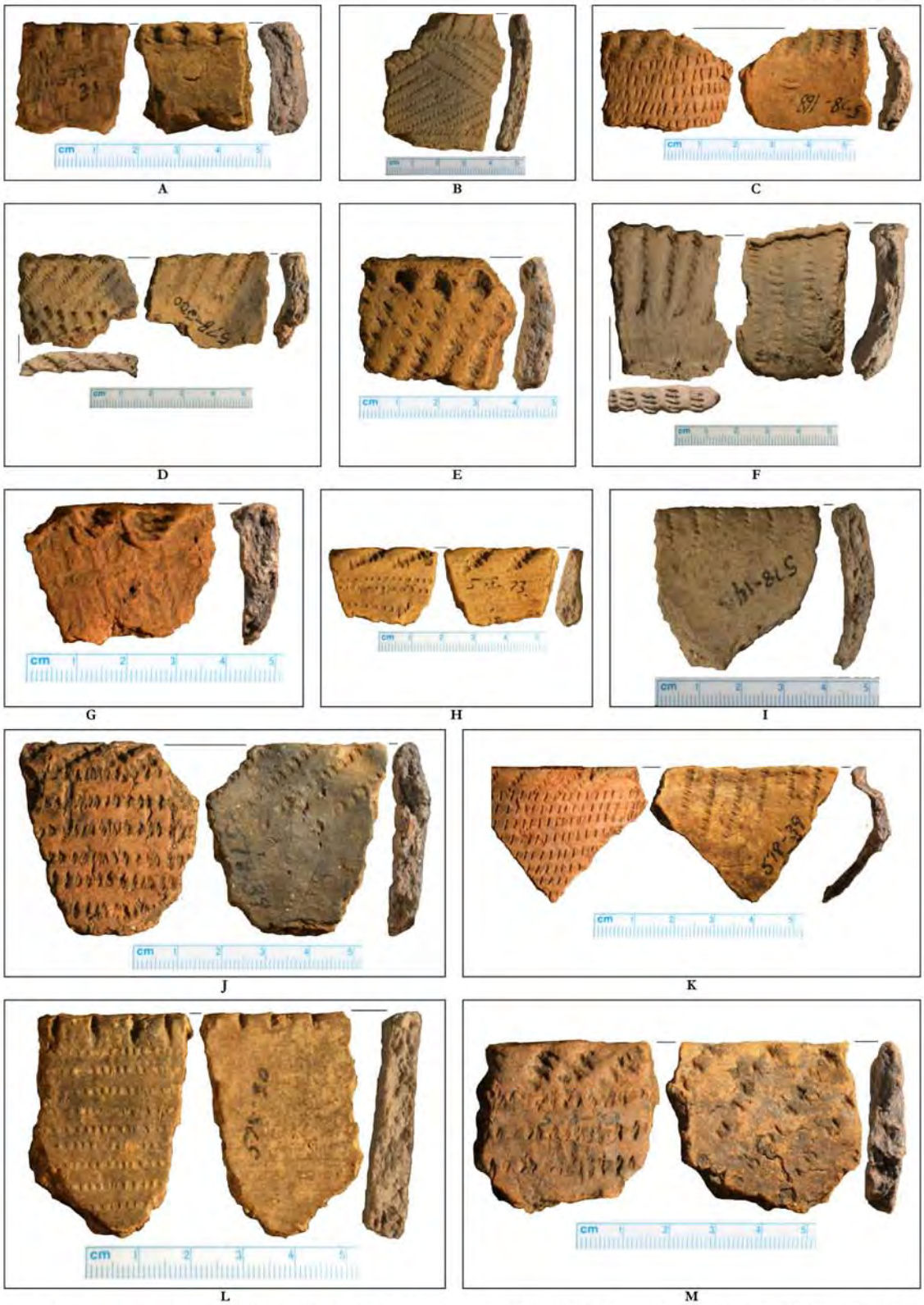


Figure 72. Rimsherds form the Petaga Point site (21ML11): A, E-G, M – Onamia Cordwrapped Stick Impressed; B – Kathio/Clam River Ware; C-D, I-K – Kathio; H, L – St. Croix Dentate Stamped. Rim exteriors on left, rim interiors on right, lip tops below rim exteriors.

The Collections

Data on many of the collections presented in this chapter were gathered by the author in 2013 by a personal examination, except those from 21ML11, which relied on the master chart data sheets provided by Hohman-Caine (2009). Data from other assemblages were extracted from various reports. Before data collection commenced, recording sheets for each pottery class were constructed which listed all of the possible attribute combinations based on a reading of type descriptions found in Anfinson (1979a) and Hohman-Caine (2009). Frequencies of these combinations were tallied on the sheets based on complete rimsherds possessing lips and fragmentary rimsherds lacking lips, resulting in adding some attribute combinations and subtracting others that were not present (see Appendix C, Tables C7–C13). These tables are based on traditionally defined wares, types, or series. The tables take a hierarchical approach to classification, making initial divisions by presence/absence of exterior rim decoration, then by decoration technique, exterior rim decoration motif, and decoration technique on other parts of the rim. For example, St. Croix Stamped series is first broken down by its two defined types or varieties (Dentate Stamped, Comb Stamped varieties), then by whether or not the exterior rim is decorated, the overall motif of the rim decoration (e.g., horizontal lines, diagonal), presence and type of lip decoration (e.g., dentate stamped, tool impressed or punctates, cordwrapped object impressed), interior rim decoration technique, whether additional decoration is also present, and presence of upper exterior rim decoration (tool impressed or cordwrapped object impressed). There is enough detail in these tables to allow for the rearrangement of attributes so that any number of hierarchical or non-hierarchical classes could be constructed.

The pottery from Big Stone County is derived from a number of sites collected by Charles E. Hanson of rural Correll, Minnesota, who lives on the northwest shore of Artichoke Lake. His collections are curated by the Big Stone County Historical Society Museum in Ortonville in their Artichoke Lake General Store building. They were examined by the author on January 14, 2013 in the company of Mr. Hanson in the main museum office courtesy of Ann Lundberg, a museum volunteer. The largest collection is from three combined sites, thought to be Toqua Lakes IV (21BS51) (ca. ¼ of collection), Hanson (21BS22) (ca. ¼ of collection), and possibly Lindholm-Gustafson Farms (21BS39) (ca. ½ of collection) (Charles Hanson, personal communication 2013). In this study, these sites are referred to by the first two site names and numbers, acknowledging the uncertainty of the 21BS39 attribution. This collection also contains other artifacts, most notably chipped stone tools. Due to logistic and time constraints, a small amount of the pottery from these three combined sites was not examined. Artifacts from the Artichoke Island site (21BS23) include pottery, chipped stone tools and flaking debris, and bone tools collected from the northernmost island on which the site is located (Hanson 1971). The collection was accumulated by Mr. Hanson over a number of years by repeated plowing of the island. It contains an impressive array of projectile points, dating from the Archaic through Late Prehistoric periods. The artifacts are identified by lettering applied to small round adhesive paper tags applied to the internal rim surfaces. Watson and Oothoudt (1978) discuss 21BS23 along with three other sites along Artichoke Lake.

Large ceramic assemblages from the Levin site (21KH93) and site 21KH36 were collected by Larry Levin of rural New London, Minnesota. These collections are stored in plastic bags and boxes in his private museum, the Raptor Ridge Museum, located next to his residence. They were examined on January 12–13, 2013. The collection from 21KH36 may also contain pottery from other nearby sites.

A small collection from the King Lake site (21ME23) is also located in Levin's museum. Seven Woodland rimsherds and four rimsherd fragments are mounted on a board behind glass. As a consequence, decoration present on the interior rims could not be recorded. Twenty rimsherd fragments from the site are stored in a bucket along with a number of bodysherds. A collection from the site may also be curated by the G.A.R. Frank Daggett Post #35/Meeker County Historical Society Museum in Litchfield, Minnesota. A visit to the museum on January 15, 2013 could not confirm the presence of the collection photographed years earlier by Scott Anfinson. There is currently a very small collection of rimsherds mounted at a distance behind glass which was not directly accessible. It was impossible to confirm if some of the rimsherds are duplicates of those from earlier photographic color slides by Anfinson but the collection appears to be significantly smaller in size. In any case, the collection at the museum is of limited analytical value and was, therefore, excluded from this analysis.

The largest ceramic assemblage in this study was collected from the Lake Koronis East site (21ME1) by Vince Jennegis of rural Paynesville, Minnesota. Nearly all of the pottery is curated at the Minnesota Historical Society; a very small

quantity is at the Jennegis residence. Both collections were examined for this study, the smaller one on January 15, 2013. In addition, a smaller collection from the site is curated at the Stearns County Heritage Center in St. Cloud, Minnesota. It was collected by Charles and Eva Roach Behr and donated by Phillip Behr. It was examined by the author on January 16, 2013 with the assistance of Adam Smith. It was also discussed by C. Johnson (1994:3.16, 3.19) in a review of the archeology of central Minnesota. The Behr collection is designated as 21ME1-B in this study to distinguish it from the Jennegis collection from the same site. Behr also donated rimsherds from the site to the Paynesville Historical Society in Paynesville, Minnesota. Since this collection is very small and access is limited, it was not used in this study.

A moderate-sized collection of rimsherds from sites 21SN5 and 21SN6 was collected by Milt Koshiol and is now in the possession of the Koshiol family of Paynesville, Minnesota. During data collection on January 15, 2013, Milt's son Chuck, of Zap Leather and Cycle in Paynesville, indicated that it was collected from site 21ME1, although an earlier study (C. Johnson 1994:3.19) ties the collection to 21SN5 and 21SN6. In the current study, the Stearns County site designation is maintained, realizing there may be rimsherds present from perhaps at least four sites.

Another moderate-sized assemblage of rimsherds from the Mink Lake site (21WR17) was examined for this study. Curated by the Wright County Museum near Buffalo, Minnesota, and examined on January 16, 2013, with the assistance of Erin Endress, the collection contains rim and bodysherds, chipped stone artifacts, unmodified vertebrate materials, and other artifacts surface-collected and excavated by Robert W. Andrew, a retired soil scientist. Notes accompanying the collection indicate that some vertical and horizontal controls were kept during fieldwork (see also C. Johnson 1994:3.20). Although not reported in the tables in this analysis, the collection contains three shell tempered Sandy Lake rimsherds, extending the southern range of the type (see Lofstrom 1988).

Another ceramic assemblage employed in this analysis is from Petaga Point (21ML11). Although a brief site report exists (Bleed 1969), the data used in this analysis is derived from Hohman-Caine (2009), particularly the master charts accompanying the report. Petaga Point has a robust ceramic assemblage consisting of 532 rimsherds. Eliminating all rimsherds in the master charts except those assigned to Onamia, Kathio, Clam River, Malmo/Kern, Snake River Incised, and St. Croix, left a total of 244. A select number of rimsherds were examined and photographed in the preparation of the data sheets used in the present study.

The last ceramic assemblage incorporated into this analysis is from Hudak's (1974, 1976, 1978) 1973–1975 Science Museum of Minnesota excavations at the Pedersen site (21LN2). The collection from the site is curated at the Science Museum of Minnesota and was examined by the author on November 13, 2013 with the assistance of Ed Fleming. A small surface collection from the site is also at the museum but was not used in this analysis. Significantly smaller collections are curated at the MHS. These were also not included in this analysis.

Analysis

Table 26 lists the frequencies of the ceramic types at the 11 site/site groups for both complete rimsherds (those having intact lips) and partial rimsherds lacking intact lips. It is derived from Appendix C, Tables C7–C13. Clam River Ware is limited to only those rims decorated by cord impressing. It is clear from this table that there are a number of Middle (Havanoid/Fox Lake), Late Middle or Early Late (St. Croix), and Late Woodland (Lake Benton, Onamia, Clam River, Kathio) occupations present at all sites except King Lake (21ME23), which lacks early pottery. Early Woodland Brainerd pottery is present in small numbers at three sites. Most sites are dominated by pottery decorated with cordwrapped object impressions (Onamia and Kathio) and dentate/comb stamping (St. Croix, Onamia) with cord impressing (Clam River) occurring in smaller quantities. By the definition used here, only cord impressed pottery is assigned to Clam River Ware, even though other definitions include cordwrapped object impressed decoration. Middle Woodland types (Havanoid, Malmo/Kern, Pokegama, Snake River, Fox Lake) constitute 10.5 percent and 13.0 percent of the assemblages from 21KH36 and 21KH93, respectively. This is somewhat less than the 16.0 percent figure for Petaga Point. The three westernmost sites (21BS22, 21BS39, and 21BS51) have relatively low percentages of these early types at 5.3 percent and 8.3 percent, respectively. Mink Lake (21WR17) is also relatively low at 6.7 percent along with 21ME1 at 7.1 percent. Sites in Meeker and Stearns counties (21ME1-B, 21SN5/6) have relatively high figures ranging from 12.7 percent to 18.0 percent. The number of types is skewed toward those defined from east-central Minnesota and differs from a recent survey of Swift County which employs Lake Benton and Blackduck, types

most commonly associated with Woodland manifestations in the southwestern and northern parts of the state (Holley et al. 2011:124-127). Holley (2011) identifies a series of Lake Benton, Fox Lake, and Onamia types from the Barrett Lake site (21GR5). The study by Ossenberg (1974) of discrete human skeletal traits designed to explore biological distance also establishes links between the Late Woodland Kathio phase sites in the Mille Lacs area and the southern Arvilla complex, which includes somewhat earlier sites associated with St. Croix pottery.

Table 26. Frequency of Woodland Ceramic Rimsherd Types for 11 Sites or Site Groups (Last Three Rows of Cordwrapped Object Impressed, Dentate/Comb Stamped, and Cord Impressed are Combined Numbers for Complete and Fragmentary Rimsherds).

	Complete Rimsherds											Fragmentary Rimsherds										
CERAMIC TYPE	21BS22/51	21BS23	21KH93	21KH36	21ME1	21ME1 (Behr)	21SN5/6	21ME23	21WR17	21LN2	21ML11	21BS22/51	21BS23	21KH93	21KH36	21ME1	21ME1 (Behr)	21SN5/6	21ME23	21WR17	21LN2	21ML11
ONAMIA SERIES																						
Onamia Cordwrapped Stick Impressed	7	3	56	10	17	10	14	-	8	-	109	10	1	63	21	93	14	18	6	1	-	-
Onamia Dentate	12	5	11	3	5	-	9	-	1	-	5	12	3	43	12	24	6	2	4	1	-	-
KATHIO SERIES	25	11	42	19	26	18	28	1	8	-	66	17	2	42	25	87	8	13	8	3	-	-
CLAM RIVER WARE	8	2	61	10	6	-	5	3	2	-	3	-	1	39	13	14	5	1	3	-	1	-
FOX LAKE COMPLEX																						
Fox Lake Smooth	1	-	-	2	-	-	2	-	-	26	-	-	-	1	-	-	-	-	-	-	5	-
Fox Lake Vertical Cordmarked	1	1	7	-	-	-	-	-	-	13	-	-	-	1	-	-	-	-	-	-	1	-
Fox Lake Horizontal Cordmarked	-	-	5	1	-	-	-	-	-	14	-	-	-	-	-	-	-	-	-	-	2	-
Fox Lake Trailed	1	-	1	1	-	1	1	-	-	23	-	-	-	17	8	22	4	2	3	-	3	-
MIDDLE WOODLAND TYPES																						
Havanoid	2	1	11	1	1	6	10	-	1	-	-	1	-	6	1	9	4	15	-	-	-	-
Malmo/Kern Series	-	1	4	1	1	2	-	-	1	-	37	-	-	1	-	-	-	-	-	-	-	-
Pokegama Smooth	2	2	5	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pokegama Punctated	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Snake River Incised	-	-	-	-	2	2	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
BRAINERD WARE																						
Net Impressed	-	-	1	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 26 (continued).

	Complete Rimsherds											Fragmentary Rimsherds										
CERAMIC TYPE	**21BS22/51**	**21BS23**	**21KH93**	**21KH36**	**21ME1**	**21ME1 (Behr)**	**21SN5/6**	**21ME23**	**21WR17**	**21LN2**	**21ML11**	**21BS22/51**	**21BS23**	**21KH93**	**21KH36**	**21ME1**	**21ME1 (Behr)**	**21SN5/6**	**21ME23**	**21WR17**	**21LN2**	**21ML11**
LAKE BENTON COMPLEX																						
Lake Benton Cordwrapped Stick Impressed	-	-	-	-	-	-	-	-	-	19	-	-	-	-	-	-	-	-	-	-	11	-
Lake Benton Dentate	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-
Lake Benton Vertical Cordmarked	-	3	15	3	1	3	13	-	1	46	-	-	-	-	-	-	-	-	-	-	5	-
Lake Benton Horizontal Cordmarked	-	-	7	5	-	-	1	3	-	18	-	-	-	-	-	-	-	-	-	-	-	-
Lake Benton Plain	-	-	-	-	-	-	-	-	-	44	-	-	-	-	-	-	-	-	-	-	3	-
ST. CROIX STAMPED SERIES																						
Dentate Stamped Variety	10	4	13	5	13	3	10	1	2	-	21	16	8	31	7	117	17	13	-	-	-	-
Comb Stamped Variety	1	2	17	4	3	1	4	2	1	-	1	7	2	21	24	43	6	7	3	2	-	-
UNTYPED WOODLAND	-	1	11	22	12	1	30	-	7	-	-	-	-	31	-	4	6	12	-	4	-	-
CORDWRAPPED OBJECT IMPRESSED	32	14	99	29	43	28	42	1	16	19	175	27	3	105	46	180	22	31	14	4	11	-
DENTATE/COMB STAMPED	23	11	41	12	21	3	23	3	4	5	27	35	13	95	43	184	29	22	7	3	-	-
CORD IMPRESSED	8	2	61	10	6	-	5	3	1	1	3	-	1	39	13	14	5	1	3	-	-	-
TOTAL	70	36	265	92	87	48	129	10	33	209	244	62	17	239	102	378	56	54	24	7	30	-

Variability of the three dominant Late Middle and Late Woodland types (cordwrapped object impressed, dentate/comb stamped, and cord impressed) in central Minnesota can be explored using the Meighan (1959) or three-pole graphical technique. It was developed as a simplified method to seriate or order sites or provenience units within sites to facilitate chronology building. The resultant ordering of sites or units can be interpreted as temporal in nature if there are independent lines of supporting evidence, such as site stratigraphy or radiocarbon dates. In this study, the percentages of the three consolidated ceramic groups are depicted in Figure 73. Note that since the percentages must equal 100 percent, all other pottery types associated with the Late Middle and Late Woodland occupations are excluded. Also included in this figure are other Late Woodland reference collections from the Gull Lake Dam (21CA27), Synsteby (21BW1), Aquipaquetin Island (21ML2), Old Shakopee Bridge (21ML20), Washington Creek (21ME14), Shady Dell (21TR6), Refuge (21SH18), Honker (21SH15), and Zacharias (39RO2) sites. These sites will be discussed later in this chapter. For obvious reasons, the ordering of sites in Figure 73 cannot be interpreted in chronological terms since independent evidence is lacking and the collections are likely a mixture of occupations over a long period of time that are represented to various degrees depending on the site. Rather, an approach that examines spatial variability in decoration across the landscape is a more fruitful line of analysis.

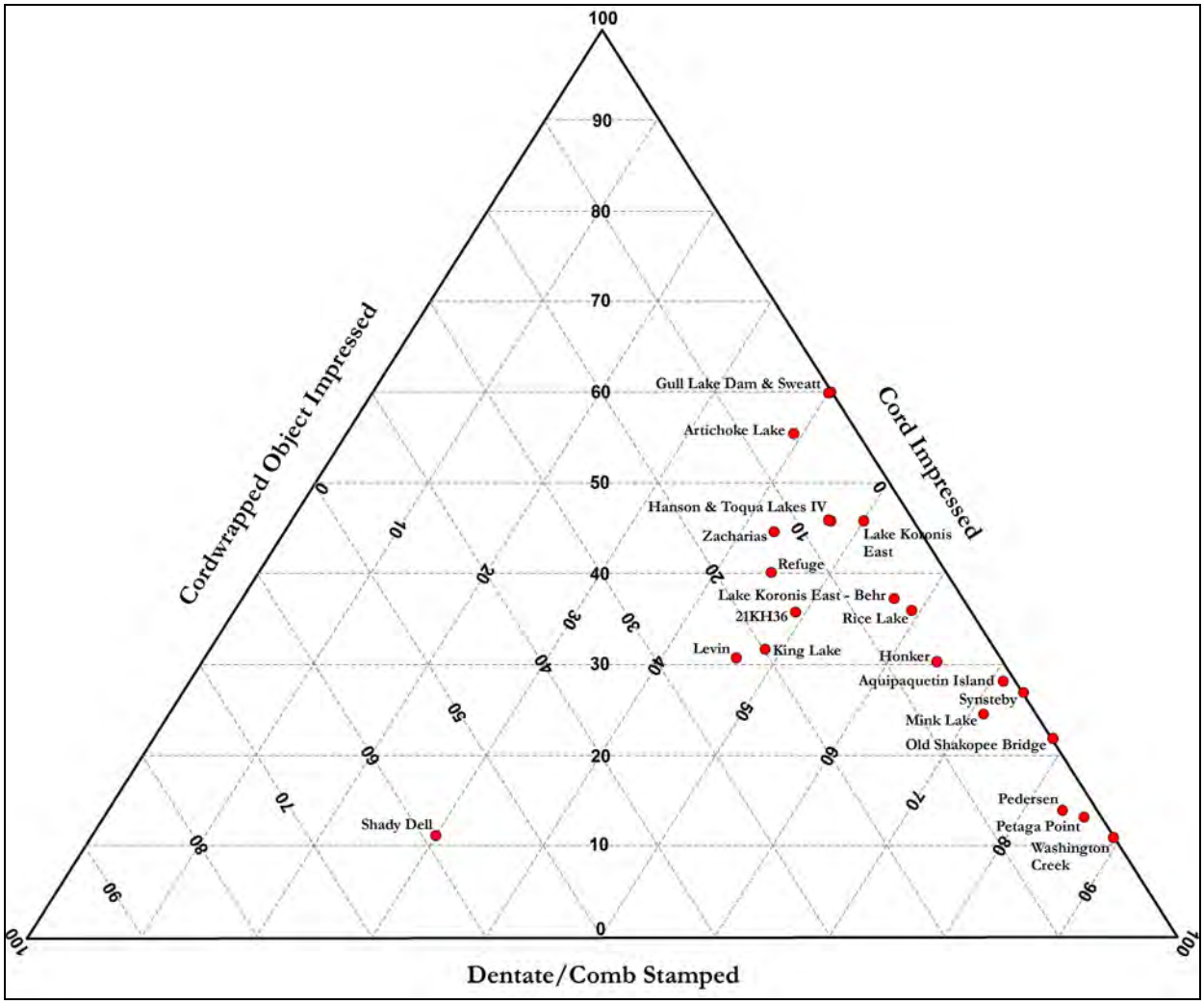


Figure 73. Tri-pole graph of the percentage of cordwrapped object impressed, dentate/comb stamped, and cord impressed rimsherd and rimsherd fragments from 22 sites or site clusters.

It is clear from Figure 73 that all the sites except Shady Dell are arranged along an axis from Gull Lake Dam, which contains 60 percent dentate/comb stamped and 40 percent cordwrapped object impressed pottery to Washington

Creek, characterized by 89 percent cordwrapped object impressing and 11 percent dentate stamping. Most of the sites from west-central Minnesota fall within a relatively small range of the three ceramic groups. The most dominant group of types, those decorated with cordwrapped object impressions, ranges from 43 percent to 59 percent. Dentate and comb stamped types vary from 31 percent to 46 percent and those characterized by cord impressions range from 4 percent to 23 percent. Petaga Point and Pedersen are clearly different from most of the west-central sites, being composed mostly of vessels decorated with cordwrapped object impressions. In that sense, these two sites are similar in overall decorative composition. The collections from 21KH93 and 21KH36 are similar, being characterized by high percentages of pottery decorated with cordwrapped object impressions (46–49 percent), somewhat less dentate/comb stamping (31–36 percent), and smaller amounts of cord impressing (15–23 percent).

The pattern in Figure 73 demonstrates that a band of dentate/comb stamping and cord impressing is present through central Minnesota from Wright County to the western Minnesota border but appears not to extend in comparable quantities to the north or south. Dentate stamping may be more widespread in north-central Minnesota, making up 60 percent of the pottery from Gull Lake Dam and Sweatt in Figure 73 (E. Johnson 1971:53-54; Terrell 2010), is somewhat less common (22–27 percent) in Late Woodland occupations to the south and east at the Synsteby, Aquipaquetin Island, and Old Shakopee Bridge sites (Figure 73) (Wilford 1962b), and is found in even smaller quantities at the Mountain Lake (Wilford 1962a), Fox Lake (Anfinson 1997:77; Wilford 1961a), Big Slough (Wilford 1954), and Pedersen (Wilford 1961b) sites (Figure 73). Surprisingly, it is nearly absent from sites at the western end of Lake Minnetonka (Nienow 2004:Table 1) but constitutes 60.9 percent (14/23) of the Early Late Woodland rimsherd assemblage from the Sweatt site (21HE353) at the lake's eastern end (Terrell 2010:59-65). Excavations at the Washington Creek site (21ME14), about 28 miles east of 21KH93 and 21KH36, yielded Middle and Late Woodland components with dentate stamping (8.2 percent) and cordwrapped object impressions (85.7 percent), constituting most of the rimsherd/rimsherd fragment assemblage there (Mather et al. 1998). Percentage calculations based only on these two types (no cord impressed pottery was found) place it near 21LN2 and 21ML11, further toward the lower right apex in Figure 73. Wilford (n.d.b) excavated the Zacharias site (39RO2) located on the western side of Lake Traverse in Roberts County, South Dakota. The Late Woodland assemblage consists of 43 percent cordwrapped object impressed, 45 percent dentate stamped, and 12 percent cord impressed based on 101 rimsherd/rimsherd fragments. This places it closest to 21BS22/51 in Figure 73. The Aquipaquetin Island site in Mille Lacs County contains 61 percent cordwrapped object impressing, 28 percent dentate stamping, and 1 percent cord impressing when rimsherds/rimsherd fragments are considered (Wilford n.d.a), placing it near Synsteby in Figure 73. The Old Shakopee Bridge site (Gibbon 1976) is positioned between Aquipaquetin and Petaga Point. Two sites in Sherburne County, Refuge (21SH18) and Honker (21SH15), excavated by Richard Lane of St. Cloud State University in the early 1970s, have profiles similar to most of the sites from west-central Minnesota (Figure 73) based on figures for Late Woodland pottery provided by C. Johnson (1994:Table 3.1).

Finally, the Late Woodland Shady Dell site in far west-central Minnesota is clearly an outlier in Figure 73, characterized by high amounts of cord impressed pottery from a total of three type assemblage of 46 rimsherd/rimsherd fragments. It contains 59 percent cord impressed, 30 percent cordwrapped object impressed, and 11 percent dentate stamped pottery when only these types are considered. Anfinson (1997:106) assigns Shady Dell to the Big Stone phase, which is composed of fortified Plains Village sites in the Big Stone-Lake Traverse locality. Although Shady Dell has some outward appearances similar to these sites, its ceramic assemblage is more similar to Late Woodland manifestations than to those at Hartford Beach and Browns Valley. As more of these fortified sites are investigated, additional ones will probably be associated with the Late Woodland, much like the fortified Menoken Village near the Missouri River in North Dakota (Ahler 2003).

Referring back to Figure 73, cord impressing likely declines rapidly north of the study area but systematic research into its distribution has not been undertaken. It is absent at Gull Lake Dam and the Sweatt site where dentate stamping is common. Cord impressing occurs in small but consistent quantities in other southwestern Minnesota sites (Anfinson 1997:79) such as Synsteby (Wilford 1962b), Mountain Lake (Wilford 1962a), Fox Lake (Wilford 1961a), and Big Slough (Wilford 1954), as well as in the Lake Minnetonka area (Nienow 2004:Table 1). Significantly, the Shady Dell site (21TR6) in western Minnesota contains a large percentage of cord impressed rimsherds at 49.1 percent of the assemblage (Wilford 1957). The co-occurrence of dentate/comb stamping and cord impressing in central Minnesota is intriguing and it is possible that these decorative treatments were used by the same people at the same time. It is also

possible that dentate stamping was partially replaced through time by cord impressing. This suspected yet undemonstrated trend can only be explored with additional excavations at sites in the study area that yield evidence of stratified or partially-stratified deposits having sufficient quantities of both types and/or additional radiocarbon dates from clearly associated components. It can be noted that the twist direction of most of the pottery examined was of the *S*-variety as compared to the *Z*-variety common in later Plains Village sites in North and South Dakota occupied after A.D. 1000.

In addition to the Meighan technique, another way to evaluate the similarities between ceramic collections is the Brainerd-Robinson approach (Brainerd 1951; Robinson 1951). Commonly used to seriate or order collections chronologically, it is employed here solely to evaluate the relative similarities between a number of sites. Stoltman (1973:81-84) uses the technique to seriate Laurel assemblages from northern Minnesota and it is briefly discussed by Shennan (1997:311-312). In its simplest form, the technique takes ceramic assemblages from two sites, calculates the percentages of various types in each one, subtracts the differences of each type between the pair of sites, and adds the differences of all types. Collections that are identical in type percentages receive a value of 0.0 while those that are totally different have a value of 200.0. Most site pairs fall somewhere in-between these two values. For example, if one site has 10 percent of Type A, 50 percent of Type B, and 40 percent of Type C, while another site has 50 percent of Type A, 25 percent of Type B, and 50 percent of Type C, the sum of the absolute differences between the two sites equals 80 [(50–10) + (50–25) + (40–25)]. The Brainerd-Robinson analysis is based on two of the most commonly occurring Late Woodland types at the sites, cordwrapped object impressed and dentate/comb stamped.

Table 27 presents the Brainerd-Robinson coefficients between 21KH36 and 21KH93 and six other sites/site groups. The percentages were calculated for each group independently from Appendix C, Tables C14–C15. The coefficients measure the decorative similarity between the sites for each group. Low coefficients mean that decorative variants are most similar between each pair of sites. Values for dentate/comb stamped decoration for 21ME1-B and 21LN2 were not calculated due to low frequencies from these sites. Two methods were used in calculating the coefficients. One was to retain all combinations of decoration, preserving as much variability as possible (unconsolidated types). The other approach was to combine the decoration variants into larger classes based on exterior rim decoration technique and motif (consolidated types). For example, all decorative variants falling within the class *Vertical over Horizontal* were combined into a single group. These larger groups might be considered types and varieties in the traditional sense. In Appendix C, Tables C14–C15, these classes are separated from each other with horizontal lines. Consolidating decorative variants has the effect of dramatically lowering the value of the coefficients. Table 27 also gives the rank values between sites, with low ranks indicating collections that are most similar. Ranks are also summed to determine overall similarities between the sites. The average or mean coefficients include all sites except 21LN2.

Table 27 indicates that 21KH36 is most similar to 21KH93 and secondarily to 21ME1 and 21BS22/51 based on the sum of ranks. Other nearby sites such as 21ME1-B and 21SN5/6 are less similar, with 21LN2 and 21ML11 being most dissimilar, not surprising considering they are located far to the southwest and northeast, respectively. The similarity of 21KH36 and 21BS22/51 is interesting and indicates some uniformity in dentate stamping and cordwrapped object impressing over broad areas of central and western Minnesota but less so for sites in the east-central portion of the state such as 21ML11. This is a little surprising considering that some of the named types (Kathio, St. Croix) common in Kandiyohi County were originally defined from sites in eastern Minnesota. The results are also similar to the arrangements of sites using the Meighan approach presented earlier in Figure 73. Finally, the higher coefficient values for 21LN2 compared to 21ML11 imply that any linkages outside of central Minnesota are greater to the northeast in the Mille Lacs locality rather than to the southwest. This provides some support for employing these eastern types (Kathio) in this study rather than those from southwestern Minnesota (Lake Benton).

Table 27. Pairwise Values and Ranks of Brainerd-Robinson Coefficients Between 21KH36, 21KH93 and Six Other Sites Based on Late Woodland Rimsherds Decorated by Dentate/Comb Stamping and Cordwrapped Object Impressing (Low Ranks are Highlighted).

	Site								
Site/Decoration Technique/ Type/Rank	**21BS22/51**	**21KH93**	**21KH36**	**21ME1**	**21ME1-B**	**21SN5/6**	**21ML11**	**21LN2**	**Mean**
21KH36									
Cordwrapped Object Impressed									
Consolidated Types	54.8	45.4	-	84.4	69.2	79.5	62.9	91.0	66.0
Rank	2	1	-	6	3	5	4	7	
Unconsolidated Types	170.2	107.7	-	107.6	160.6	116.8	184.5	-	141.2
Rank	5	2	-	1	4	3	6	-	
Dentate/Comb Stamped									
Consolidated Types	90.8	75.5	-	69.4	-	81.9	110.1	-	85.5
Rank	4	2	-	1	-	3	5	-	
Unconsolidated Types	131.8	148.6	-	152.2	-	132.5	160.9	-	145.2
Rank	1	3	-	4	-	2	5	-	
Sum of Ranks	12	8		12	-	13	20	-	
21KH93									
Cordwrapped Object Impressed									
Consolidated Types	58.1	-	45.4	62.2	56.5	50.7	54.3	71.0	54.5
Rank	5	-	1	6	4	2	3	7	
Unconsolidated Types	138.4	-	107.7	106.7	128.0	114.9	182.2	-	129.6
Rank	5	-	2	1	4	3	6	-	
Dentate/Comb Stamped									
Consolidated Types	98.9	-	75.5	75.3	-	112.2	97.3	-	91.8
Rank	4		2	1	-	5	3	-	
Unconsolidated Types	159.0	-	148.6	140.6	-	174.4	166.0	-	157.7
Rank	3		2	1	-	5	4	-	
Sum of Ranks	17		7	9	-	15	16	-	

Moving on to 21KH93, the results in Table 27 are somewhat different. It is not surprising that it is closest to 21KH36 and secondarily to 21ME1 based on the sum of the coefficient rankings. Unlike 21KH36, the highest overall similarity ranking of 21KH93 is with 21BS22/51, making these sites the most dissimilar of the pairings. This suggests that despite the similarity in their ceramic assemblages, 21KH36 and 21KH93 have different links to those in western Minnesota. Nonetheless, coefficients indicate that variability between 21KH93 and the other assemblages has a strong spatial component since the sites further away (21BS22/51, 21ML11, 21LN2) are most dissimilar, particularly 21LN2, which has the highest ranking coefficients for rimsherds decorated with cordwrapped object impressions.

A final comparison can be made between the average values of the cordwrapped object impressed and dentate/comb stamped coefficients separately for each site in Table 27. For 21KH36, these averages are higher for cordwrapped object impressions for both the consolidated and unconsolidated types compared to their dentate/comb stamped

counterparts (66.0 vs. 85.5 and 141.2 vs. 145.2). These differences are even more pronounced at 21KH93 (54.5 vs. 91.8 and 129.6 vs. 157.7). These figures suggest that there is more inter-site decorative variation in dentate/comb stamping compared to cordwrapped object impressing.

Another way to explore both the relationship of ceramics between regions in Minnesota and the potential evolution of types from one to another is to examine changes in decorative motifs, patterns, or designs. In the following analysis presented in Table 28, the percent of cordwrapped object impressed and dentate stamped decorative motifs between sites in west-central, east-central, and southwestern Minnesota are quantitatively compared to determine their degrees of similarity. The goal is to assess any temporal and spatial changes in these ubiquitous potting traditions. In this analysis, it is assumed that dentate stamping largely preceded cordwrapped object impressing in time. Although there is some supporting stratigraphic evidence (Hohman-Caine 1966:100), a systematic study demonstrating this sequence of ceramic types has yet to be undertaken with other assemblages. A smaller amount of cord impressed pottery from 21KH36 and 21KH93 is added because it may date between these two types.

Table 28. Frequency of Ceramic Cordwrapped Object Impressed Rimsherd Types for Eight Sites by Decoration Area, Rim Decoration Technique, Rim Decoration Motif, and Lip Decoration Technique (DS = Dentate Stamped, CI = Cord Impressed, CWOI = Cordwrapped Object Impressed; Large Percentage Differences are Highlighted).

Exterior Rim Decoration Motif and Technique	Site															
	21LN2		21BS22/51		21KH93		21KH36		21ME1		21ME1-B		21SN5/6		21ML11	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Horizontal																
CWOI	5	15.8	5	15.7	2	16.2	5	17.2	13	30.4	6	22.9	6	16.2	31	11.5
DS	-	-	9	39.0	6	15.5	3	24.9	8	24.9	1	-	9	40.8	12	44.4
CI	-	-	-	-	37	60.7	7	70.0	-	-	-	-	-	-	-	-
Diagonal over Horizontal																
CWOI	1	5.3	3	9.3	12	12.2	5	17.2	4	9.3	5	19.1	6	16.2	52	19.2
DS	-	-	4	17.3	5	12.9	1	8.3	2	9.5	1	-	2	9.1	-	-
Vertical over Horizontal																
CWOI	-	-	-	-	6	6.1	1	3.4	3	7.0	-	-	3	8.1	25	9.3
DS	-	-	-	-	2	5.1	-	-	2	9.5	-	-	-	-	-	-
Vertical over Diagonal																
CWOI	-	-	-	-	-	-	2	6.9	-	-	-	-	-	-	3	1.1
DS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3.7
Diagonal over Vertical																
CWOI	9	47.4	14	43.8	33	33.6	11	37.9	9	21.1	8	30.7	6	16.2	74	13.0
DS	-	-	8	34.7	9	23.1	4	33.3	5	23.9	-	-	7	31.7	6	22.2
Horizontal over Diagonal																
CWOI	-	-	-	-	-	-	-	-	1	2.3	-	-	1	2.7	3	2.4
DS	-	-	1	4.3	-	-	-	-	1	4.8	-	-	-	-	2	7.4
Triangular Plats																
CWOI	-	-	-	-	3	3.0	1	3.4	-	-	-	-	1	2.7	2	0.8
DS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CI	-	-	-	-	7	11.5	1	10.0	-	-	-	-	-	-	-	-

Turning to Table 28, percentages are calculated independently for each decoration technique based on Appendix C, Tables C14–C15. Since only the most commonly occurring consolidated decorative motifs are employed, they do not add to 100 percent for each of the two main types.

Cells with percentages greater than 15 percent between any pair of ceramic types with the same site and motif are highlighted. It is clear from this table that although there are some differences between the percentages of cordwrapped object impressing and dentate stamping for any particular motif (e.g., horizontal, diagonal over horizontal) at any particular site, they are small at most sites. This points to a general continuity in decorative motifs from the Early through Late Woodland. However, there are differences. Nearly half of the large differences are due to the prevalence of horizontal dentate stamping at three site groups (21BS22/51, 21SN5/6, 21ML11), indicating that this motif decreases with cordwrapped object impressed rimsherds at later sites. Diagonal over horizontal cordwrapped object impressions at 21ML11, and diagonal or vertical cordwrapped object impressions at 21LN2 and 21ME1-B significantly increase through time while remaining relatively stable among the others. Dentate stamped diagonal or vertical impressions decrease from 31.7 percent to similar cordwrapped object impressed motifs at 16.2 percent at 21SN5/6. The largest temporal changes in decorative motif occur at 21KH36 and 21KH93 from horizontal dentate stamping (24.9 percent and 15.5 percent) to cord impressing (70.0 percent and 60.7 percent), and finally back down to cordwrapped object impressing (17.2 percent and 16.2 percent). This indicates that cord impressing is dominated by simple horizontal motifs not present in earlier dentate stamping or later cordwrapped object impressing at these two sites. However, this motif is relatively common among dentate stamped rimsherds at 21BS22/51, 21SN5/6, and 21ML11. The dominance of horizontal cord impressing may suggest that this pottery was made by groups who differed from those with ceramic assemblages characterized by dentate/comb and cordwrapped object impressing.

FUTURE RESEARCH

The preceding analysis has just begun to explore inter-regional spatial and temporal ceramic variability. Much remains to be done for there are numerous ceramic assemblages that could be examined, additional variables to be employed, and other analytical or statistical techniques to be used. The following discussion outlines additional areas to explore along these three themes.

A number of archeologists have discussed the need to examine the spatial variability of Late Woodland pottery in Minnesota decorated with cordwrapped object impressions. This ubiquitous decorative technique is widespread throughout Minnesota and has led archeologists to define or identify a number of ceramic types largely based on location. These include Lake Benton Cordwrapped Stick in southwestern Minnesota and adjoining areas (Anfinson 1979b), Onamia Cordwrapped Stick in central and southwestern Minnesota (Ready and Anfinson 1979b), Kathio series in east-central Minnesota (Ready and Anfinson 1979a), and Blackduck in north-central Minnesota and adjacent areas (Lugenbeal 1979). Many of these and other archeologists acknowledge the similarity of these types and recognize the need for a systematic study of their variability across the landscape and through time, regardless of type name. Dentate and comb stamped pottery including St. Croix Stamped series (George 1979b), Onamia Dentate (Ready and Anfinson 1979b), and Lake Benton Dentate (Anfinson 1997:76-78) could be added to the study because of their widespread occurrence and overlapping type definitions.

The future of this research can begin by identifying sites that contain sufficient quantities of rimsherds. Early in 1992, Elden Johnson outlined a research topic in a letter to the author entitled *Settlement Types in the Early Phases of Late Woodland Cultures in Central Minnesota and Northwestern Wisconsin*. It outlined three research phases, the first being the most well-developed and applicable to the present discussion. It discussed the need to compare ceramics associated with the cultural/temporal units Clam River, Kathio, Lake Benton, and southern Blackduck using an attribute-based ceramic coding system developed by Guy Gibbon for the University of Minnesota collections from the Cooper (21ML9), Petaga Point (21ML11), Vineland Bay (21ML7), and Wilford (21ML12) sites. The focus would be to define both spatial and temporal variability among types which seemingly form a continuum based on a series of attributes. Johnson identified a number of additional sites for study, most excavated by the University of Minnesota, including Mitchell Dam (21BK1) and Mud Lake (21CA2), containing Blackduck, Kathio, Brainerd and Psinomani ceramics; Osufsen Mound (21IC2) and Scott (21CA1) with Blackduck, Brainerd, and Psinomani pottery; the Bartke (21PO12), Fox Lake (21MR2), Pedersen (21LN2), and Synsteby (21BW1) sites with Fox Lake, Lake Benton, and/or Onamia

ceramics; and Clam River pottery from Clam Lake Mound (47BT1) and Spencer Lake Mound (47BT2), Ed Oerichbauer's Burnett County, Wisconsin sites, and the Burnett County Historical Society collections. As Johnson envisioned, the goal of this phase of the research would be the revised definition of Clam River, Kathio, Lake Benton and southern Blackduck ceramic types. He did not propose any specific methods on how this was to be accomplished but some sorts of statistical procedures would likely be involved. Since funding was unavailable to the author at the time, this research was never undertaken.

The second phase of this research envisioned extending the search for Late Woodland ceramic assemblages to various unpublished but unidentified cultural research reports. There are a number of collections from Knife Lake in Kanabec County that have been photographed and drawn by Goltz (2006). A number of potential sites appear in Arzigian (2008), which also lists the components present at many of them. Paramount in the selection of sites would be assemblage size since only modest to large assemblages provide the necessary variability and numbers to make statistical analyses meaningful. These sites could be supplemented by smaller collections which could be combined together into groups based on location.

In addition to expanding the number of sites, research into Late Woodland ceramic variability involves the selection of variables to be used. This process goes hand-in-hand with the statistical techniques to be employed since various procedures require specific assumptions about levels of measurement. If there is a continuum of variation among the pottery types as many archeologists suggest, then interval or ratio level variables focusing on measurements such as decoration element width, thickness, number of elements/cm, and interval between decorative elements could be used with all pottery decorated with cordwrapped object impressions or dentate/comb stamping regardless of type assignment. Focusing on these variables will avoid a key issue associated with small fragments of rimsherds, namely incomplete decorative motifs (see also Hohman-Caine 1983:68-69). Motifs or portions of them, particularly banding patterns on the upper portions of rims, could be explored at additional sites. Even nominal-level variables such as decorative motifs can be adapted to an interval-level measurement scale by making each discrete motif (e.g., diagonal over horizontal) either present (1) or absent (0) on a particular rim. The above analyses indicate that there are motif differences from one region to another. Hohman-Caine (1983:222) also feels that a systemic/stylistic approach is better than a normative/typological one when transitional types exist in the St. Croix, Onamia, Kathio, and Blackduck continuum. Specific attributes are outlined in Hohman-Caine (1983:Appendix C), some of which are interval level variables. She also determines the relationships between ceramic groups (e.g., Onamia-Kathio, St. Croix-Onamia, St. Croix-Kathio) by examining the number of shared and different modes between them. This approach differs from the one proposed here which focuses on actual amounts or degrees of variability rather than presence or absence of modes.

Any number of statistical techniques can be employed in this analysis, some of which focus on significance testing with individual variables while others can project the relationships between sites in multidimensional space similar to those depicted in Figure 73. There are a series of statistical techniques on interval level variables that are applied to single variables from either paired (T-tests) or multiple sites (analysis of variance). Since a series of variables are potentially involved, multivariate statistical techniques will be most informative because they can reduce a large number of variables into a smaller subset of dimensions, factors, or axes. These pattern-seeking data reduction techniques are designed to uncover underlying dimensions in the data, patterns which might relate to temporal or spatial variation. Common techniques include principal components analysis, multidimensional scaling, correspondence analysis, and discriminant analysis (Baxter 1994; Shennan 1997:265-360). The results of these analyses will likely be a refinement of the pattern depicted in Figure 73, potentially adding dimensions of spatial or temporal variability.

A key to interpreting any graphical arrangement of site components resulting from multivariate analyses is temporal control since location is known. Identifying collections that have either been radiocarbon dated or arranged chronologically by stratigraphy will be a challenge since this supporting information is basically lacking at this time. Not all components need to be dated since the goal is to identify possible dimensions in the data relating to temporal variability. Using sites that have some component mixture in the interpretive process will likely obscure the results. Despite stratigraphic analyses at the Synsteby (Wilford 1962b), Mountain Lake (Wilford 1962a), Pedersen (Wilford 1961b), Aquipaquetin Island (Wilford n.d.a), and Zacharias (Wilford n.d.b) sites, no clear stratigraphic ceramic trends could be detected. There are some differences at the Big Slough site (21MU1) (Wilford 1954), where cordwrapped

object impressions predominate in the lower two levels (12–24 inches) and cord impressing in the upper two levels (0–12 inches). However, since the ceramic assemblage is small (n=23) these figures may be the result of sampling bias.

Despite these problems of mixing, there is a clear separation of dentate/comb stamped St. Croix pottery from later cordwrapped object impressed and cord impressed Clam River Ware from the surface to a depth of 1.5 feet at the Neubauer site (Hohman-Caine 1966:93-97, 100-101). Hohman-Caine also cites Cooper's (1964) work at the Altern and Johnson sites in Wisconsin as supporting the stratigraphic separation of St. Croix from later Late Woodland pottery. However, Cooper does not provide any quantitative evidence in support of this statement. More recently, Van Dyke and Oerichbauer (1988:157-160) reviewed the evidence, and suggest that St. Croix and Clam River pottery are at least partially contemporaneous. They conclude that good stratigraphic sequences supported by radiocarbon dates are needed. They propose that a full analysis of partially reported fieldwork, along with an examination of the actual artifacts, is needed to establish a regional chronology for northwestern Wisconsin and east-central Minnesota.

The spatial distribution of dentate stamping and cord impressing is another research area that needs to be systematically explored. Late Woodland dentate stamping declines to very small numbers in far southwestern Minnesota at the Pedersen site, but is present in moderate amounts more to the north at the Synsteby site in Brown County. It is present in very low frequencies at the Washington Creek site in Meeker County in the study area, despite being more popular at most sites in west-central Minnesota. These differences may not be entirely spatial and could be due to temporal position, with higher percentages of dentate stamping associated with earlier occupations. Until additional radiocarbon dates are obtained or sites containing cordwrapped object impressed and dentate stamped pottery reveal reasonably clear stratigraphic changes, separating variability due to spatial and temporal factors will continue to elude us. The northern distribution of dentate stamping is also elusive. Additional collections need to be examined to determine if the trend northward slowly declines or is relatively abrupt. A relatively large amount of dentate stamping at the Gull Lake Dam site in Cass County seems to be an anomaly. The far western distribution also needs to be explored to determine how far the technique extends into North and South Dakota.

The distribution of cord impressing deserves further research. It is popular during the Late Woodland in west-central Minnesota at 21KH36 and 21KH93, and reaches a peak far to the west at the Shady Dell site. The apparent relatively sharp drop to the south and north from west-central Minnesota needs to be verified by an examination of additional collections. Its temporal position vis-à-vis other pottery types and the broader Woodland chronology also needs to be systematically studied. An investigation of the various cord impressed motifs could yield important information on their spatial distributions. Does the dominance of the horizontal motifs found in west-central Minnesota extend further to the east in Minnesota and western Wisconsin where Madison Ware is found or are the eastern types more often decorated with other complex patterns?

The spatial distribution of undecorated rimsherds that are horizontal or diagonal cordmarked on their exteriors needs to be quantified. This study proposes that many of them are associated with Late Woodland occupations similar to more widespread Lake Benton complex sites to the southwest rather than earlier Fox Lake components.

The present study identified a widespread Middle Woodland Havana-related (Havanoid) presence in the central and western parts of the state, peaking at several sites in Stearns and Meeker counties and falling off in western Minnesota. Additional collections could be examined to establish an area where its presence is most pronounced and how rapidly it declines to the north, south, and west of the study area. In his description of Howard Lake ceramics, Gibbon (2012b) states that the type is found in largest quantities in Anoka County, then in an area running from Taylors Falls on the St. Croix River up to St. Cloud in central Minnesota, and then down through Paynesville and on to New Ulm and Fairmont. A study of chipped stone raw materials could be incorporated into the analysis to determine if the distribution of Knife River flint corresponds to the presence of Middle Woodland pottery in Minnesota, indicative of a trade network (see Clark 1984).

The study of relationships between Woodland manifestations in west-central Minnesota and adjacent regions could also incorporate an analysis of chipped stone raw material exploitation. The goal would be to determine if the raw material types establish links from the study area to the northeast like the ceramics, to the southwest, or conclude that their use was more locally oriented. Kandiyohi County is located on the northern edge of Bakken's (2011:38) Shetek

Subregion of the larger South Agassiz Resource Region and near the Quartz Subregion of the larger West Superior Resource Region. The estimated raw materials for the Shetek Subregion are Swan River Chert (primary); Tongue River Silica, Red River Chert, Quartz (secondary); Border Lakes Greenstone Group, Western River Gravels (minor); and Knife River Flint, Burlington Chert (exotic). For the Quartz Subregion, the predicted raw materials are Knife Lake Siltstone, Tongue River Silica, Quartz (primary); Swan River Chert (secondary); Lake of the Woods Rhyolite, Biwabik Silica, Gunflint Silica, Jasper Taconite, Kakabeka Chert, Hudson Bay Lowland Chert, Lake Superior Agate (minor); and Knife River Flint, Hixton Group, Burlington Chert (exotic) (Bakken 2011:Table 3-3). The purpose would be to determine if the Woodland raw material percentage profiles from west-central Minnesota sites fall more in line with the actual collections that Bakken describes for the Shetek or Quartz subregions. Greater than expected connections to the Quartz Subregion would appear to support the findings of the ceramic analysis that there is an orientation toward east-central Minnesota.

Ceramic and chipped stone data may be used to assess various hypotheses about the Woodland occupation of west-central Minnesota. In their survey of Swift County, Holley et al. (2011:99-103) discuss three models of occupation for west-central Minnesota, including Lake-Forest Tethered where groups from the north and east seasonally exploited the region as E. Johnson (1985:161) envisioned, River-Tethered with seasonal groups originating from the Minnesota River valley, and Prairie-Based consisting of local semi-sedentary peoples. Their survey work supports the latter model although they assign ceramics from an amateur collection to Blackduck and Lake Benton (Holley et al. 2011:124-127) that are very similar to rimsherds assigned to the Kathio Series in this study. The ceramic evidence presented here appears to support a Lake-Forest connection but it is unclear if it is from eastern groups exploiting the region on a seasonal basis and/or year-round local groups with strong ties to the northeast.

SUMMARY

The results of this analysis suggest that west-central Minnesota was occupied during the Woodland period by peoples with potting traditions linking them to developments in eastern, rather than southwestern, Minnesota. This connection began during the Middle Woodland with the presence of Malmo/Kern, Pokegama Smooth, and Havana-related types such as Howard Lake. A few Fox Lake Trailed, Fox Lake Smooth, Fox Lake Vertical Cordmarked, and Fox Lake Horizontal Cordmarked rimsherds, typically found in southwest Minnesota Middle Woodland contexts, are present. Except for Fox Lake Trailed, all Fox Lake types are undiagnostic and can be found in many Middle Woodland contexts throughout the state as unnamed types, so their presence in the study area may be because the type is undefined from other regions. A few Brainerd Ware rimsherds are present at three study area sites, perhaps indicating a somewhat earlier Woodland occupation of the region.

This eastern connection intensified during the Late Middle and Late Woodland with the presence of St. Croix, Clam River, Onamia, and Kathio ceramics in substantial numbers. A small amount of undecorated Lake Benton types was identified, although these, like Fox Lake, can be found in many parts of the state under unnamed types. A plot of three of the most common rimsherd decorative types indicates that most sites in west-central Minnesota have ceramic assemblages characterized by roughly equal amounts of cordwrapped object impressions and dentate/comb stamping with more moderate quantities of cord impressions. This contrasts with one eastern (Petaga Point) and one southwestern (Pedersen) Minnesota site that have assemblages made up almost entirely of cordwrapped object impressions and small amounts of dentate stamping. Pairwise comparisons between 21KH93 and 21KH36 and six other site/site groups employing Brainerd-Robinson coefficients establish the closest links within the west-central group, secondarily to the Petaga Point site in eastern Minnesota, and finally to the Pedersen site in southwestern Minnesota.

Examination of a series of cordwrapped object and dentate/comb stamped motifs indicates that there is a general continuum of motifs through time. There are some differences, particularly at Petaga Point where there is a shift from simple horizontal dentate/comb stamping to more complex cordwrapped object impressed designs. This continuity supports the notion that these two types were made by the same peoples or their descendants. However, the predominance of horizontal cord impressing appears to support the idea that it may have been made by peoples with a different potting tradition as it is expressed at 21KH36 and 21KH93.

A number of additional research topics are suggested, including defining Late Woodland spatial and temporal variability in the ubiquitous cordwrapped object impressed potting tradition included within types assigned to Kathio, Onamia, Clam River, southern Blackduck, and Lake Benton. Although a number of site assemblages were identified, additional sites will have to be included to reach adequate sample sizes and insure that all areas are equally covered. It will be important to establish temporal control through absolute dating and stratigraphy. The focus should be on interval level decorative variables since they can be measured on small rimsherds or rimsherd fragments. Although these can be supplemented by nominal level variables such as complete or fragmentary motifs, bias due to differential breakage must be addressed. Employing only larger rimsherds bearing complete motifs would probably reduce the sample sizes to very low figures. The results of this research might define a continuum of spatial variation or could discover discrete differences in time or space that could be the basis for defining new types or reformulating existing ones. It would also provide additional data to assess relationships between west-central Minnesota and adjoining regions. The presence or absence of these connections could be used to assess hypotheses about the occupation of west-central Minnesota, either by indigenous peoples, those from the lake-forest to the north, and/or groups from the riverine areas to the south.

LITHIC, FAUNAL, BOTANICAL, & HISTORIC ARTIFACT ANALYSES

L. Adrien Hannus, Timothy V. Gillen,
& Austin A. Buhta

With the exception of the ceramic assemblage (see preceding chapter), analyses of artifacts recovered from excavations at sites 21KH36, 21KH46, and 21KH93 were conducted at ALAC during the winter of 2013/2014. L. Adrien Hannus analyzed the lithics while Timothy V. Gillen and Jason M. Kruse analyzed the faunal material recovered. Fill from two features discovered at site 21KH93 was processed via water flotation by Austin A. Buhta and Augustana College anthropology students Creighton Gerber and Katherine Carlson. OSA archeologists Scott Anfinson and Bruce Koenen water screened select samples from site 21KH46, including fill from two features identified at the site. Charcoal samples extracted from the light fraction of each feature from site 21KH93 were submitted to the Illinois State Geological Survey (ISGS) for AMS-dating (see Appendix A). The recovered macrobotanical specimens were examined by Gillen, Hannus, and Gary Larson, Professor of Biology, South Dakota State University, Brookings.

LITHIC ASSEMBLAGE

Specimens comprising the lithic assemblage are addressed below by site and then by tool type or debitage/fire-cracked rock (FCR), respectively. Analysis of the projectile points follows a methodology similar to that established by Ahler (1971:23), which utilizes both stylistic and metric criteria (Figures 74 and 75). Scrapers were documented utilizing a suite of measurements from a system similar to that employed by Lee and Lovick (1979) (Figure 76).

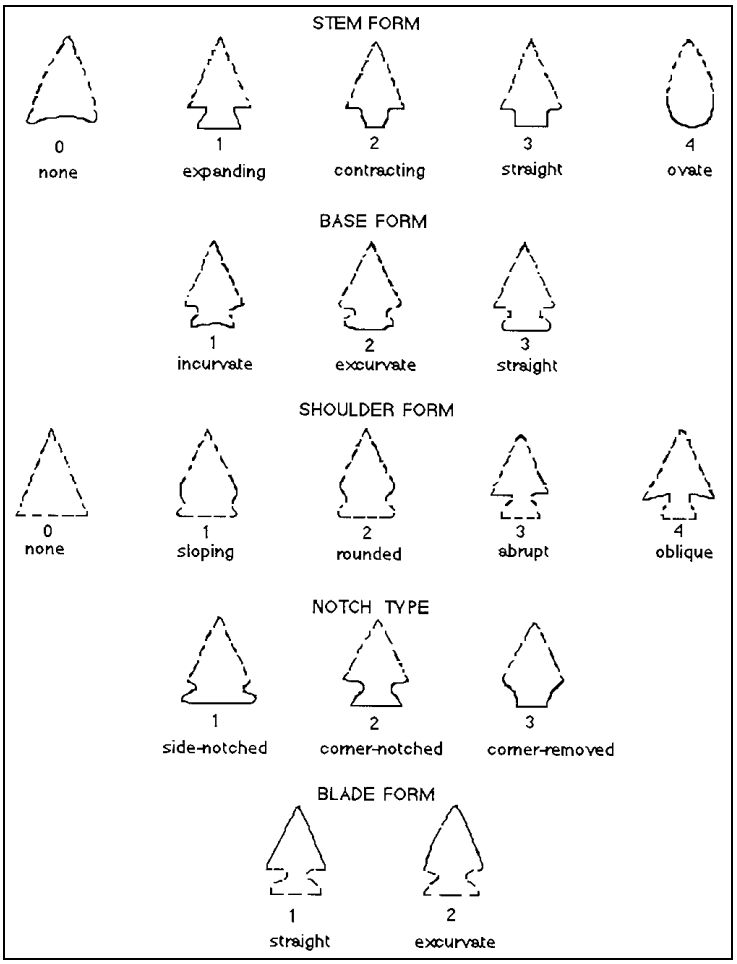


Figure 74. Form-related observations utilized in projectile point analysis (adapted from Ahler 1971:23).

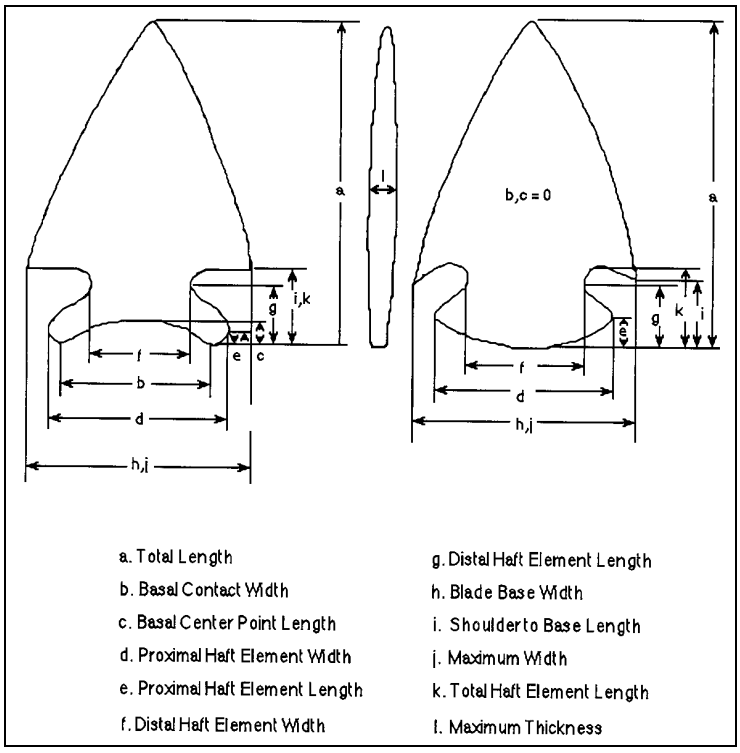


Figure 75. Measurements utilized in projectile point analysis (adapted from Ahler 1971:23).

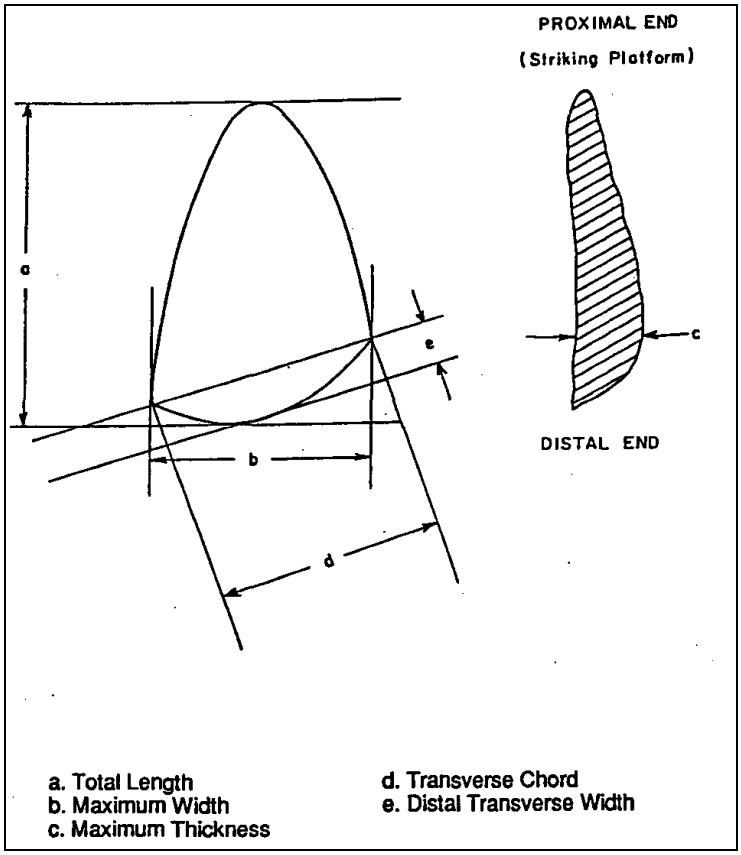


Figure 76. Measurements recorded for transverse scraper specimens (adapted from Lee and Lovick 1979).

Site 21KH36 Lithics

Five projectile points, six scrapers, two biface fragments, one unifacial tool, and one chopper were recovered from the excavation units at site 21KH36. The lithic assemblage also includes 421 pieces of debitage (primary flakes, secondary flakes, tertiary flakes, and shatter) and 858 pieces of FCR that were recovered.

Debitage and Fire-Cracked Rock

Over three-fourths (77.33 percent) of the debitage recovered was reduced from cherts. Chalcedony comprises 10.74 percent of the debitage, followed by quartzites (5.73 percent), and quartz (3.82 percent); jasper and silicified sediment each comprise slightly more than 1.00 percent of the debitage recovered. Most materials appear to be locally derived from glacial cobble sources. Exotic materials were limited to three Burlington chert tertiary flakes and three Hixton Group quartzite specimens (one secondary flake and two tertiary flakes). Figure 77 depicts the relative proportions of lithic debitage from the site.

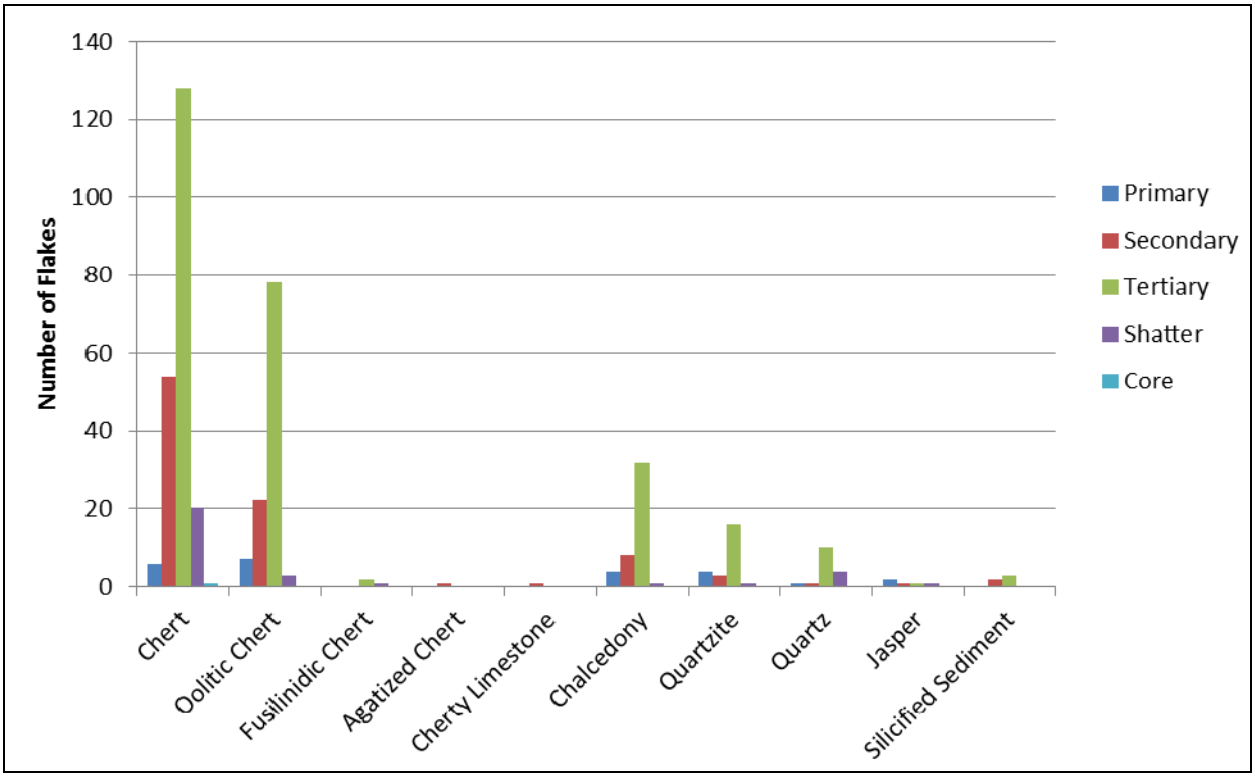


Figure 77. Debitage by general material type, site 21KH36.

Primary flakes comprise 5.73 percent of the debitage, secondary flakes 22.20 percent, tertiary flakes 64.44 percent, and shatter 7.40 percent. Cores represent 0.24 percent of the non-tool lithic assemblage. The presence of primary cortical debitage strengthens the supposition that locally derived materials are the principal resource.

Seven retouched flakes were identified. Four were categorized as secondary flakes (one of chalcedony and three of chert). Three chert tertiary flakes also exhibit retouch.

Thirty-five heat-treated or thermally altered flakes, representing 8.35 percent of the debitage, were identified at site 21KH36. Two projectile points (catalog numbers 202 and 303) and one uniface fragment (catalog number 37) also exhibited heat treatment. No thermally altered artifacts were found in direct association with hearth features; it cannot be ascertained whether these items experienced intentional heat treatment or incidental thermal alteration.

Eight hundred fifty-eight pieces of FCR, totaling 44.95 kg in weight, were recovered during excavations. Nearly 49 percent of the assemblage (420 pieces), was recovered from 11-20 cmbs. No discernable concentration or horizontal distribution of FCR was noted during excavations at the site, nor was the material observed in association with charcoal or ash deposits suggestive of a feature remnant.

Projectile Points

The five projectile point specimens recovered from site 21KH36 are all likely associated with a Late Woodland through Plains Village occupation of the site (Tables 29 and 30). Four of the five specimens are triangular unnotched arrow points, while a fifth is a corner-removed arrow or very small dart point.

Catalog Number 51 (Figure 78) is a nearly complete, reddish gray, triangular unnotched projectile point reduced from chert. The distal tip terminates in an impact fracture; one ear of the base is also missing. Temporal affiliations range from the Late Woodland to the Late Prehistoric.

Figure 78. Projectile point from site 21KH36 (catalog number 51).

Catalog Number 149 (Figure 79) is a complete, triangular unnotched projectile point with laterally serrated edges reduced from white chert. Temporal affiliation is Late Prehistoric.

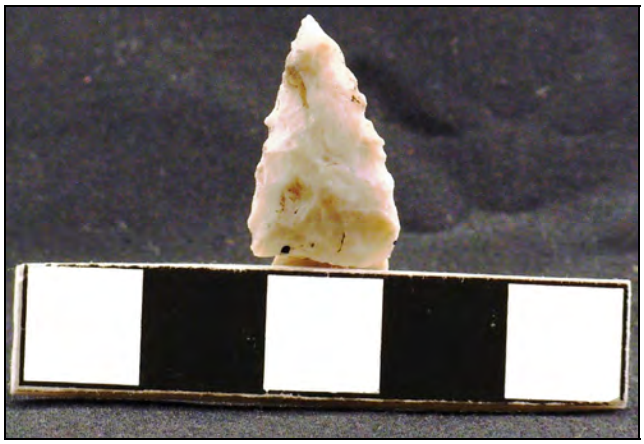


Figure 79. Projectile point from site 21KH36 (catalog number 149).

Catalog Number 202 (Figure 80) is a complete, triangular unnotched projectile point reduced from a light reddish brown, heat-treated oolitic chert. The temporal affiliation is Late Prehistoric.

Figure 80. Projectile point from site 21KH36 (catalog number 202).

Catalog Number 303 (Figure 81) is a corner-removed projectile point terminating in an impact fracture at the distal tip. It is reduced from a white, heat-treated oolitic chert. Cultural affiliation is estimated to be Late Woodland to Late Prehistoric.

Figure 81. Projectile point from site 21KH36 (catalog number 303).

Catalog Number 401 (Figure 82) is the basal portion of an unnotched triangular projectile point reduced from a light gray oolitic chert. Cultural affiliation cannot be determined.

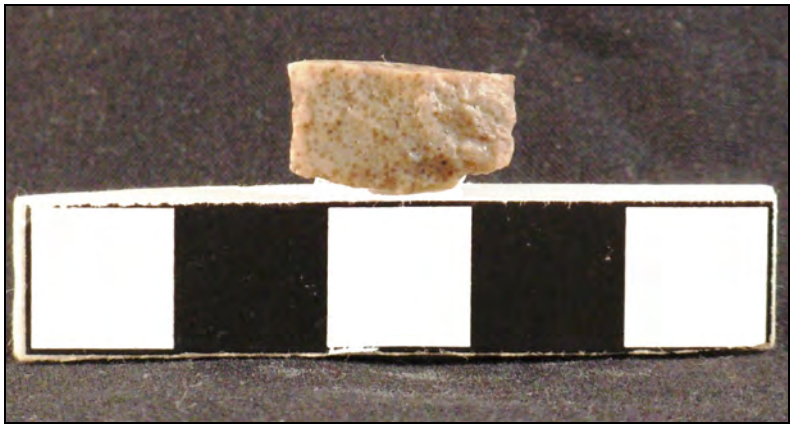


Figure 82. Projectile point from site 21KH36 (catalog number 401).

Table 29. Projectile Point Assemblage Form Observations (see Figure 74, above), Site 21KH36.

Catalog Number	Provenience	Stem Form	Base Form	Shoulder Form	Notch Form	Blade Form	Material Type and Color	Point Type
51	XU4, 10-20 cm	0	1	0	n.a.	2	Chert, 2.5YR-6/1, reddish gray	Late Woodland to Late Prehistoric
149	XU6, 10-20 cm	0	3	0	n.a.	1	Chert, 2.5Y-8/1 white	Late Prehistoric
202	XU8, 10-20 cm	0	1	0	n.a.	1	Heat-treated oolitic chert, 2.5YR-7/4, light reddish brown	Late Prehistoric
303	XU9, 20-30 cm	3	3	3	2	2	Heat-treated oolitic chert, 7.5YR-8/1 white	Late Woodland/ Late Prehistoric
401	XU11, 20-30 cm	0	3	n.a.	n.a.	n.a.	Oolitic chert, 7.5YR-7/1, light gray	Probable unnotched triangular

n.a.=not applicable

Table 30. Projectile Point Assemblage Measurements (see Figure 75, above), Site 21KH36.

Catalog Number	Measurements (mm)												General Condition
	A	B	C	D	E	F	G	H	I	J	K	L	
51	24.45*	13.36	n.a.	18.35	n.a.	n.a.	n.a.	18.37	n.a.	n.a.	n.a.	4.45	Nearly complete
149	20.04	8.31	n.a.	12.25	n.a.	n.a.	n.a.	12.24	n.a.	12.24	n.a.	4.42	Complete
202	18.38	8.35	n.a.	16.14	n.a.	n.a.	n.a.	16.14	n.a.	16.14	n.a.	5.02	Complete
303	19.46*	7.24	n.a.	9.04	n.a.	10.01	4.49	16.15	6.15	16.15	6.15	6.15	Distal tip missing
401	8.38*	10.11	n.a.	15.00	n.a.	n.a.	n.a.	15.04	n.a.	15.04	n.a.	4.42	Basal fragment

***incomplete; n.a.=not applicable**

Scrapers

Six specimens recovered from 21KH36 fall into this category. Two specimens are complete and four are broken; all are transverse, or end scrapers. Measurement and provenience data are provided in Table 31, below.

Catalog Number 5 (Figure 83) is an end scraper reduced from a very dark brown chalcedony. The specimen is complete.

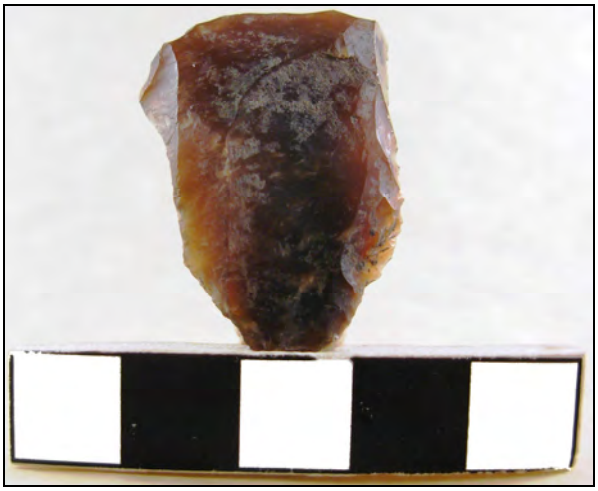


Figure 83. End scraper from site 21KH36 (catalog number 5).

Catalog Number 269 (Figure 84) is an end scraper reduced from a black chalcedony. The scraper is in two conjoining fragments; a pot lid has spalled off of the ventral surface of the specimen, which is otherwise complete.

Figure 84. End scraper from site 21KH36 (catalog number 269).

Catalog number 304 (Figure 85) is an end scraper reduced from a black chalcedony. The specimen has snapped transversely and is missing the proximal end.

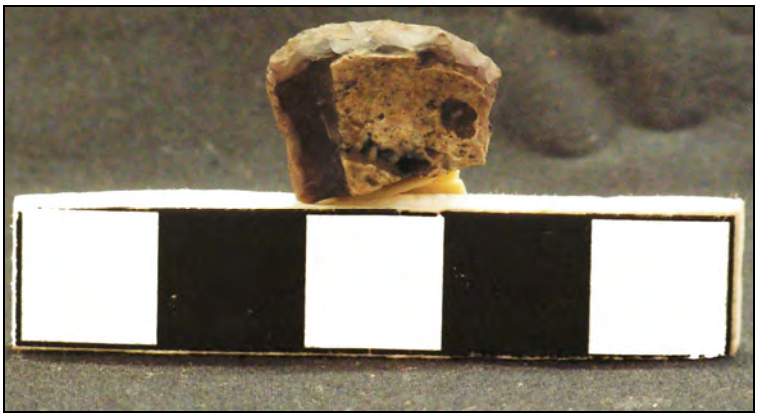


Figure 85. End scraper from site 21KH36 (catalog number 304).

Catalog Number 339 (Figure 86) is an end scraper reduced from a dark reddish gray chert. The scraper has snapped transversely and is missing the proximal end.

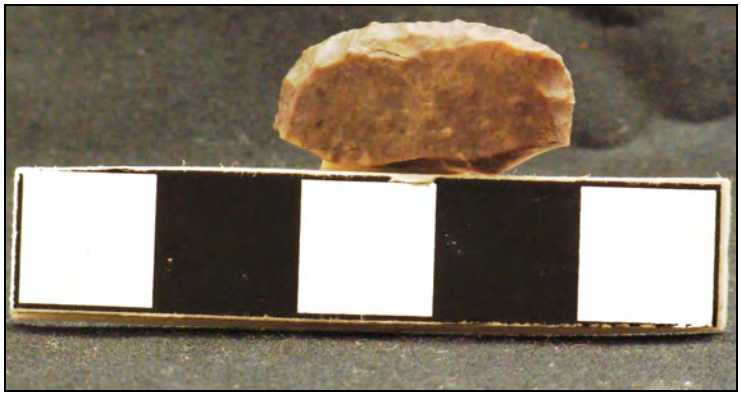


Figure 86. End scraper from site 21KH36 (catalog number 339).

Catalog Number 378 (Figure 87) is an end scraper reduced from a very dark gray chalcedony. The specimen has snapped transversely and is missing the proximal end.

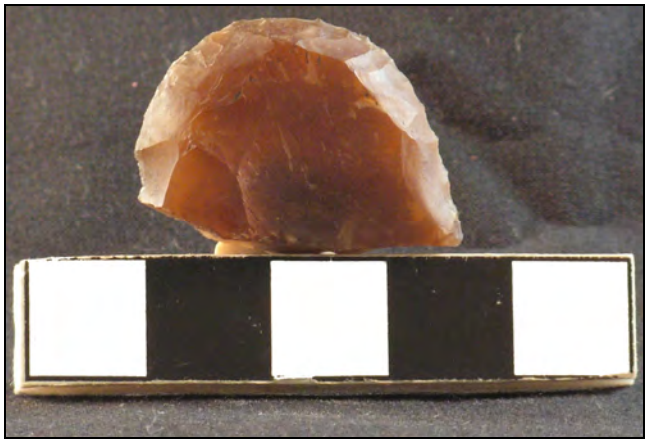


Figure 87. End scraper from site 21KH36 (catalog number 378).

Catalog Number 379 (Figure 88) is an end scraper reduced from a brownish yellow chert. The specimen has been thermally fractured across the transverse axis and is missing the proximal end.

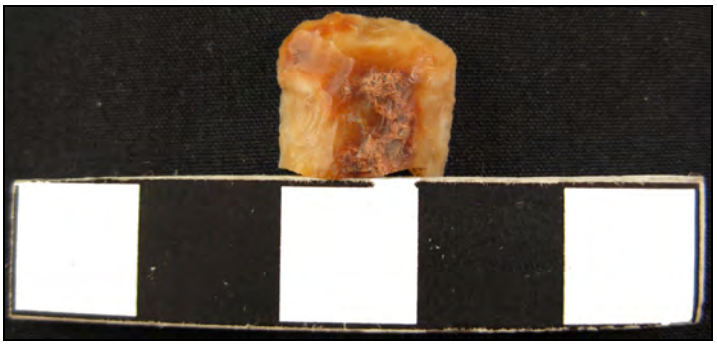


Figure 88. End scraper from site 21KH36 (catalog number 379).

Table 31. Lithic Scraper Assemblage, Site 21KH36.

Catalog Number	Provenience	Measurements (mm) A	B	C	D	E	Material Type
5	XU1, 10-20 cm	35.05	25.07	6.18	26.19	6.16	Chalcedony, 10YR-2/2, very dark brown
269	XU9, 10-20 cm	45.05	27.20	7.22	27.22	8.32	Chalcedony, 10YR-2/1, black
304	XU9, 20-30 cm	12.20*	16.13	3.35	16.14	4.44	Chalcedony, 10YR-2/1, black
339	XU10, 10-20 cm	11.14*	22.25	3.30	21.13	4.45	Chert, 10R-4/1, dark reddish gray
378	XU11, 10-20 cm	19.48*	27.23	5.06	25.05	6.17	Chalcedony, 10YR-3/1, very dark gray
379	XU11, 10-20 cm	13.31*	13.39	4.49	13.34	3.39	Chert, 7.5YR-6/6, reddish yellow

*** incomplete**

Chopper

A chopping tool reduced from a greenish gray (Gley 1-10Y-6/1) gabbro cobble (Catalog Number 129) was recovered from site 21KH36 (Figure 89). It measures 132.30 mm in total length and has a maximum width of 111.20 mm. The maximum thickness is 40.10 mm. The artifact weighs 0.59 kg. A single large flake was removed from one side and secondary bifacial retouch was applied to the distal margin.

Figure 89. Cobble chopper from site 21KH36 (catalog number 129).

Bifaces

Two biface fragments were recovered from XU9 at site 21KH36. Both came from the 10-20 cm level. Catalog Number 270 was reduced from a brown chalcedony tertiary flake and exhibits minimal bifacial retouch on the right lateral margin. Catalog Number 271 was reduced from a tan oolitic chert tertiary flake that retains the striking platform. Bifacial retouch is present on the lateral margins.

Uniface

A single uniface fragment was recovered from site 21KH36. Catalog Number 37 consists of the distal end of a mottled gray

oolitic chert tertiary flake. The flake has thermally fractured along internal faults and is missing the proximal end and one lateral margin. The specimen exhibits shallow unifacial retouch on the dorsal surface of the flake along the distal edge and remaining lateral margin.

Site 21KH46 Lithics

Two projectile points, two scrapers, two biface fragments, and a possible grinding stone were recovered from the block excavations at site 21KH46. Additionally, 120 pieces of debitage (primary flakes, secondary flakes, tertiary flakes, shatter, and cores) and 530 pieces of FCR were recovered from Blocks 1 and 2 at the site.

Debitage and Fire-Cracked Rock

The lithic assemblage is dominated by cherts, which comprise 59.17 percent of the total debitage. The remaining debitage is composed of chalcedonies (17.5 percent); quartzites (16.67 percent); silicified sediment (3.33 percent); and jasper, quartz, and silicified wood, each of which comprise less than 2 percent of the assemblage. Most materials appear to be locally derived from glacial cobble sources. Exotic materials were limited to three Burlington chert tertiary flakes and 18 Hixton Group quartzite artifacts (3 secondary flakes and 15 tertiary flakes). Figure 90 graphically depicts the relative proportions of lithic debitage from the site.

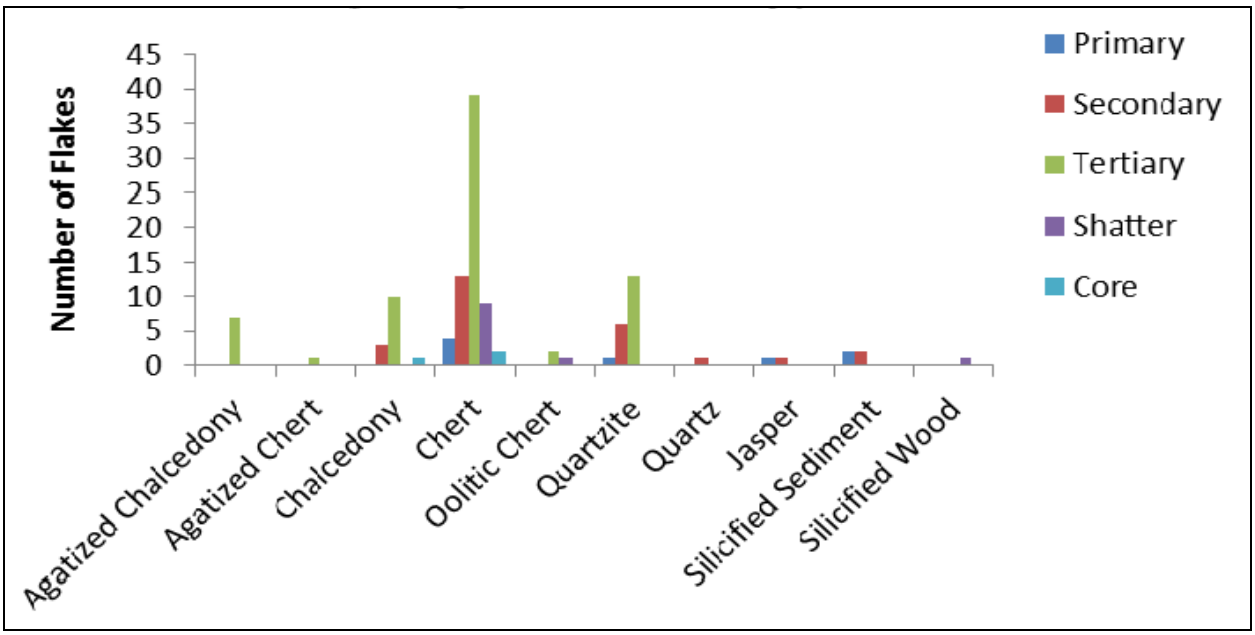


Figure 90. Debitage by material type, site 21KH46.

The debitage is comprised of 6.67 percent primary flakes, 21.67 percent secondary flakes, 60.00 percent tertiary flakes, and 9.17 percent shatter. Cores represent 2.50 percent of the non-tool lithic assemblage. The presence of primary cortical debitage strengthens the supposition that locally derived materials are the principal resource.

Two retouched tertiary flakes were recovered. One was reduced from chert, while the second was reduced from quartzite.

Sixty-one heat-treated or thermally altered flakes, representing 50.83 percent of the debitage, were identified at site 21KH46. Two biface fragments (catalog numbers 2013.113.38 and 2013.113.93) also exhibited heat treatment. No thermally altered artifacts were found in direct association with hearth features; it cannot be ascertained whether these items were subjected to intentional heat treatment or whether thermal alteration is due to incidental heat exposure.

Five hundred thirty pieces of FCR, totaling 29.36 kg in weight, were recovered from the Block 1 and Block 2 excavations. The majority of this material, over 65 percent (347 pieces), was recovered from 31-60 cmbs. No discernable concentration or horizontal distribution of FCR was noted during excavations at the site, nor was the material observed in association with charcoal or ash deposits suggestive of a feature remnant.

Projectile Points

Two projectile points were recovered from excavations at site 21KH46 during the current study (Tables 32 and 33). One specimen is likely associated with the Middle to Late Woodland period. The second specimen is a broken distal tip, the fragmentary nature of which precludes its assignment to a specific historic context.

Catalog Number 2013.113.185 (Figure 91) is a corner-removed Middle Woodland projectile point reduced from a pale yellow quartzite. The specimen is complete.

Figure 91. Projectile point from site 21KH46 (Catalog Number 2013.113.185).

Catalog Number 2013.113.342 (Figure 92) is the distal tip portion of a projectile point reduced from a white chalcedony. No cultural affiliation is proposed for this fragment.

Figure 92. Projectile point distal tip from site 21KH46 (Catalog Number 2013.113.342).

Table 32. Projectile Point Assemblage Form Observations (see Figure 74, above), Site 21KH46.

Catalog Number	Provenience	Stem Form	Base Form	Shoulder Form	Notch Form	Blade Form	Material Type and Color	Point Type
2013.113.185	ST3, 0-90 cm	1	2	1	2	2	Quartzite, 2.5Y-8/2, pale yellow	Middle Woodland
2013.113.342	XU17, 45-60 cm	Incomplete	Incomplete	Incomplete	Incomplete	1	Chalcedony, 2.5Y-8/1, white	None assigned

Table 33. Projectile Point Assemblage Measurements (see Figure 75, above), Site 21KH46.

Catalog Number	Measurements (mm)												General Condition
	A	B	C	D	E	F	G	H	I	J	K	L	
2013.113.185	33.40	0	0	14.46	2.26	13.36	6.12	18.32	9.45	18.32	9.46	7.25	Complete
2013.113.342	19.43*	—	—	—	—	—	—	—	—	15.05*	—	5.05*	Tip only

*** incomplete**

Scrapers

Two end scrapers were recovered from site 21KH46 during the current investigation. Both specimens are complete. Measurement and provenience data are provided for each in Table 34, below.

Catalog Number 2013.113.92 (Figure 93) is an end scraper reduced from a very dark gray chalcedony. The specimen is complete.

Figure 93. End scraper from site 21KH46 (Catalog Number 2013.113.92).

Catalog Number 2013.113.130 (Figure 94) is an end scraper reduced from a white oolitic chert. The specimen is complete.

Figure 94. End scraper from site 21KH46 (Catalog Number 2013.113.130).

Table 34. Lithic Scraper Assemblage, Site 21KH46.

Catalog Number	Provenience	Measurements (mm) A	B	C	D	E	Material Type
2013.113.92	XU11, 40-50 cm	24.42	20.10	5.05	20.06	5.08	Chalcedony, 5Y-3/1, very dark gray
2013.113.130	XU18, 20-30 cm	25.07	19.45	6.19	16.19	6.16	Oolitic chert, 2.5Y-8/1, white

Bifaces

Two incomplete biface fragments were recovered from site 21KH46. Catalog number 2013.113.38 is the distal portion of a biface produced on Tongue River silicified sediment. It exhibits heat treatment and heavy abrasion by water. The reverse surface exhibits parallel oblique flaking, suggesting a Late Paleoindian technology. Catalog number 2013.113.93 is the possible proximal portion of a biface produced on brown chalcedony. The reverse side of the flake exhibits pot-lidding.

Ground Stone

Catalog Number 2013.113.171 was recovered from Shovel Test 1 at 0-60 cm. It is a thermally altered gray (7.5YR-5/1) granitic cobble, exhibiting edge abrasion on the right lateral surface (Figure 95). It is unclear whether this specimen represents a culturally modified grinding stone or a natural, glacially abraded cobble. The material type is atypical for most grinding stones. The cobble fragment has a length of 63.40 mm, a width of 51.20 mm, and a maximum thickness of 31.20 mm. The specimen weighs 0.11 kg (4 oz).

Figure 95. Possible grinding stone from site 21KH46 (Catalog Number 2013.113.171).

Site 21KH93 Lithics

One projectile point, two scrapers and two biface fragments were recovered from site 21KH93. Additionally, 217 pieces of debitage (primary flakes, secondary flakes, tertiary flakes and shatter) and 859 pieces of FCR were recovered from shovel tests and excavation units at the site.

Debitage and Fire-Cracked Rock

Cherts and chalcedonies dominate the lithic assemblage. Cherts comprise 53.21 percent of the debitage. The remainder consists of chalcedonies (33.49 percent); quartzites (6.42 percent); quartz (4.13 percent); and silicified sediment, jasper and gabbro, each of which comprise less than 2 percent. Most materials appear to be locally derived from glacial cobble sources. Exotic materials were limited to two Burlington chert tertiary flakes and 12 Hixton Group quartzite artifacts (three secondary flakes, six tertiary flakes and three shatter). Figure 96 graphically depicts the relative proportions of lithic debitage from the site.

The debitage is comprised of 2.75 percent primary flakes, 11.93 percent secondary flakes, 69.27 percent tertiary flakes, and 16.06 percent shatter. No cores were recovered from site 21KH93. The presence of primary cortical debitage strengthens the supposition that locally derived materials are the principal resource.

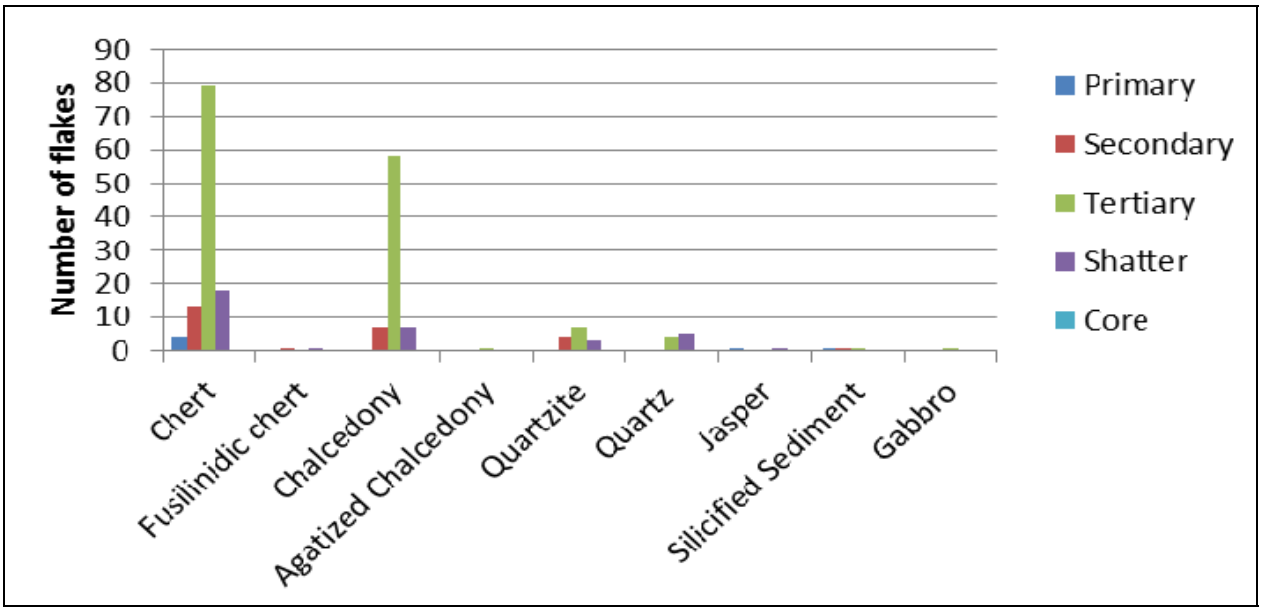


Figure 96. Debitage by material type, site 21KH93.

Heat treatment or thermal alteration was evident on 33 pieces of debitage (15.14 percent) and one biface fragment (Catalog Number 2013.115.2). No heat-treated artifacts were recovered in direct association with a hearth, and it cannot be ascertained with certainty whether the thermal alterations were deliberate or incidental.

Eight hundred fifty-nine pieces of FCR, totaling 29.44 kg in weight, were recovered during excavations. The majority of this material, nearly 59 percent (503 pieces), was recovered from 10-20 cmbs. One concentration of eight FCR cobbles was documented at 40-50 cmbs in XU-3 at the site. This was discovered in association with a small collection of charcoal and designated Feature 1. Fill comprising the feature was collected and processed, and the charcoal was submitted for AMS dating (see below).

Projectile Point

A single Woodland-period projectile point was recovered from the surface of a plowed field at site 21KH93 during the current study (Tables 35 and 36).

Catalog number 2013.115.1 (Figure 97) is a complete, corner-notched specimen with an expanding stem. It is reduced from gray Swan River chert. It is associated with the Late Woodland.

Figure 97. Corner-notched projectile point from site 21KH93 (Catalog Number 2013.115.1).

Scrapers

Two end scrapers were recovered from site 21KH93 during the current investigation. Both specimens are complete. Measurement and provenience data are provided for each in Table 37, below.

Catalog number 2013.114.76 (Figure 98) is an end scraper reduced from a reddish black chalcedony. The specimen is complete.

Table 35. Projectile Point Assemblage Form Observations (see Figure 74, above), Site 21KH93.

Catalog Number	Provenience	Stem Form	Base Form	Shoulder Form	Notch Form	Blade Form	Material Type and Color	Point Type
2013.115.1	Surface	1	2	4	2	1	Swan River Chert, Gley 1-5/, gray	Late Woodland

Table 36. Projectile Point Assemblage Measurements (see Figure 75, above), Site 21KH93.

Catalog Number	Measurements (mm)												General Condition
	A	B	C	D	E	F	G	H	I	J	K	L	
2013.115.1	30.09	0	0	11.16	2.25	9.45	3.41	18.34	3.41	18.34	5.05	4.49	Complete

Table 37. Lithic Scraper Assemblage, Site 21KH93.

Catalog Number	Provenience	Measurements (mm)					Material Type
		A	B	C	D	E	
2013.114.76	XU3, 0-10 cm	19.45	17.26	5.01	17.25	4.49	Chalcedony, 2.5YR-2.5/1 reddish black
2013.114.101	XU3, 30-40 cm	30.05	23.36	6.15	23.32	5.09	Silicified sediment, 10R-3/4 dusky red

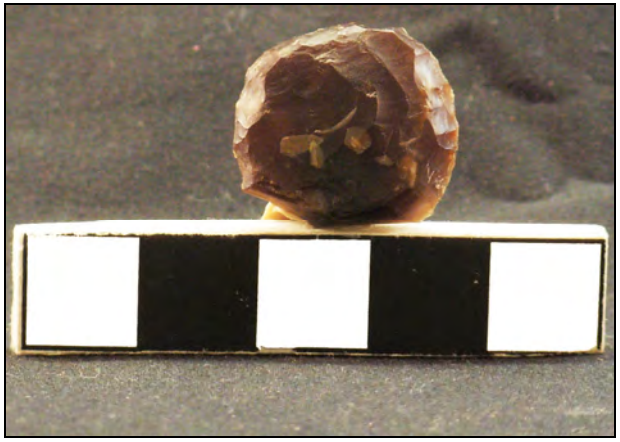


Figure 98. End scraper from site 21KH93 (Catalog Number 2013.114.76).

Figure 99. End scraper from site 21KH93 (Catalog Number 2013.114.101).

Catalog number 2013.114.101 (Figure 99, above) is an end scraper that is reduced from a thermally altered dusky red silicified sediment. The specimen is complete.

Bifaces

Two biface fragments were recovered from site 21KH93. Catalog number 2013.114.159 is a primary thinning stage biface produced on gray porcellanite. The fragment is represented by the proximal end of the biface. Catalog number 2013.115.2 was reduced from a tertiary flake which exhibits unifacial retouch on the distal tip and fine bifacial retouch on the fragmented proximal portion of the flake. The latter specimen exhibits evidence of heat alteration.

Lithics Summary

A commonality noted among sites 21KH36, 21KH46, and 21KH93 was the predominant selection of lithic raw material derived from local glacial cobble gravels. The presence of primary reduction flakes produced from a variety of materials at all three sites also supports the conclusion that local raw material sources were exploited for stone tool production. Cherts are the predominant lithic material in the assemblages from the three sites, followed by chalcedonies and quartzites. Very little quartz is present among the assemblages. In terms of specific material types identified, Swan River chert was the most prolific throughout the three assemblages, while Red River chert and Tongue River silica were also not uncommon. Tumberg et al. (2009:4-5) identified the following specific lithic material types from previous excavations at site 21KH46: "…Swan River Chert, Quartz, Red River Chert, and Knife River Flint [KRF], with smaller amounts of Grand Meadow Chert, Cedar Valley Chert, Gunflint Silica, Siltstone, Jasper, and Agate." These material types are also present in Larry Levin's extensive private collection of projectile points from sites 21KH36 and 21KH93 (see Appendix B). The material types occurring with the highest frequency are Swan River chert, Red River chert, Tongue River silica, and KRF; interestingly, Prairie du Chien chert and Grand Meadow chert were also noted multiple times among the specimens in the private collection.

Small quantities of "exotic" lithic source materials were recovered during the 2013 excavations at the three sites. Exotics constitute 1.43 percent of the recovered lithic assemblage at site 21KH36, 12.50 percent at site 21KH46, and 6.88 percent at site 21KH93. The exotic lithic source materials identified at the three sites were Hixton Group quartzites and Burlington chert. The most notable primary bedrock source of Hixton orthoquartzite is Silver Mound, located approximately 190 miles east-southeast of the study area in west-central Wisconsin (Brown 1984). However, Bakken (2011:130-133) has combined this material with several other related quartzites from the same general region into what he has termed the Hixton Group quartzites. The presence of material comprising this broader group extends further west and possibly into southeastern Minnesota (Bakken 2011:130). Bedrock deposits of Burlington chert are located about 300 or more miles southeast of the study area in southeastern Iowa, northeastern Missouri, and west-central Illinois (Bakken 2011:134). No obsidian was recovered from the three sites during the current investigations; however, a small amount of obsidian was previously collected from site 21KH93 by Larry Levin, and two obsidian flakes were recovered during the 2007 test excavations at site 21KH46 (Tumberg et al. 2009:5). Tumberg et al. (2009:4) also report the presence of KRF at site 21KH46. ALAC recovered a number of flakes of translucent brown chalcedony or chert very similar in appearance to KRF from each of the three investigated sites; some of these specimens may, in fact, be KRF. However, the specimens were neither petrographically nor geochemically tested and the investigators are reticent to label them as KRF because numerous other, locally occurring specimens with very similar appearances are also present in glacial gravels throughout the study area and the whole of Minnesota (Dan Wendt, personal communication 2014).

A comparison of prevalent lithic material types at sites 21KH36, 21KH46, and 21KH93 relative to Bakken's (2011) lithic raw material resource regions suggests nothing atypical about the site assemblages. The west-central Minnesota study area falls within portions of three of Bakken's (2011:38) resource subregions: *Shetek*; *Upper Red*; and *Quartz*. However, the three excavated sites are all confined to the Shetek subregion. The most prevalent lithic raw material estimated to be in this subregion is Swan River chert; estimated secondary materials include Tongue River silica, Red River chert, and quartz (Bakken 2011:67). The identified lithic material types at the three sites, both from the current excavations and from previously recovered artifacts (Tumberg et al. 2009; specimens from the Levin collection [see Appendix B]), appear to correlate well with the estimated materials for the Shetek subregion.

Four complete and four incomplete projectile points were recovered. One specimen was identified as Middle Woodland, one as Late Woodland, and two as Late Woodland to Late Prehistoric. Specimens collected previously from these sites by Larry Levin range, temporally, from Paleoindian times through the historic period.

FAUNAL ASSEMBLAGE

Nearly all specimens were identified to the taxonomic level of class (Mammalia, Aves, Actinopterygii, Reptilia, or Amphibia), with the primary exception of extremely small fragments. Fragments with partial or complete articular surfaces or unique anatomical landmarks were identified to the level of order or below when possible utilizing comparative specimens housed at ALAC and reference texts (Balkwill and Cumbaa 1992; Brown and Gustafson 1979; Getty 1975; Gilbert 1990; Gilbert et al. 1981; Hargrave and Emslie 1979; Lawrence 1951; Mundell 1975; Oates et al. 1993; Olsen 1960, 1964, 1968, 1979; Sobolik and Steele 1996). Following cautions outlined by Driver (2011) and Wolverton (2012), identifications were conservative and care was taken not to introduce errors into the dataset by identifying specimens beyond a reproducible level. Nomenclature follows that used by the Integrated Taxonomic Information System (2014).

Mammalian bone fragments lacking specific identifying characteristics were subjectively categorized as derived from small, medium or large mammals based on size and cortical thickness. Large mammal fragments are consistent with species attaining adult weights of over 125 pounds, including herbivores (bison, cow, elk, deer or horse) and carnivores (bear or mountain lion). Medium mammal remains include species with adult weights of between approximately 25 and 125 pounds, including canids, porcupine, groundhog, beaver and raccoon, while the category of small mammals was reserved for animals with adult weights between 1 and 25 pounds, generally rabbit-sized or smaller. The size and condition of much of the bone material precluded identification beyond a combined medium/large mammal classification.

All remains were macroscopically examined for evidence of burning—color shifting, carbonization and calcination. Although more exacting techniques for determination of thermal alteration of bone and other evidence of cooking exist (e.g., Buikstra and Swegle 1989; Pijoan et al. 2007), a number of factors, including the investigatory nature of the project, short time frame and budget for analysis, precluded additional research.

The faunal assemblage from the three sites was also examined macroscopically for evidence of butcher marks and carnivore and rodent gnawing. Heavy root etching and other post-depositional damage to the bone has undoubtedly obscured butcher marks on many of the specimens.

Site 21KH36 Faunal Material

The vertebrate assemblage from site 21KH36 consists of mammals, bony fish and reptiles. The 442 specimens examined are discussed below. They include 434 mammalian specimens, 3 fish bones, 4 reptilian elements, and 1 modified bone (probably reptilian).

Three mammalian fragments were identifiable to the level of genus. A fragmentary metapodial diaphysis morphologically resembles deer (probably *Odocoileus virginianus* [white-tailed deer] based on habitat and range) rather than *Cervus* or immature *Bison*. A right mandible and right talus from *Procyon lotor* (raccoon) were also identified.

Eleven tooth fragments were identified as undifferentiated Bovidae. One canine tooth belonging to the order Carnivora was recovered; although a specific identification was not made, it is similar in size to skunk, *Mephitis mephitis*.

Unidentified mammalian remains consist of 35 fragments categorized as large mammal and 346 fragments categorized as medium/large mammal. Medium mammals are represented by 9 fragments, including 3 maxillary teeth (P^4, M^1 and M^2), which are similar in size to raccoon, *Procyon lotor*. Small mammal elements were limited to a single femoral diaphysis from a rabbit-sized animal. Twenty-eight fragments were categorized as general mammal remains and not sorted into a size group.

Fish elements recovered from site 21KH36 were limited to three items. One cleithrum, one vertebral fragment and one unidentified fragment comprise the assemblage.

Reptile remains collected from the site were likewise limited. Testudines is represented by four carapace fragments.

Culturally Modified Bone

Burned Bone

Eighty-nine burned bone fragments were identified from site 21KH36. The burned bone assemblage consists of 5 large mammal fragments, 66 medium/large mammal fragments and 18 general mammal fragments.

Butchered Bone

Four fragments of bone from the site exhibit butchering or cut marks. Three of the four fragments have also been burned. None of the fragments were identifiable beyond Mammalia; one fragment is categorized as large mammal, one as medium mammal, and two as medium/large mammal.

Modified Bone

One enigmatic item of worked bone was identified from site 21KH36 (Figure 100). Catalog number 226 resembles the head of a large turtle femur in size and texture (comparable to *Chelydra serpentina*) and measures 19.40 mm wide by 16.24 mm by 8.60 mm. It has been beveled and polished; its function or use is unknown.

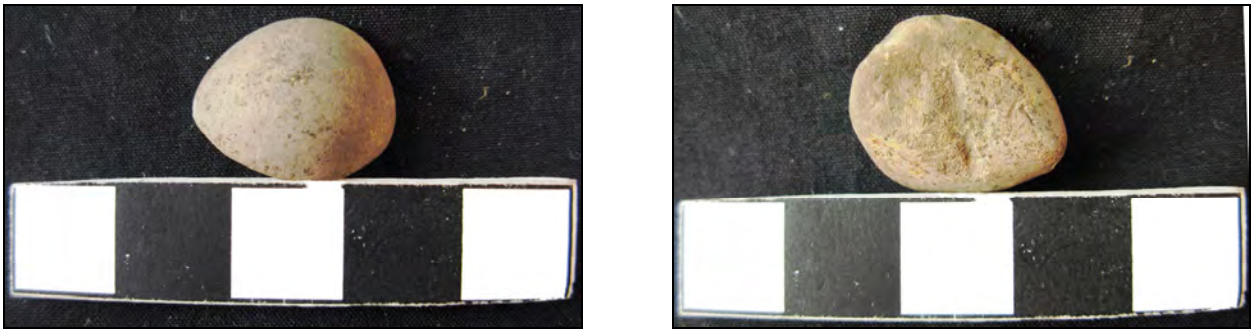


Figure 100. Modified bone from site 21KH36 (Catalog Number 226); obverse (left) and reverse (right).

Site 21KH46 Faunal Material

Vertebrate remains from this site include members of the mammal, bird, bony fish, reptile, and amphibian classes. A total of 750 bone fragments were examined. Mammalian fragments were most common, with 492 items identified, including one bone tool. Thirteen avian fragments, 66 fish elements, 68 reptile fragments and 1 amphibian element were also collected. In addition, 110 small crumbs of bone were recovered from flotation and fine screening. The crumbs were not sorted by class due to their small size.

Mammalian remains identified to the genus level include *Bison bison*, *Procyon lotor*, *Canis* sp., and *Marmota monax* (groundhog). Identified *Bison* elements consist of a left lunar and a fragment of a distal left radius. *Procyon lotor* is represented by several maxilla and tooth fragments and a right ulna fragment. Two mandible fragments and a maxilla with associated M^3 were identified to the genus *Canis*. *Marmota monax* is represented by a distal right tibia fragment.

Several identifications were made to the level of family or order. Bovidae elements include a P_4 tooth and several enamel fragments, a distal left radius fragment and a distal phalanx fragment. Canidae is represented by the distal epiphysis of a left femur and a fox-sized distal right femur fragment. Identified Leporidae (rabbits and hares) remains consist of a single distal left tibia fragment. Elements identified to the order Rodentia are comprised of a complete right femur, a left mandible fragment and four teeth.

The majority of the mammal bone from site 21KH46 could not be identified. Twenty-nine fragments were categorized as large mammal, 26 fragments were categorized as medium mammal, and 5 fragments were categorized as small mammal. A total of 296 fragments were cataloged as medium/large mammal and 8 fragments were cataloged as small/medium mammal remains. Ninety-five fragments were not placed into a size category.

Avian remains identified to the family Anatidae—ducks, geese and swans—include a right coracoid, one left cuneiform and a right tarsometatarsus fragment. A crow-sized cervical vertebra and a distal carpometacarpus fragment are likely from the order Passeriformes. Two middle phalanxes were recovered, one mallard-sized and one larger than crow or duck. Six additional avian bone fragments were cataloged.

Fish remains were not identified below the level of class (Actinopterygii—ray-finned fishes). Documented elements include two dentary fragments from toothed fish such as walleye, pike or muskellunge, two mandible fragments, one parasphenoid fragment, and the centrum of 25 vertebrae. Thirty-two unidentified fragments and four scales were also recorded.

Reptilian remains recovered from site 21KH46 are limited to turtles. Specimens identified to the genus level include a right scapula of *Chelydra serpentina*, snapping turtle, and 5 carapace fragments from *Apalone* sp., softshell turtles. Pond turtles of the family Emididae are represented by 3 carapace fragments. General turtle elements include one unsided radius fragment and 57 carapace or plastron fragments. One proximal phalanx fragment is tentatively identified as turtle as well.

Amphibian remains from the site consist of a single element from the order Anura, frogs and toads. One unsided tibio-fibula fragment was recovered.

Culturally Modified Bone

Burned Bone

A total of 107 burned bone items were identified. One element, a carapace fragment, was identified to the order Testudines. The remaining fragments include 7 large mammal, 13 medium mammal, 46 medium/large mammal and 8 small/medium mammal fragments. Thirty-two small fragments were not placed into a size category. Additionally, small bone crumbs from fine screening were not sorted for burned bone; any burned material present was not counted for inclusion in the burned bone assemblage.

Bone Tool

One bone awl (Figure 101) was recovered from the excavation. Catalog number 2013.113.367 is in two conjoining pieces and exhibits heavy rodent gnawing on the lateral surfaces. It is 106.33 mm long, with a maximum width of 20.29 mm and a maximum thickness of 8.86 mm.

Figure 101. Bone awl from site 21KH46 (Catalog Number 2013.113.367).

Butchered Bone

Evidence of butcher marks was found on seven bone fragments. One large mammal rib has been saw-cut. Three large mammal rib fragments and three medium/large mammal bone fragments exhibit linear cut marks associated with stone tool use. Butcher marks were not identified on any of the burned bone.

Site 21KH93 Faunal Material

Vertebrate remains from this site include mammals, birds, bony fish and reptiles. Mammalian fragments, including one bone tool, dominate the bone assemblage, comprising 746 of the total 902 items. Eight avian bone fragments, 18 fish elements, 14 reptilian elements and 116 unidentified fragments are also present.

Mammalian elements identified to the genus level include *Bison bison*, *Odocoileus* sp. and *Geomys bursarius*. *Bison* remains include numerous fragments of a single left rear leg recovered from one excavation unit (XU-10). Fragmented but conjoining pieces of distal femur, tibia, fibulare, and astragalus were found as an articulated unit. A metatarsal in numerous conjoining fragments was found approximately 50 cm distant in close association with a portion of a proximal phalanx and complete middle phalanx. Between the upper leg unit and lower leg unit, a calcaneus and naviculocuboid were recovered. One additional *Bison* element, a fragment of a left distal radius, was collected from a separate unit.

The genus *Odocoileus* (most likely *O. virginianus* due to habitat and range) is represented by a single metapodial fragment. *Geomys bursarius* (plains pocket gopher) is represented by one mandible fragment.

Additional remains were identifiable as undifferentiated Bovidae, Canidae, Carnivora and Rodentia. A number of anatomically identifiable fragments could not be definitively classified beyond the family Bovidae due to their poor preservation. Undifferentiated Bovidae fragments include two right naviculocuboids, a left radius and central carpal, a middle phalanx and several tooth fragments. Probable bovid remains include a right patella and a single proximal sesamoid. One tooth fragment, a lower premolar, resembles *Sus scrofa* (wild pig)—an invasive North African and Eurasian species introduced to North America during the mid-16th century.

A single canid left M_1, similar in size to *Vulpes vulpes* (red fox), was recovered. A small mandible or maxilla fragment from the same excavation unit was identified to the level of Carnivora. One lower canine tooth from elsewhere in the site resembles raccoon, *Procyon lotor*.

In addition to the identified *Geomys* mandible, a single mouse-sized mandible and six mandible/maxilla fragments were identifiable as Rodentia.

The remaining mammalian fragments were not identifiable to a specific element. Large mammals are represented by 52 fragments, medium mammals by 5 fragments and small mammals by 6 fragments. The generalized medium/large category contained 407 fragments; 6 fragments were categorized as general small/medium animal. Seventy-seven mammal bone fragments were not differentiated into a size group.

Positively identified avian remains were limited to a single right femur from a turkey, *Meleagris gallopavo*; it was recovered from 10-20 cmbs in XU-9. This level of XU-9 included Woodland and Village ceramics, as well as a modern shotgun shell. Therefore, it is impossible to assign the turkey element to a specific one of these contexts. The femur was damaged on discovery and is in three fragments. A fragment of a right proximal femur from the same unit and level compares favorably to *Meleagris*; although the fragments do not conjoin, it is possible they represent the same individual. The remaining elements are comprised of a duck-sized mandible fragment, a pigeon-sized coracoid fragment and a rib fragment. Unidentified longbone fragments comprise the remainder of the avian assemblage.

Identified fish bone from site 21KH93 consisted of one pectoral spine from the catfish family Ictaluridae. The remaining elements (13 centrum fragments, one mandible fragment, one cycloid scale fragment and two unidentified fragments) were not identified beyond the class Actinopterygii.

The reptilian bone contained both turtle and snake. One turtle quadrate bone was identified as *Chelydra serpentina* (snapping turtle), while the remaining nine turtle elements consist of carapace fragments which could not be further identified. Four unidentified snake vertebrae were also recovered.

The remaining bone fragments were categorized as unidentified. A flotation sample included 37 extremely small fragments that contained a mix of mammal, avian and fish bone. The other unidentified items were recovered from the general excavation; some are potentially identifiable, including possible avian and snake vertebrae, as well as three fragments with articular surfaces.

Culturally Modified Bone

Burned Bone

Seventy bone fragments exhibit signs of burning. None of the burned bone fragments were identifiable to species. Eight fragments were categorized as large mammal, two as medium mammal, and 55 as generalized medium/large mammal. Five fragments were not placed in a size category.

Butchered Bone

Evidence of butchering of the bone remains was limited. Cut marks are present on the turkey femur. A diaphyseal fragment of a medium mammal right tibia and a diaphyseal fragment of a large mammal long bone with missing epiphysis both exhibit possible cut marks. The large mammal fragment has been burned.

Bone Tool

A single artifact of worked bone was recovered. Artifact 2013.115.98 (Figure 102) is a distal fragment of a bone awl that measures 25.89 mm in length. The proximal end is 6.76 mm wide and 4.22 mm thick. It appears to be manufactured from the cortex of a large mammal long bone.

Figure 102. Bone awl distal tip from site 21KH93 (Catalog Number 2013.115.98).

Faunal Summary

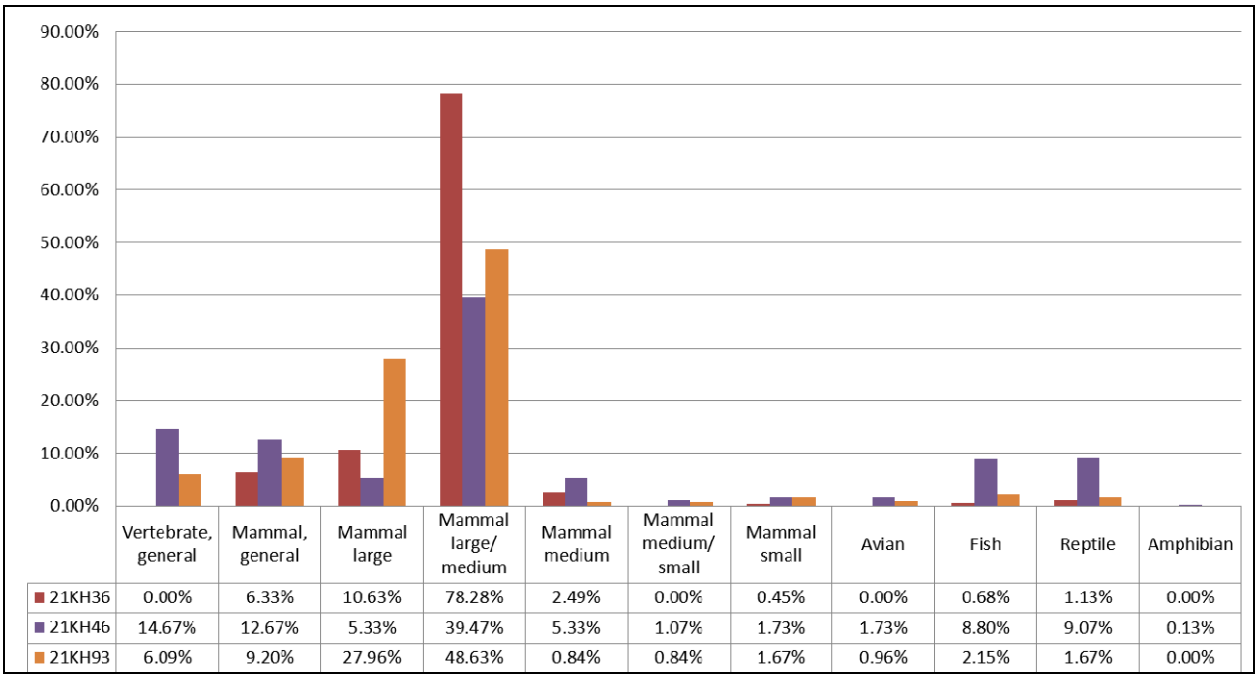
The faunal assemblages recovered from the 2013 excavations at sites 21KH36, 21KH46 and 21KH93 consist exclusively of vertebrate species and are dominated by mammalian remains. Specimens representing birds, fish, reptiles and amphibians are limited. Positive identifications to the genus level include *Bison bison*, American bison (21KH46, 21KH93), *Odocoileus* sp., deer (21KH36, 21KH93), *Canis* sp., dog (21KH46), *Procyon lotor*, raccoon (21KH36, 21KH46), *Marmota monax*, groundhog (21KH46), *Geomys bursarius*, Plains pocket gopher (21KH93), *Meleagris gallopavo*, wild turkey (21KH93), *Chelydra serpentina*, Common snapping turtle (21KH46, 21KH93), and *Apalone* sp., Softshell turtle (21KH46). All identified species are native to the prairie/woodland/lake ecotone; no exotic or unexpected species were documented.

Evidence of domesticated animals was limited. A single tooth fragment tentatively identified as *Sus scrofa*, pig, was recovered from site 21KH93. Additionally, it is possible that a domestic livestock species is the source of the saw-cut large mammal rib fragment found at site 21KH46.

Due to the limited nature of the testing at all three sites, no attempt was made to calculate the minimum number of individuals (MNI) for each species identified. Other analytic techniques, such as estimations of available biomass or kcal, were likewise deemed inappropriate for the current level of investigation. Results are simply reported on the basis of the number of individual specimens (NISP) present in the artifact assemblage and as a percentage of the faunal assemblage as a whole. Figure 103, below, summarizes the faunal data by taxonomic class from the 2013 testing.

A slightly higher percentage of fish, reptile and amphibian bone was recovered from site 21KH46. The higher percentage of small bone elements of these classes is not the result of fine-screening. Limited fine-screening conducted for soil samples collected from the site ($\frac{1}{16}$-inch mesh for portions of XU-17) generated primarily small, unidentifiable bone fragments and crumbs. Large numbers of identifiable bone, even to the broad level of class, were not present. Identified elements from fine screening are limited to the lone amphibian element, a rodent femur and a small mammal bone fragment.

Limited fine-screening at site 21KH93 (⅛-inch mesh for portions of XU-3 and XU-8) also failed to produce significant numbers of identifiable bone. Portions of three fish elements, six rodent elements, two small mammal vertebrae, four snake vertebrae and two possible snake vertebrae were recovered from the fine-screening of matrix from site 21KH93.



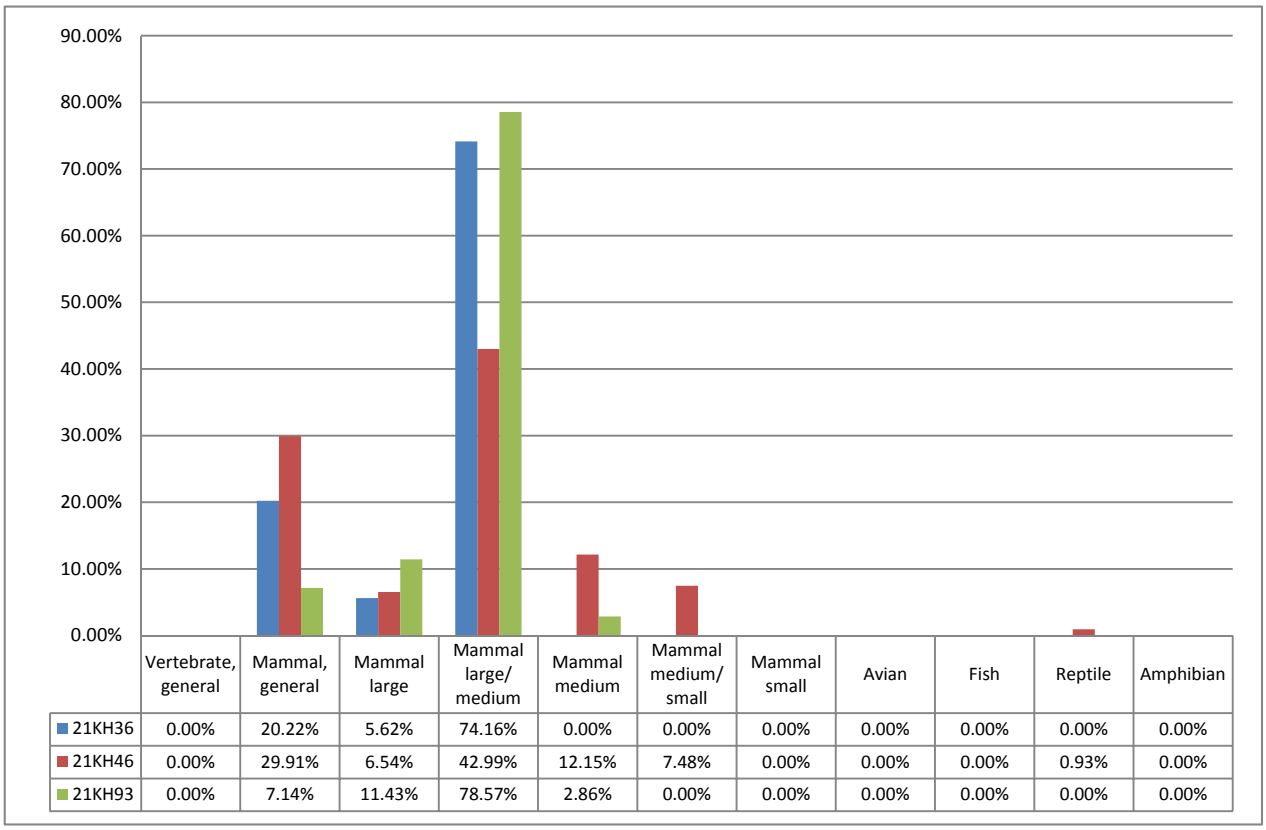
	Vertebrate, general	Mammal, general	Mammal large	Mammal large/ medium	Mammal medium	Mammal medium/ small	Mammal small	Avian	Fish	Reptile	Amphibian
21KH36	0.00%	6.33%	10.63%	78.28%	2.49%	0.00%	0.45%	0.00%	0.68%	1.13%	0.00%
21KH46	14.67%	12.67%	5.33%	39.47%	5.33%	1.07%	1.73%	1.73%	8.80%	9.07%	0.13%
21KH93	6.09%	9.20%	27.96%	48.63%	0.84%	0.84%	1.67%	0.96%	2.15%	1.67%	0.00%

Figure 103. Summary and comparison of faunal remains from sites 21KH36, 21KH46, and 21KH93.

Due to differential preservation, it is probable that the proportions of avian, fish, reptile and amphibian remains recovered from all three sites do not reflect actual proportions of deposition. Subsistence activities, both human and non-human, at the site locations would likely focus greater attention on aquatic species available in the immediate vicinity. Natural deaths of aquatic animal species would also likely be higher in these lakeside settings.

Limited amounts of burned bone were recovered from the 2013 investigations. Burned bone comprised 20.14 percent of the overall faunal assemblage from site 21KH36, 16.72 percent of all bone from 21KH46 (excluding crumbs), and 8.75 percent of bone recovered from site 21KH93 (excluding crumbs). Site 21KH46 contained the only non-

mammalian burned bone, a single burned fragment of turtle carapace. Percentages of burned bone by taxonomic class for the three sites are presented in Figure 104.



	Vertebrate, general	Mammal, general	Mammal large	Mammal large/ medium	Mammal medium	Mammal medium/ small	Mammal small	Avian	Fish	Reptile	Amphibian
21KH36	0.00%	20.22%	5.62%	74.16%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
21KH46	0.00%	29.91%	6.54%	42.99%	12.15%	7.48%	0.00%	0.00%	0.00%	0.93%	0.00%
21KH93	0.00%	7.14%	11.43%	78.57%	2.86%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Figure 104. Percentages of burned bone recovered by class, sites 21KH36, 21KH46 and 21KH93.

The burned bone cannot be firmly associated with any of the known components at these sites, although it is presumed to be prehistoric in origin. While it is assumed that the thermal alterations observed are the result of direct cultural activity (cooking), it is possible that the burning occurred indirectly as a result of disposal of waste bone into hearths. Given the abundance of timber in the area, it is unlikely that bone was used as a fuel source. Natural fires cannot be eliminated as a source of thermal alteration to the bone; however, evidence of wide-spread burning was not identified in the 2013 ALAC excavations.

Bone retaining evidence of butchering is also rare from the three sites. Four butchered bones represent 0.9 percent of all bone identified from site 21KH36; seven butchered bones represent 1.09 percent of all bone recovered from site 21KH46 (excluding crumbs); one definite and two possibly butchered fragments represent 0.38 percent of all faunal material found at site 21KH93 (excluding crumbs). The *Meleagris gallopavo* femur from 21KH93 is unique in that it is the sole butchered element that could be classified to the level of genus and the only non-mammalian butchered bone identified; all other butchered bone from the 2013 testing was categorized either as large, large/medium, or medium mammal.

Indications of butcher marks are almost certainly underrepresented at all three sites. Heavy root-etching is present on most of the bone; carnivore gnawing is common, particularly on the large mammal fragments and on the specimens large enough to be identified to the level of Bovidae and *Bison bison*. Exfoliation of the cortex was observed on some of the bone fragments; this is also a factor in obscuring evidence of butchering.

Elements of the bison rear limb found from 10-20 cmbs in XU-10 of site 21KH93 are believed to represent a single individual; in addition to being found partially articulated and in close association, when placed in proper anatomical

positions, the elements fit together well. Unfortunately, carnivore gnawing and root etching were found on all elements of the limb, and cut marks, if present, were not identified. It cannot be determined whether the limb represents a quartered and butchered animal subsequently scavenged by domestic or wild canids, or a natural death that has been scavenged. It should be noted that the long bones were not processed for marrow extraction. Middle Woodland, Late Woodland, and Prairie Village ceramics, as well as a shotgun shell base, were all found at the same depth below surface in both XU-9 and XU-10 in Block 3, as well as in the adjacent OSA ST-5.

With the exception of the saw-cut rib fragment from 21KH46, all butcher marks observed appear to be the result of prehistoric stone tool use. A specific temporal affiliation cannot be determined for any of the prehistoric butchered bone due to the lack of stratification at all three sites. It is likewise not possible to determine whether the saw-cut rib relates to the Hogburg family's occupation of site 21KH46 in the years between 1882 and 1927, to activity associated with the Kasota Gun Club of Minnesota's subsequent ownership of the property, or if it is related to trash disposal not associated with either era.

Previous testing at site 21KH46 was conducted by the MHS in 2007 (Tumberg et al. 2009). A total of 1,149 faunal specimens were recovered; however, a detailed analysis of this material has yet to be undertaken (Tim Tumberg, personal communication 2014) and, as a result, comparisons with material recovered during the 2013 excavations is not presently possible.

Excavations at two other west-central Minnesota sites containing Woodland components, 21DL2 (Gonsior 2006; Gonsior et al. 1999) and 21DL46/21GR41 (Mulholland et al. 2011), located in nearby Douglas and Grant counties, also recovered faunal remains. Because these are the only two sites with Woodland components to have been intensively excavated in the west-central Minnesota study area, it was initially hoped that they would serve as a baseline for artifact assemblage comparisons. Gonsior (2006:ii) notes that bison, deer, beaver, and turtle dominate the faunal assemblage at site 21DL2. The faunal assemblage from 21DL46/21GR41 represents an array of species, including bison, deer and elk, fish, turtles, birds, various domesticated species, beaver, muskrat, and others (Mulholland et al. 2011:103–104). However, comparisons between these two sites and those tested by ALAC in 2013 are problematic in that they contain multiple prehistoric and historic components with little to no stratigraphic separation (see Gonsior 2006:15–16, 29, 51; and Mulholland et al. 2011:17, 112). So, while it is possible to discern which animal species were utilized at these sites through time, it is, with few notable exceptions (e.g., domesticated cattle, chickens, and pigs), impossible to recognize whether certain species were utilized more widely than others during specific time periods or by specific cultural groups.

The situation is similar at sites 21KH36, 21KH46, and 21KH93. Because of the limitations of NISP data, the exploratory nature of the excavations, post-depositional damage, and the lack of stratification at these multi-component sites, only broad interpretations are possible concerning the faunal assemblages. A single burned fragment of turtle carapace from site 21KH46 is the only non-mammalian burned element, and a turkey femur from site 21KH93 is the only non-mammalian butchered bone recovered from the three sites. Only one faunal artifact can be attributed to a specific time period—the historic saw-cut large mammal rib fragment from site 21KH46. The small, fragile nature of fish bones suggests that these animals are likely underrepresented in the archeological record at the three sites, although just *how* underrepresented is difficult to know. Large mammals appear to be economically significant to the prehistoric inhabitants of all three sites. Even if a large percentage of the faunal remains recovered are the result of natural deaths or predation, the burned and butchered fragments reflect a strong prehistoric bias towards larger game animals. Of course, this perceived bias is likely to be at least partially the result of the robust nature of large mammal skeletal remains and their ability to survive longer in the archeological record. Nevertheless, big game hunting was certainly a significant activity among the previous inhabitants of all three sites. Finally, the presence of bison remains at these sites together with deer, fox, rabbit, raccoon, fish, and waterfowl suggests the broad exploitation of aquatic, grassland, and forest ecosystems.

MACROBOTANICAL ASSEMBLAGE & RADIOCARBON ASSAYS

Five soil samples were collected and processed by means of water flotation as part of the current study. One processed sample was collected from the east half of Level 6 (45–50 cmbs), XU-17, at site 21KH46, while the remaining four

samples consisted of fill from four different features. Two of the samples, comprising fill from Features 1 and 2 at site 21KH46, were processed at the OSA, together with the sample from the east half of XU-17. The remaining two samples, from Features 1 and 2 at site 21KH93, were processed at ALAC.

All of the samples were processed utilizing a manual barrel flotation method similar to that described by Pearsall (2000:21). Samples were first placed in a bucket filled with approximately 12 liters of water. The sample was stirred until a strong vortex was created. Any botanical material floating in the bucket following this process was skimmed off with a strainer and placed in a fabric mesh, rinsed with water, and allowed to dry. The remaining heavy fraction was water-screened through ⅛-inch wire mesh, dried, and sorted in the laboratory. This practice was repeated until the entire sample was processed. Samples processed at the OSA were passed through $^{1}/_{16}$-inch window screen.

Heavy fraction from the samples included numerous small and fragmentary pieces of bone, lithic detritus, and FCR; two pieces of pottery were discovered in the heavy fraction sample from Feature 2 at site 21KH93. Additional tiny crumbs of pottery were identified in the heavy fraction samples from 21KH46; however, these were too small for any practical analytical purposes. Specimens large enough for classification were sorted by specimen type, cataloged, and included with the appropriate material type analyses above.

The light fraction samples were sorted for identifiable plant remains and resulted in the recovery of numerous pieces of wood charcoal, as well as eight seed/seed casing specimens. Charcoal was recovered from all of the processed samples. Five seeds were recovered from F-1, site 21KH46. One seed was recovered from F-1 and two seed casings were recovered from F-2, site 21KH93. Following sorting, the botanical remains were examined with the aid of a stereomicroscope that afforded between 10x and 40x magnification. Specimens were identified taxonomically using modern and archeological comparative collections housed at ALAC and the Seed Technology Laboratory, South Dakota State University, Brookings; several botanical identification manuals (Davis 1993; Delorit and Gunn 1986; Martin and Barkley 2000; Montgomery 1977), as well as online databases (Minnesota Department of Natural Resources 2014b; U.S. Department of Agriculture, Natural Resources Conservation Service 2014), were also consulted. Information for each specimen recovered is provided in Table 38.

Table 38. Macrobotanical Specimens Recovered from Sites 21KH46 and 21KH93.

	Specimen Catalog No.	Inter-site Provenience	Taxonomic Classification (common name)	Specimen Type	Charred?
21KH46 Specimens	113.377	F-1, XU-17 (55-60 cmbs)	*Ranunculus* sp. (buttercup)	Seed	No
	113.377	F-1, XU-17 (55-60 cmbs)	*Ranunculus* sp. (buttercup)	Seed	No
	113.395	F-1, XU-17 (60-65 cmbs)	Legume? Heavily damaged	Seed fragment	No
	113.396	F-1, XU-17 (60-65 cmbs)	*Vicia* sp. (vetch)	Seed	No
	113.396	F-1, XU-17 (60-65 cmbs)	*Vicia* sp. (vetch)	Seed	No
21KH93 Specimens	114.113	F-1, XU-3 (40-50 cmbs)	*Fallopia cf. convolvulus* (wild buckwheat)	Seed	No
	114.193	F-2, XU-8 (30-37 cmbs)	*Celtis occidentalis* (common hackberry)	Seed casing	No
	114.193	F-2, XU-8 (30-37 cmbs)	*Celtis occidentalis* (common hackberry)	Seed casing	No

For the purpose of AMS-dating, charred plant remains with a single growing season are preferred; however, none of the eight seed specimens recovered was charred. The contamination of archeological sites through deposition of modern seeds is well-documented (see for example Keepax 1977:226; Minnis 1981:147). In light of the disturbed nature of the investigated sites and the common occurrence of the recovered seeds throughout the area today, it is likely that these are modern specimens, which were introduced through natural seed rain processes. Additional support for this presumption is illustrated by the presence of the wild buckwheat seed recovered from F-1 at site

21KH93. Wild buckwheat is a weed native to Africa and Eurasia that is now an invasive species in North America (Professor Gary Larson, Botanist, South Dakota State University, personal communication 2014). Therefore, only wood charcoal samples from features were submitted for AMS dating. Charcoal specimens were not identified taxonomically as part of the present study.

Three samples, all from site 21KH93, were submitted for radiocarbon assay: two from Feature 1 and one from Feature 2. Table 39 presents the AMS dates returned for these samples. Unfortunately, neither feature dates to the Woodland period. The two dates returned for Feature 1, 3920 ± 30 and 3935 ± 30 uncalibrated RCYBP, pre-date Minnesota's earliest recorded Woodland dates by a minimum of 1,170 years. These Late Archaic dates make sense from a chronological/stratigraphic context, as Feature 1 was discovered at a depth just below that of the deepest ceramic-bearing deposits at the site. The sample from Feature 2 yielded a modern date—either A.D. 1956 or 2006 based on calibration using the post-bomb curve (Hong Wang, Director, Geochronology Laboratory, Illinois State Geological Survey, personal communication 2013). The earlier of these dates, when adjusted by the 25-year deviation, offers a range of A.D. 1931–1981. This timeframe encompasses the late 1970s, the period when the property owner cleared trees from this part of the site and burned the brush and remaining stumps. Feature 2 is clearly a remnant of this modern activity.

Table 39. Accelerator Mass Spectrometry (AMS) Age Results of Samples from Features 1 and 2, Site 21KH93.

ISGS No.	Sample No.	Provenience	Sample Material	Age (RCYBP)	$\delta^{13}C$ (‰)
A2808	XU3F1-1	21KH93, XU-3, F-1, 45-50 cmbs	Charcoal	3920 ± 30	-23.9
A2809	XU3F1-2b	21KH93, XU-3, F-1, 45-50 cmbs	Charcoal	3935 ± 30	-22.2
A2810	XU8F2-1	21KH93, XU-8, F-2, 30-35 cmbs	Charcoal	-435 ± 25*	-27.6

*** The negative number here indicates a "modern" carbon sample.**

HISTORIC ARTIFACT ASSEMBLAGE

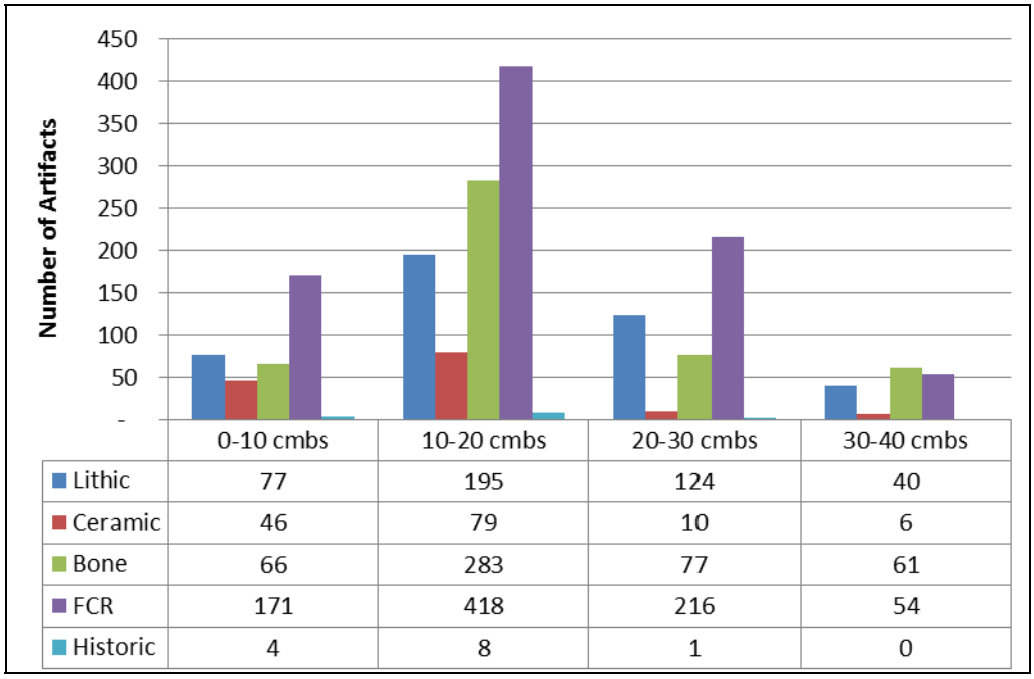
Historic-period artifacts were recovered from all three investigated sites during the present study, and the material appears to be largely consistent with the timeframes of the historic components previously identified at these localities. A general selection of material recovered includes whiteware, blue transferware, crockery, window and bottle glass, round-head and square-head nails, plaster fragments, a steel threaded nut, an iron tinkling cone, brick, and miscellaneous metal items and fragments. Thirteen historic-period artifacts were recovered from excavations at site 21KH36 during the current study, while 472 specimens were recovered from site 21KH46; only three were recovered from site 21KH93. At site 21KH36, historic artifacts were discovered buried from 0–30 cmbs. Historic material was identified from the surface to depths of 40 cmbs at site 21KH46 and 20 cmbs at 21KH93. In each instance, prehistoric artifacts were discovered stratigraphically either at or above the historic-period deposits—a clear indication of the degree to which component mixing has occurred among the upper stratigraphic zones at these sites.

Given the scope of the current study, a detailed analysis of the historic artifact assemblage was not undertaken. However, all of the recovered material was cataloged and copies of the catalogs are archived at the MHS. The majority of specimens recovered from site 21KH46 are also curated at MHS under Accession No. 2013.113. A limited number of specimens from site 21KH46, as well as both pieces from site 21KH93, were determined to be modern refuse and were culled prior to curation. Culled specimens included items such as aluminum pop and beer can pull tabs, pop bottle glass, recent plastic fragments, and shotgun casings. Material recovered from site 21KH36 was returned to the current property owner following completion of this investigation.

SUMMARY

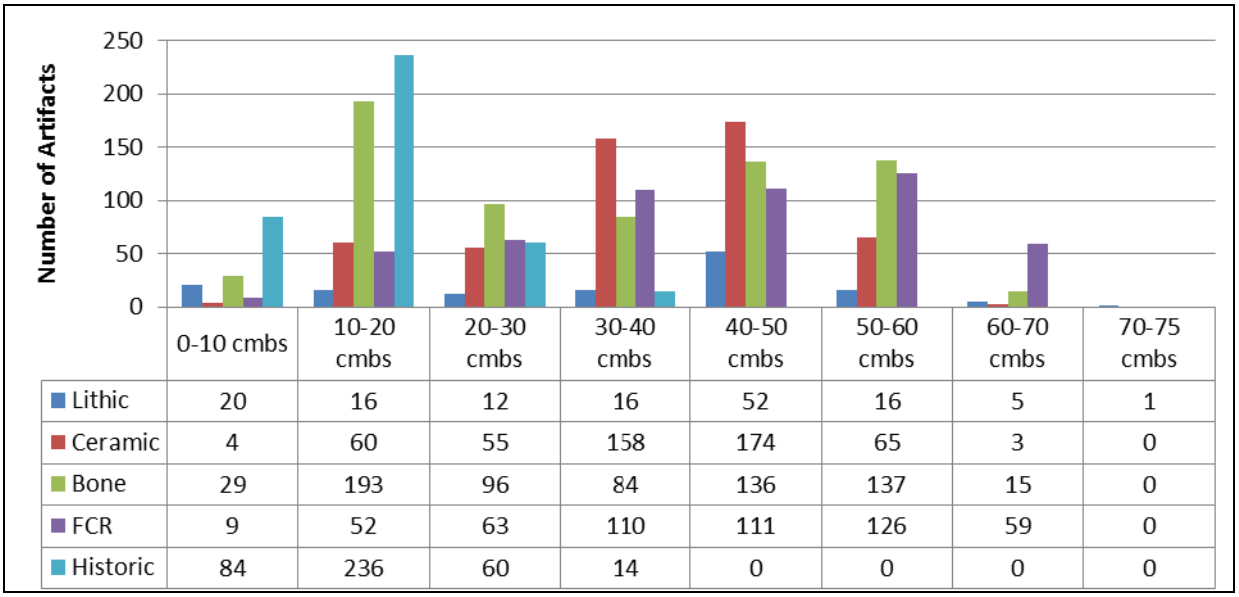
Overall, the artifact assemblages recovered from sites 21KH36, 21KH46, and 21KH93 during the current study are small and spatially restricted by the limited number of units excavated at each locality. Not surprisingly, this complicates interpretive efforts for the three sites, particularly considering that each contains multiple components. Compounding this limitation at each site are the lack of discernable stratigraphy and the commingling of artifacts due

to animal burrowing, root action, agriculture, and deforestation practices. Figures 105–107 illustrate the extent of historic/prehistoric component mixing by depth at each site.



	0-10 cmbs	10-20 cmbs	20-30 cmbs	30-40 cmbs
Lithic	77	195	124	40
Ceramic	46	79	10	6
Bone	66	283	77	61
FCR	171	418	216	54
Historic	4	8	1	0

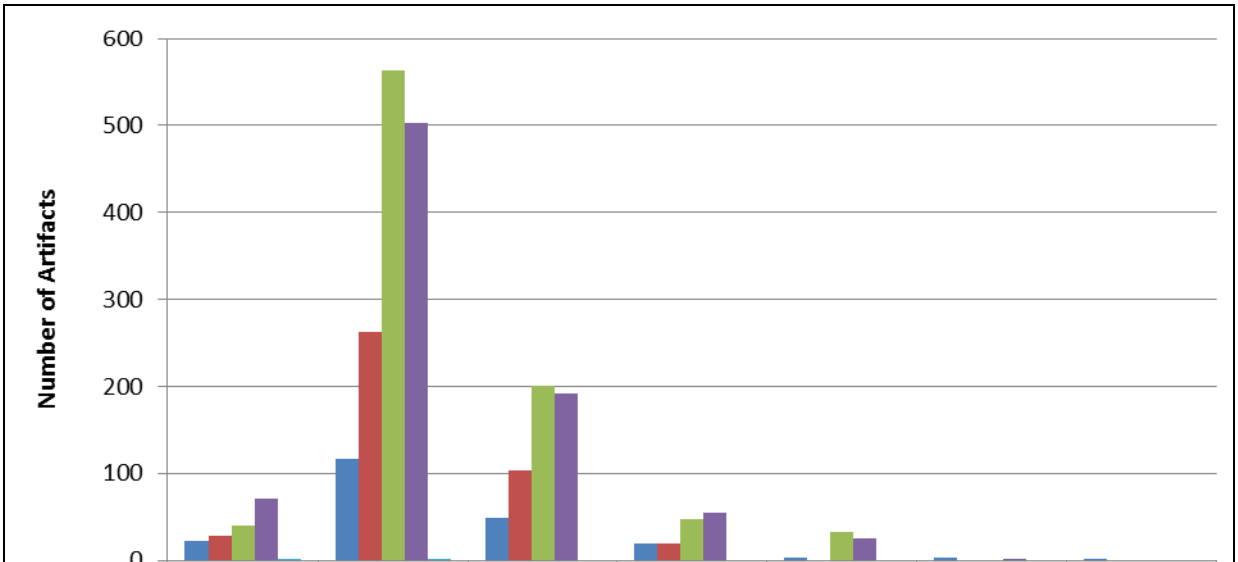
Figure 105. Distribution of artifact types by depth, site 21KH36.



	0-10 cmbs	10-20 cmbs	20-30 cmbs	30-40 cmbs	40-50 cmbs	50-60 cmbs	60-70 cmbs	70-75 cmbs
Lithic	20	16	12	16	52	16	5	1
Ceramic	4	60	55	158	174	65	3	0
Bone	29	193	96	84	136	137	15	0
FCR	9	52	63	110	111	126	59	0
Historic	84	236	60	14	0	0	0	0

Figure 106. Distribution of artifact types by depth, site 21KH46.[1]

[1] Does not include artifacts (n=221) from OSA ST-1 (0–45 cmbs); OSA ST-2 (0–60 cmbs); OSA ST-3 (0–90 cmbs); and OSA ST-4 (0–75 cmbs).



	0-10 cmbs	10-20 cmbs	20-30 cmbs	30-40 cmbs	40-50 cmbs	50-60 cmbs	60-70 cmbs
Lithic	23	116	49	20	4	4	2
Ceramic	28	262	104	20	0	0	0
Bone	40	563	200	48	33	0	0
FCR	71	503	192	55	26	2	0
Historic	1	1	0	0	0	0	0

Figure 107. Distribution of artifact types by depth, site 21KH93.[2]

These figures do not depict the extent of mixing between different prehistoric components; however, Johnson (this report) discusses this topic as it pertains to the ceramic assemblages from each site (see also Appendix C). Suffice it to say that the vertical distribution of ceramics observed at sites 21KH36, 21KH46, and 21KH93 does not correspond to pre-established cultural-chronological frameworks for the state. One example is found at Block 3, site 21KH93, where a shotgun shell and Prairie Village, Late Woodland, and Middle Woodland pottery were recovered from the same depth below surface.

Datable features were only discovered at site 21KH93. Unfortunately, neither of the two features is associated with Woodland occupations. Although a small number of seeds were recovered from sites 21KH46 and 21KH93, none is charred. Therefore, they are not suitable for dating and their association with a particular cultural component at either site is dubious.

The faunal assemblages from sites 21KH36, 21KH46, and 21KH93 are consistent with the exploitation of aquatic, grassland, and forest ecosystems, which coincides with the geographic location of the sites. Unfortunately, details concerning resource utilization during specific occupation periods are not discernible due to the absence of stratigraphic separation at each locality. A comparison of these assemblages to those from sites 21DL2 and 21DL46/21GR41 revealed a similar pattern.

Similar issues also exist with respect to the lithic assemblages. While a small amount of exotic lithics was recovered from sites 21KH36, 21KH46, and 21KH93, the vast majority of material is available locally in glacial deposits. Chipped stone debitage from these three sites, ranging from larger decortication flakes and shatter to tiny finishing flakes, reflects knapping patterns consistent with all stages of lithic tool production. Diagnostic projectile points recovered from the sites are consistent with the previously identified cultural components at these localities. Other

[2] Does not include artifacts (n=50) from OSA ST-1 and OSA ST-3 (unspecified depth); OSA ST-5 (0–20 cmbs); ST-1 (20–40 cmbs); cleanup from XU-6 and XU-8 (0–40 cmbs).

formal tools are typical of prehistoric habitation throughout the region; however, their collective ubiquity coupled with pervasive component mixing made it impossible to distinguish which items are associated with which occupation periods.

SYNTHESIS & RECOMMENDATIONS

Archeologically, west-central Minnesota is largely an enigma. Overall, the region has received little previous attention from archeologists. In terms of Woodland-period archeology, the limited existing dataset for the distribution of known contexts initially seems to suggest that the region is peripheral (i.e., Woodland groups were entering the area on a limited basis from established population centers elsewhere). However, only two Woodland sites in the region have been intensively excavated to-date and both are located near the region's margin. The paucity of intensively excavated Woodland sites, in turn, results in a lack of accompanying Woodland-period radiocarbon dates. Further complicating matters is that a great many of the tested Woodland sites throughout Minnesota have poor stratigraphic separation or deposits with mixed components; these issues are pervasive throughout the present study area as well. This situation has hampered the ability of archeologists to both date these components and evaluate the development and change in ceramics through time, as well as the functional relationships present among sites that are believed to be contemporaneous.

RESEARCH OBJECTIVES AND INVESTIGATION RESULTS

The objective of the current study, as stated on page 2 of the project RFP, was to determine: "…how early they [Woodland contexts in west-central Minnesota] appear, how late they survive, their physical manifestations, and their interaction with other prehistoric contexts that pre-date them, that are coeval with them, and that post-date them." Three primary tasks comprised the project:

1) Review archeological, environmental, and ethnographic literature pertinent to the Woodland period in west-central Minnesota, examine known Woodland site distributions in the area via the OSA's site inventory, and examine artifacts in major local museums and private collections.

2) Excavate a single major multi-component Woodland site in the study area or intensively test several such sites. Excavations are to include at least 20 square meters in units of at least one square meter and some fine-recovery sampling should be utilized to recover subsistence information and materials for radiocarbon dating. The focus of excavations is on obtaining *in situ* artifacts and associated materials suitable for developing the Woodland ceramic/cultural sequence in the study area.

3) Complete an analytical and descriptive report that summarizes the findings of the literature search, collections research, fieldwork, artifact analysis, and absolute dating results.

The following discussion summarizes the results of the investigation as they pertain to the above-listed tasks and provides recommendations for future Woodland-period research in west-central Minnesota and the broader region.

Earlier in this report (see pages 18–19), the following three research questions were posed concerning the Woodland tradition in west-central Minnesota as it relates to three critical statewide research topics for the Woodland period: chronology, ceramic typology, and site distribution (see also Arzigian 2008:12-18). Discussions addressing each of the questions are developed below.

1) **Will excavations at sites 21KH36, 21KH46, or 21KH93 result in the discovery of settlement features or diagnostic ceramics suitable for dating, and how will these dates fit into the chronological make-up of Woodland contexts in west-central Minnesota and beyond?**

2) **How will the range of identifiable Woodland contexts be reflected in the ceramic wares examined during the current study and how does this composition compare with previously identified trends in the distribution of Woodland contexts throughout the study area?**

3) **Where do Woodland-period sites tend to be located within the study area and can trends in their distribution be utilized to predict the location of other such sites in the region?**

Testing and Material Culture Analysis

In response to Task 2 from the RFP and Research Question 1, above, limited test excavations were conducted at three previously identified sites with Woodland components in Kandiyohi County: 21KH36, 21KH46, and 21KH93. In total, 25 square meters and nine additional shovel tests were excavated among the three sites (Table 40). Only a single shovel test failed to yield prehistoric artifacts. In short, the answer to Research Question 1 is *yes* and *no*. AMS dates were obtained from two features identified at site 21KH93. Unfortunately, one feature pre-dated the Woodland occupation of the site while the other post-dated it. No features were discovered at 21KH36 or 21KH46. It was initially believed that these three sites contained areas with undisturbed deposits. While limited excavations conducted during the present study did reveal that some deposits were undisturbed, stratigraphic segregation of Woodland and subsequent Village through historic-period components was lacking. Although previous work at 21KH46 (see Tumberg et al. 2009) may have yielded stratigraphically separated Woodland ceramics from one small portion of the site, no such separation was observed among ceramic specimens recovered from the areas of the site investigated during the current study. Historic timbering, agricultural activities, and decades of repeated artifact collecting have heavily disturbed the majority of deposits at 21KH36, 21KH46, and 21KH93. Localities within these three sites that did appear to retain undisturbed deposits did not contain cultural components that were stratigraphically isolated from one another.

Table 40. Summary of Test Excavations Conducted During the Current Study.

Site Investigated	1-m-x-1-m Units Excavated	50-cm-x-50-cm Units Excavated	Shovel Tests Excavated	Sterile Tests?
21KH36	8	—	—	No
21KH46	6	—	4	No
21KH93	10	4	5	Yes (ST-4)

Generally speaking, the artifact assemblages recovered from sites 21KH36, 21KH46, and 21KH93 are consistent with the substantial assemblages previously obtained from these localities by area collectors. The faunal assemblages do offer a glimpse of the variety of animal resources utilized by the inhabitants of each site and evidence suggests the exploitation of both aquatic and terrestrial resources. However, their small sample sizes and generally fragmentary nature, coupled with an inability to differentiate and date discrete stratigraphic zones within a given site, render this material of little analytical value within the context of the present study (i.e., Woodland-specific trends). In terms of lithics, only small numbers of "exotic" material were observed among the assemblages from each site. This material consisted of Hixton Group quartzites and Burlington chert. Additionally, a small amount of obsidian was observed in a local collection from 21KH93 and two obsidian flakes were recovered during 2007 testing at 21KH46 (Tumberg et al. 2009:5). Tumberg et al. (2009:4) also report the presence of KRF at site 21KH46. In essence, these sites contain very limited quantities of exotic lithic source material originating from the east, southeast, and west. The vast majority of the lithics observed at these sites, however, are from locally derived glacial cobbles. Four identifiable projectile points were recovered during the current study; they range in approximate timeframe from Middle Woodland through Late Woodland and possible Late Prehistoric. Similar to the faunal assemblages, the cultural component mixing and lack of stratigraphic separation at the sites limits the analytical value of the lithic specimens.

Ceramics recovered from sites 21KH36, 21KH46, and 21KH93 offer the greatest insights into the different Woodland-period groups who occupied these areas. Pottery associated with seven defined Woodland contexts has been documented at site 21KH36; specimens associated with four Woodland contexts were identified at 21KH46; ceramics associated with six contexts were identified at 21KH93. The specific Woodland contexts associated with each site are presented in Table 41. As would be expected given the geographic proximity of these sites to one another, there is a significant degree of overlap in the documented contexts—particularly with respect to 21KH36 and 21KH93. The four contexts present at site 21KH46 have also been identified at the other two sites; however, it is interesting to note that the two southwestern Minnesota manifestations, Fox Lake and Lake Benton, are absent from the 21KH46 assemblage but present among the other two. The apparent absence of southwestern ceramic wares could easily be a product of sample size—as the assemblages from 21KH36 and 21KH93 are much larger than that of 21KH46. It

should also be reiterated that the rims recovered during the 2007 testing of 21KH46 have yet to be analyzed in detail (Tim Tumberg, personal communication 2014), so it is possible that additional wares may be identified upon completion of this analysis.

Table 41. Woodland Contexts Identified in Association with Sites 21KH36, 21KH46, and 21KH93.

Archeological Site Investigated	Woodland Contexts Identified Based on Ceramic Ware Classification
21KH36 (Mennetaga)	Brainerd; Havana Related; Fox Lake; Central Minnesota Transitional Woodland; Lake Benton; Blackduck-Kathio; Psinomani
21KH46 (Kasota Lake)	Brainerd; Havana Related; Central Minnesota Transitional Woodland; Blackduck-Kathio
21KH93 (Levin)	Brainerd; Havana Related; Fox Lake; Central Minnesota Transitional Woodland; Lake Benton; Blackduck-Kathio

Ultimately, there is fairly good evidence for which Woodland groups occupied sites 21KH36, 21KH46, and 21KH93 through time. While there is at least a general indication in terms of when these groups were present during the Woodland period (i.e., Early, Middle, or Late Woodland), the precise timeframe of the occupations remains unknown. The problem, of course, lies in the inability to differentiate components of these different contexts from each other and, in many cases, from subsequent Village and later contexts due to the lack of stratigraphic separation. In turn, this problem renders it impossible to develop meaningful hypotheses concerning such issues as subsistence, chronology, paleoenvironment, and interaction with other contemporaneous groups.

Site Distribution and Composition

With respect to Task 1 and Research Questions 2 and 3, site inventory records and reports from the OSA, Ft. Snelling History Center, and the SHPO were obtained between the fall of 2012 and the spring of 2013 and a Woodland-period site locational probability map of the study area was generated in MN/Model (see Figure 12, page 21, above). Two private artifact collections and five publicly curated collections were also examined during the course of the investigation; limited interviews were conducted with the owners of the private collections. Examined collections include those from 14 sites in Kandiyohi County, three sites in Meeker County, and two sites in Stearns County in the study area, as well as those from three sites in Big Stone County, one in Lincoln County, and one in Wright County to the west, southwest, and east of the study area, respectively.

Regarding Research Question 3 specifically, MN/Model results (see pages 20-21, above) seem to support previous findings of a strong correlation between prehistoric site distribution and proximity to water in the study area—particularly lakes when present (see for example MHS 1981:1). An examination focused solely on Woodland sites in the study area (see Figure 11, page 17, above) reveals a similar trend. In the westernmost tier of counties (Grant and Stevens counties), areas exhibiting the highest site locational probability appear to follow the course of prominent waterways such as the Pomme de Terre and, to a lesser extent, Mustinka rivers. Another substantial zone of high probability surrounds the series of lakes in northern and northeastern Grant County, most notably Pelican Lake and the westernmost shores of Lake Christina. Elsewhere throughout west-central Minnesota, the areas of highest site locational probability are, as noted, clearly defined by the distribution of lakes. While the preference for lakes over waterways is not in-and-of-itself surprising, it is interesting to note the high incidence of low probability lands modeled adjacent to most of the study area's major waterways and the nearly complete absence of high probability localities in such settings. The current model suggests that, where lakes and rivers were both present, the overwhelming preference for site selection was on lakes. Particularly relevant to the Woodland occupation of the region is the absence of large burial mound groups. Scott Anfinson (personal communication 2014) suggests that, although this may be the result of a variation in mortuary practices, it may also imply smaller population groups in the region. Unfortunately, the model does not predict site location for specific Woodland site-types or contexts; however, perhaps a detailed, future study modeling the distribution of known sites from a particular context in relation to the MN/Model prehistoric site probability map could reveal hitherto undetectable distribution trends (see below for more discussion).

Concerning Research Question 2, existing site data coupled with the analysis of collections and recovered pottery during the current study have identified the presence of seven of the 11 designated Woodland contexts in the west-central Minnesota study area (Table 42). An examination of Table 42 reveals that the majority of Woodland-period site components in the study area relate to the Central Minnesota Transitional and Blackduck-Kathio contexts. However, the sample size is quite small and there appears to be a relatively even distribution of the remaining contexts listed. Of note is the lack of Woodland sites identified within the Red River Valley portion of the study area—as admittedly small as it is. It is difficult to read too much into this, though, as again, the sample size is extremely limited.

Table 42. Woodland Components with Identified Contexts in Study Area by Archaeological Region.

	Components Identified by Sub-Region				
Woodland Context (Dates & Associated Wares)	**Prairie Lake North (2n)**	**Central Lakes Deciduous South (4s)**	**Central Lakes Deciduous West (4w)**	**Red River Valley South (6s)**	**Total Count (Percent of Total)**
Brainerd (800 B.C.–A.D. 250)	3	1	3	—	7 (13.21)
Havana-related (200 B.C.–A.D. 300)	3	2	—	—	5 (9.43)
Fox Lake (200 B.C.–A.D. 700)	4	2	—	—	6 (11.32)
Lake Benton (A.D. 700–1200)	5	—	1	—	6 (11.32)
Central Minnesota Transitional (St. Croix [A.D. 300/500–800]* & Onamia† [A.D. 800–1000])	5	4	1	—	10 (18.87)
Blackduck-Kathio (A.D. 600/900–1300)‡	3	7	2	—	12 (22.64)
Psinomani (Sandy Lake [A.D. 1100–1750])	2	2	3	—	7 (13.21)
Total	**25**	**18**	**10**	**0**	**53 (100)**

*** dates for St. Croix Isle phase** **† dates for Onamia Vineland phase** **‡ dates for Kathio Vineland/Wahkon phases**

An analysis of 11 ceramic assemblages from sites in and near west-central Minnesota yielded results consistent with the earlier findings of Woodland context site distribution in the study area (see Johnson, this report, pages 89-98). Specifically, Johnson notes the following concerning different Woodland pottery types identified during his collection analysis:

> ...there are a number of Middle (Havanoid/Fox Lake), Late Middle or Early Late (St. Croix), and Late Woodland (Lake Benton, Onamia, Clam River, Kathio) occupations present at all sites [included in this analysis] except King Lake (21ME23), which lacks early pottery. Early Woodland Brainerd pottery is present in small numbers at three sites. Most sites are dominated by pottery decorated with cordwrapped object impressions (Onamia and Kathio) and dentate/comb stamping (St. Croix, Onamia) with cord impressing (Clam River) occurring in smaller quantities [Johnson, this report, page 89].

In further exploring the variability among the three dominant decorative types (cordwrapped object impressed, dentate/comb stamped, and cord impressed) observed in the analysis, Johnson (this report, page 94) reports an interesting co-occurrence of cord impressing and dentate/comb stamping in the west-central Minnesota study area. One possible explanation for the co-occurrence of these decorative treatments is that the same groups were utilizing both treatments concurrently. Alternatively, it is possible that dentate stamping was partially replaced by cord impressing through time (Johnson, this report, pages 93-94).

Ultimately, it appears that west-central Minnesota's Woodland-period populations possessed potting traditions that are more closely affiliated with developments in eastern Minnesota (Archaeological Region 4) than southwestern Minnesota (Region 2s). Evidence of this connection is first detected among Middle Woodland ceramic assemblages, and a trend towards intensification is observed among Late Middle and Late Woodland assemblages in the study area (see Johnson, this report, page 101). Thus, at least in terms of the Woodland presence, Archaeological Region 2n is more culturally similar to Region 4 than Region 2s. While recently investigating ceramic distribution among southern Minnesota's Village cultures, Holley and Michlovic (2013:34-35) offered a possibility that the Minnesota River valley may have served as a partial barrier to the northerly spread of Great Oasis groups from the south. It is possible that the valley acted as a barrier to earlier Woodland groups in a similar fashion; however, such a hypothesis remains to be tested.

RECOMMENDATIONS FOR FUTURE STUDY

Avenues available for future research into the Woodland archeology of west-central Minnesota, though many and varied, all relate back to the three critical, statewide Woodland-period research topics outlined earlier in this report (page 18) and previously by Arzigian (2008:12-18): ceramic typology, site distribution, and chronology. It is noteworthy, albeit not unexpected, that a certain degree of overlap exists among exploration avenues for the three research topics.

Ceramic Typology

Johnson (this report, pages 98-101) provides a detailed discussion on avenues for future research on Woodland period ceramics. Each of the topics addressed by Johnson is summarized below. A recurring theme underlying several of the following recommendations is the need to reevaluate the ceramic typologies currently employed in Minnesota. For, as Arzigian (2008:13) and others have previously noted, many of the existing typologies are either antiquated, inadequate, or both.

- One avenue that would be valuable to explore is a detailed examination of the spatial variability of Minnesota's Late Woodland pottery decorated with cordwrapped object impressions. Johnson (this report, page 98) describes this decorative technique as both ubiquitous and widespread throughout the state, noting that it has caused researchers to define or identify a number of ceramic types largely based on location. Defined types exhibiting this decorative treatment include Lake Benton Cordwrapped Stick (Anfinson 1979b), Onamia Cordwrapped Stick (Ready and Anfinson 1979b), Kathio series (Ready and Anfinson 1979a), and Blackduck (Lugenbeal 1979). A similar problem exists in the widespread distribution and ubiquity of dentate and comb stamped pottery in Minnesota, and a study like that proposed for ceramics decorated with cordwrapped object impressions could be undertaken. Types defined based on dentate/comb stamping include St. Croix Stamped (George 1979b), Onamia Dentate (Ready and Anfinson 1979b), and Lake Benton Dentate (Anfinson 1997:76-78). Several means of approaching such an analysis are offered on pages 98-100, above.

- Johnson (this report, page 100) also proposes researching the distribution of Late Woodland cord impressed ceramics. While relatively common in west-central Minnesota, this pottery type occurs with far less frequency to the south and north. Whether this circumstance is an artifact of biased sample size or a legitimate trend is currently uncertain. Specifically, the temporal relationship of cord impressed ceramics with other Woodland pottery types is in need of investigation, as is the spatial distribution of various cord impressed motifs throughout the state and the broader region.

- A spatial distribution study is also warranted for undecorated rims with horizontal or diagonal cordmarked exteriors. The present study suggests that many of these types relate to Late Woodland occupations such as Lake Benton complex sites to the southwest rather than earlier Fox Lake components. Further investigation into this topic could provide additional data capable of either supporting the present proposition or refuting it.

- A study focused on the distribution of Middle Woodland Havanoid sites would also be beneficial. A strong Havanoid presence in central and western Minnesota was noted (Johnson, this report, page 100). An analysis of additional collections could establish both an area where its presence is most pronounced and how rapidly it declines to the north, south, and west of the study area.

- Finally, an analysis of chipped stone raw material exploitation patterns as a means of augmenting the study of Woodland ceramics in west-central Minnesota relative to adjacent regions of the state could be insightful (Johnson, this report, pages 100-101). The ceramics analyzed during the current study appear to be more closely tied to eastern Minnesota Woodland types than to those from the southwestern part of the state. The aim, through analyzing lithic raw material types relative to Bakken's (2011) defined lithic resource regions, would be to determine if patterns similar to those observed among the ceramics are also present in non-local lithic raw material usage from sites in the study area. Limited sample size notwithstanding, the current study examined the debitage from sites 21KH36, 21KH46, and 21KH93 in this manner; however, no patterns were detected as the respective lithic assemblages were overwhelmingly local in origin.

Site Distribution

In terms of Woodland-period site distribution in the study area, initial data have been examined and tabulated and a generalized prehistoric site locational probability map has been generated in MN/Model (see pages 20-21, 135-137, above). Future research on this topic should focus on basic survey coverage and site documentation in the study area, as well as model testing and refinement. Very few systematic archeological investigations have been undertaken in the west-central Minnesota study area to-date. Systematic investigations, including both pedestrian survey and documentation of artifact collections, will aid in expanding the existing database of Woodland sites in the region. This, in turn, will lead to a clearer understanding of the presence of different Woodland contexts, both in terms of geographic distribution and numbers. This additional data could then be employed in the testing and refinement of site locational probability models for the region. Ultimately, a series of context-specific models could be generated for each of the identified Woodland contexts in the study area. These models could then be compared and contrasted with each other, as well as with the more general prehistoric site locational probability model.

One means of augmenting site distribution model refinement, particularly as it relates to the west-central Minnesota region, is paleoenvironmental reconstruction. By understanding what the environment was like during the occupation period of a particular context, we are better equipped to understand how the people comprising that context subsisted and interacted with their environs. West-central Minnesota is unique in this respect in that it features two distinct ecological regions as well as a substantial ecotone between them. The prairie-forest ecotone bisects the study area in a general northwest-to-southeast line with open grassland prairies to the south and west and the expansive forest to the north and east. The position of the prairie-forest border was anything but static during the Holocene. It retreated far to the northeast during the Altithermal and began encroaching back to the southwest afterwards; however, as Grimm (this report, page 22) points out, "…the precise history of late Holocene reforestation is highly variable along the prairie-forest border, depending on local physiographic, edaphic, and hydrologic factors." A series of palynological studies conducted in the study area would afford a clearer picture of where the prairie-forest border was at different points throughout the Woodland period. In turn, these data could be incorporated into models and used to detect potential patterns in settlement for a given complex. Do sites of a given context appear in forest, prairie, and ecotone settings or does distribution suggest a primary or singular adaptation to one of these biomes? Trends or patterns revealed in this manner should be capable of predicting population group movement across the landscape through time. For instance, Arzigian (2008:16) notes that many Kathio sites appear to cluster in greater numbers along ecotones, including the prairie-forest border. Additional palynological data could test this perceived pattern in the study area and determine whether Kathio sites could then serve as a reliable marker for the position of the prairie-forest border during the Late Woodland.

Chronology

For Woodland-period archeology in Minnesota, chronology is perhaps the most pressing issue moving forward because it directly impacts our ability to understand issues related to both site distribution and the typological classification of Woodland ceramics. The chronology issue is clear for Woodland sites and their associated contexts throughout the

state: better dates are needed, and more of them. The problem is that, for multiple reasons, these dates are difficult to obtain. In the Woodland MPDF, Arzigian describes the most notable issues as follows:

> Minnesota's Woodland sites range in size from small to large, but individual sites are rarely well circumscribed or defined, so that the actual sizes of most sites or site types are poorly known. The soils in many parts of Minnesota are shallow, with minimal soil buildup and little separation between components. Shallow sites are often disturbed partially or completely by plowing, with only portions of middens or features left intact below the plow zone. This is particularly true in the southern part of the state, where much of the land is under cultivation. Woodland peoples did not often dig deep storage pit features...features such as hearths, basin-shaped pits, or post holes from semi-permanent houses are not common and, when present, are often shallow [Arzigian 2008:12].

Extensive component mixing and collapsed or compressed stratigraphy is a problem both state-wide and beyond for Woodland-period research. It has been noted among Fox Lake and Lake Benton assemblages in southern Minnesota (Gibbon 2012a:102, 148-149), several multi-component Woodland sites in the current study area (Gonsior 2006:56; Mulholland et al. 2011:107-109; and this report, pages 36-76), as far north as southwestern Manitoba (Syms 1977:2-5), and elsewhere. This problem is twofold: it hampers the ability of researchers to obtain meaningful radiocarbon dates for the various Woodland contexts in the study area while concurrently restricting the relative dating of ware types through seriation. At present, there are only two Woodland-period AMS dates from west-central Minnesota; both are carbon residue dates from Brainerd ware sherds recovered from site 21DL2. These dates are A.D. 70 ± 50 and 30 B.C. ± 50, respectively (Gonsior et al. 1999:37), and are relatively late on the timeline of dated Brainerd sites (see Hohman-Caine and Syms 2012). Aside from these two dates, the chronology of west-central Minnesota's Woodland tradition is unknown.

While there is clearly a need to obtain more viable dates for the Woodland period, the problems enumerated above are so pervasive that the future focus of researchers should perhaps be directed towards two specific avenues: the identification and dating of features discovered at *single-component* Woodland sites; and the less conventional methods designed to date the typologically classified ceramics directly, such as residue dating, thermoluminescence (TL), and optically stimulated luminescence (OSL). As far as the first avenue is concerned, there are relatively few single-component Woodland sites listed in the state site records; only six are currently documented in the west-central Minnesota study area. As depicted in Table 43, these sites are located in four different counties in the study area and consist of single components associated with four different Woodland contexts. Clearly, the options for investigating single-component sites are limited, and the uncertain composition of each of these could present further limitations (i.e., some or all sites may be completely disturbed or in other ways lack intact, datable settlement features).

Table 43. Single-Component Woodland Sites in the Study Area by Context and County.

Woodland Context	County Location	Individual Site(s) Present
Brainerd	Todd	21TO22; 21TO26
Central Minnesota Transitional (St. Croix/Onamia)	Todd	21TO3
Blackduck/Kathio	Douglas; Stearns	21DL105; 21SN18
Psinomani	Kandiyohi	21KH24

The second of these avenues—directly dating typologically classified Woodland ceramics—may possess the greatest potential for future exploration since the more traditional options noted above have a multitude of limitations. A recent study of Brainerd ceramics employed the use of both carbon residue and OSL direct dating methods to date 25 Brainerd ware sherds from sites throughout north-central Minnesota (Hohman-Caine and Syms 2012). These methods, as well as TL dating, have been used to date prehistoric ceramics elsewhere in the world. Where TL and OSL dating have been possible, they have proven to be fairly reliable (see for example Barnett 2000; Herbert et al. 2002; Kiyak et al. 2010; Zimmerman 2007). Though the possibility of establishing a detailed Woodland-period chronology through the direct dating of ceramics using TL and OSL techniques is promising, these dating methods are not without their own limitations. Hohman-Caine and Syms (2012:31-32, 41) cite some common limitations involved in

TL and OSL dating, including long turn-around time for submitted samples (though these turn-around times may become increasingly reasonable as additional labs begin processing samples more frequently), minimum sherd thickness of 5-6 mm, the destructive nature of the dating process, and the need to submit a small (ca. 50 g) soil sample from a location within one-half-meter of the ceramic find as a control. Clearly, the need for an associated soil sample greatly restricts the applicability of these dating techniques, particularly with respect to existing private or publicly curated collections. For archeologists conducting site excavations, this issue is less problematic provided it is accounted for ahead of time. Unfortunately, the current landscape of the profession is such that large-scale excavations capable of producing vast quantities of ceramics have become increasingly rare, and the pottery that would likely be the most valuable to date is the series of extensive assemblages from previously excavated sites that are now curated—in most cases sans accompanying soil samples.

Another means of directly dating pottery is through the assay of carbonized food residue. Unlike TL and OSL dating, this method is non-destructive, requiring only the removal of carbonized residue from the surface of the specimen to be tested. The obvious limitation is that it can only be used to date sherds that have the requisite carbonized residue. The presence of large enough quantities of carbonized residue is not the only limiting factor associated with this dating technique; it has proven to be problematic by yielding potentially older than expected dates on a number of different samples as a result of the freshwater reservoir effect (FRE). Though the degree to which the FRE is capable of offsetting residue dates from a given sample varies based on a number of factors and is presently under debate (see for example Fischer and Heinemeier 2003; Hart and Lovis 2007, 2014; Roper 2013), researchers must nevertheless continue to take its potential effects into consideration. This is not intended to suggest that residue dating be abandoned as a potential means of Woodland-period chronological evaluation/establishment. Indeed, current and future studies focused on the FRE may well establish adjustment or correction protocols that improve dating reliability or that identify signatures related to its presence (extremely negative $^{13}C/^{12}C$ isotope ratios are one potential signature suggested by Fischer and Heinemeier [2003]).

Perhaps the most promising method of directly dating ceramics is a new process called rehydroxylation (RHX) dating (Wilson et al. 2009, 2012). RHX is a chemical process which is described at its most basic level as: "The slow progressive chemical recombination of ceramics with environmental moisture" (University of Manchester 2013:9). The process measures the lifetime mass gain in a ceramic sample due to RHX, which begins during cooling after firing a specimen to a temperature of at least greater than 500° Celsius (932° Fahrenheit). Since RHX rates follow a known physical law, "A ceramic sample may be dated by first heating it to determine its lifetime water mass gain, and then exposing it to water vapour [sic] to measure its mass gain rate and hence its individual rehydroxylation kinetic constant. The kinetic constant depends on the temperature the measurements are taken at" (University of Manchester 2013:9). The date generated as a result of this process is equivalent to the time the sample was last heated to a temperature in excess of 500° Celsius—almost always the time the vessel was initially fired.

At present, RHX dating is in its infancy and, through testing, researchers continue to try to understand how various environmental factors, such as temperature and humidity instability, may impact final dating results (see for example Bowen et al. 2013; Drelich et al. 2013; Hall et al. 2011, 2013). Preliminary test results from a small suite of pottery sherds (Wilson et al. 2012) and from a variety of different historic brick and tile samples (Wilson et al. 2009) concur with known specimen ages/existing dates obtained from the same provenience. The method has also successfully dated several prehistoric ceramic sherds in the New World (Lipo et al. 2011). However, not all tests conducted have yielded satisfactory results (see for example Bowen et al. 2011, 2013; Burakov and Nachasova 2013; Le Goff and Gallet 2014; Lipo et al. 2011) and researchers continue to search for answers that can help refine the process. For instance, there is now some evidence to suggest that physical modification or pulverization of the specimen to be dated may be required (see Bowen et al. 2013; Wilson et al. 2012). Because this research is ongoing, RHX dating is not yet routinely available for commercial processing of ceramic samples; however, the method is self-calibrating and, according to Christopher Hall of Edinburg University, is both simpler and cheaper to conduct than other current methods of direct ceramic dating (Goring 2013:26). If and/or when RHX dating is found to yield accurate results on a consistent basis, it could become the key to not only establishing a chronological framework for west-central Minnesota's Woodland tradition, but for establishing chronological frameworks for all prehistoric ceramic contexts found in the state and beyond.

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APPENDIX A

LABORATORY RESULTS OF THREE AMS-DATED CHARCOAL SAMPLES RECOVERED FROM THE LEVIN SITE (21KH93), KANDIYOHI COUNTY, MINNESOTA

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Prairie Research Institute
Illinois State Geological Survey

615 East Peabody Drive
Champaign, Illinois 61820

AMS ^{14}C assays for Buhta: *November 4, 2013*

ISGS #	Sample #	Material	$\delta^{13}C$	Fraction of MC	±	$D^{14}C$	±	^{14}C yr BP	±
A2808	XU3F1-1	Charcoal	-23.9	0.6137	0.0019	-386.3	1.9	3920	30
A2809	XU3F1-2b	Charcoal	-22.2	0.6129	0.0020	-387.1	2.0	3935	30
A2810	XU8F2-1	Charcoal	-27.6	1.0560	0.0032	56.0	3.2	-435	25

The half-life of 5568 is used for the age calculation. It is reported as BP (before present defined as before 1950). MC-Modern Carbon.

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APPENDIX B

CATALOG AND PHOTOGRAPHIC DOCUMENTATION OF LARRY LEVIN PRIVATE ARTIFACT COLLECTION FROM SITES 21KH36, 21KH93, AND OTHER KANDIYOHI COUNTY SITES

Electronic Appendix on Compact Disk

APPENDIX C

DATA TABLES FOR CERAMIC ASSEMBLAGES ANALYZED DURING THE CURRENT STUDY

Table C1. Distribution of Ceramic Bodysherds by Size Grade, Surface Treatment, and Provenience Unit – Site 21KH36.

			Size Grade 1†		Size Grade 2†		Size Grade 3†		
Cat. No.	Provenience Unit	Level	Cord Roughened	Smooth	Cord Roughened	Smooth	Cord Roughened	Smooth	Unknown Split/ eroded
2	XU 1	10 – 20	-	-	-	-	1	-	-
24	XU 1	10 – 20	-	-	3	1	6	2	-
47	XU 4	0 – 10	-	-	1	-	2	2	-
64	XU 4	10 – 20	-	-	1	-	-	-	4
68	XU 4	20 – 30	-	-	1	-	-	-	-
79	XU 5	0 – 10	-	-	1	3*	-	2	2
105	XU 5	10 – 20	-	-	2	1	4	1*	2
144	XU 6	0 – 10	-	-	-	-	1	-	-
164	XU 6	10 – 20	-	-	-	1*	3	-	2
180	XU 6	20 – 30	-	-	1	-	2	-	-
186	XU 6	30 – 40	-	-	-	-	-	-	1
187	XU 6	30 – 40	-	-	-	-	2	-	-
198	XU 8	0 – 10	-	-	2	1*	3	1	2
225	XU 8	10 – 20	-	-	2	1*	1	-	2
256	XU 8	30 – 40	-	-	-	-	1	-	-
266	XU 9	0 – 10	-	-	-	-	2	3	1
299	XU 9	10 – 20	-	-	2	-	-	-	-
320	XU 9	20 – 30	-	-	1	-	1	-	-
336	XU 10	0 – 10	-	-	1	5	-	-	-
348	XU 10	10 – 20	-	-	3	1	3	1	1
358	XU 10	20 – 30	-	-	-	-	1	-	-
362	XU 10	30 – 40	-	-	-	-	1	1	-
374	XU 11	0 – 10	-	-	1	-	4	-	2
397	XU 11	10 – 20	1	-	3	-	4	3	-
Total			1		25	14	42	16	19

***Net Impressed.**

† Size Grades: 1 (greater than 1 inch), 2 (greater than ½ inch, less than 1 inch), 3 (greater than ¼ inch, less than ½ inch).

Table C2. Frequencies of Rimsherds by Catalog Number, Unit, Level, and Decoration Type – Site 21KH36.

			Exterior Rim Decoration Technique							Exterior Rim Surface Treatment			
Cat. No.	Unit	Level	Cordwrapped Object Impressed	Dentate Stamped	Comb Stamped	Cord Impressed	Bossing	Tool Impressed	Havanoid	Vertical Cordmarked	Horizontal Cordmarked	Prairie Village	Indeterminate
23, 24	XU 1	10-20	-	-	-	-	-	-	-	-	1	-	1
30	XU 1	20-30	-	-	-	-	-	-	-	-	-	-	1
64	XU 4	10-20	-	-	1	-	-	-	-	-	-	-	-
104	XU 5	10-20	-	-	-	-	-	-	-	-	-	1	-
105	XU 5	10-20	-	-	-	-	-	2	-	-	-	-	-
119	XU 5	20-30	-	-	-	-	-	1	-	-	-	-	-
143	XU 6	0-10	-	-	1	-	-	-	-	-	-	-	-
163	XU 6	10-20	1	-	-	-	-	-	-	-	-	-	-
225	XU 8	10-20	-	-	-	-	-	1	-	-	-	-	-
265	XU 9	0-10	-	-	-	-	-	-	-	-	-	1	-
297	XU 9	10-20	-	-	-	-	-	-	-	-	-	1	-
319	XU 9	20-30	-	-	-	-	-	-	-	-	-	1	-
345	XU 10	10-20	1	-	-	-	-	-	-	-	-	-	-
347	XU 10	10-20	-	-	-	-	-	-	1	-	-	-	-
348	XU 10	10-20	1	-	-	-	-	-	-	-	-	-	-
Total			3		1	-	-	4	1	-	1	4	2
Maximum Thickness													
N			3	-	2	-	-	7	-	-	-	-	4
Mean			5.6	-	6.2	-	-	9.8	-	-	-	-	5.3
Standard Deviation			0.96	-	0.42	-	-	0.84	-	-	-	-	1.41

Table C3. Distribution of Ceramic Bodysherds by Size Grade, Surface Treatment, and Provenience Unit – Site 21KH46.

			Size Grade 1		Size Grade 2		Size Grade 3		
Cat. No.	Provenience Unit	Level	Cord Roughened	Smooth	Cord Roughened	Smooth	Cord Roughened	Smooth	Unknown Split/ eroded
166,173	ST 1	-	-	-	-	1	6	3	-
188	ST 3	-	-	-	2	-	4	-	-
201	ST 4	-	-	-	-	1	1	3	1
7	XU 2	0 – 10	-	-	1	-	-	-	-
20	XU 2	10 – 20	-	-	1	-	-	1	-
221	XU 6	10 – 20	-	-	1	-	4	-	1
42	XU 7	0 – 10	-	-	1	-	-	1	-
52	XU 7	10 – 20	-	-	1	-	1	-	-
64	XU 11	10 – 20	-	-	3	-	6	-	5
79	XU 11	20 – 30	-	-	-	2	3	3	1
89	XU 11	30 – 40	-	-	6	4	14	2	6
102	XU 11	40 – 50	-	-	10	3	25	-	10
109	XU 11	50 – 60	-	-	1	-	8	1	6
234	XU 16	20 – 30	-	-	1	2	3	2	-
241	XU 16	30 – 40	-	-	1	1	1	-	3
249	XU 16	40 – 50	-	-	-	-	1	-	3
256	XU 16	50 – 55	-	-	-	-	1	-	-
261	XU 16	55 – 60	-	-	1	-	3	-	1
266	XU 16	60 – 65	-	-	-	-	-	-	1
269	XU 17	0 – 10	-	-	1	2	3	2	-
287	XU 17	10 – 20	-	-	5	1	5	-	-
307	XU 17	20 – 30	-	-	5	1	3	4	4
319	XU 17	30 – 40	2	-	11	2	16	3	13
328	XU 17	40 – 45	-	-	7	7	22	1	10
350,337	XU 17	45 – 50	-	-	4	-	17	3	6
366	XU 17	-	-	-	-	-	5	5	7
381	XU 17, F1	55 – 60	-	-	-	-	-	-	1
372	XU 17	55 – 60	-	-	4	1	3	3	-
351	XU 17	45 – 50	-	-	-	-	18*	-	-
112	XU 18	0 – 10	-	-	1	1	-	-	-
123	XU 18	10 – 20	-	-	1	1	3	2	-
136	XU 18	20 – 30	-	-	1	2	9	2	-
151	XU 18	30 – 40	-	1	16	1	-	-	-
156	XU 18	40 – 50	-	1	6	3	3	2	1
161	XU 18	50 – 60	-	-	-	2	2	4	-
Total			2	2	92	38	190	47	80

***Size Grades: 1 (greater than 1 inch), 2 (greater than ½ inch, less than 1 inch), 3 (greater than ¼ inch, less than ½ inch), 4 (less than ¼ inch).**

Table C4. Frequencies of Rimsherds by Catalog Number, Unit, Level, and Decoration Type – Site 21KH46.

Catalog Number	Unit	Level	Exterior Rim Decoration Technique						Exterior Rim Surface Treatment		Indeterminate
			Cordwrapped Object Impressed	Dentate Stamped	Comb Stamped	Cord Impressed	Bossing	Havanoid	Vertical Cordmarked	Horizontal Cordmarked	
187	ST 3	-	1	-	-	-	-	-	-	-	2
200	ST 4	-	1	-	-	-	-	1	-	-	1
41	XU 7	10 – 20	1	-	-	-	-	-	-	-	-
50	XU 7	10 – 20	-	-	-	1	-	-	-	-	-
51	XU 7	10 – 20	-	-	-	1	-	-	-	-	-
64	XU 11	10 – 20	-	1	-	-	-	-	-	-	1
78	XU 11	20 – 30	-	1	-	-	-	1	-	-	-
102	XU 11	40 – 50	3	-	-	-	-	-	-	-	1
219	XU 16	10 – 20	2	-	-	-	-	-	-	-	-
220	XU 16	10 – 20	-	-	-	-	-	1	-	-	-
232	XU 16	20 – 30	-	-	-	-	-	-	-	-	-
233	XU 16	20 – 30	1	-	-	-	-	1	-	-	2
240	XU 16	30 – 40	1	-	-	-	-	-	-	-	-
248	XU 16	40 – 45	-	-	-	-	-		1	-	-
269	XU 17	0 – 10	-	-	-	-	-	1	-	-	-
286	XU 17	10 - 20	-	-	-	-	-	-	-	-	1
287	XU 17	10 – 20	1	-	-	-	-	-	-	-	-
304	XU 17	20 – 30	-	-	-	-	-	-	-	-	1
305	XU 17	20 – 30	-	3	-	-	-	-	-	-	-
317	XU 17	30 – 40	1	-	-	-	-	-	-	-	1
318	XU 17	30 – 40	-	-	-	1	-	-	-	-	1
328	XU 17	40 – 45	-	-	-	-	-	-	-	-	1
337	XU 17	45 – 50	-	-	1	-	-	-	-	-	-
350	XU 17	45 – 50	-	1	-	-	-	-	-	-	-
365	XU 17	50 – 55	-	-	-	-	-	-	-	-	1
366	XU 17	50 – 55	1	-	-	-	-	-	-	-	-
392	XU 17	60 – 65	-	-	-	-	-	-	-	-	1
112	XU 18	0 – 10	-	-	-	-	-	1	-	-	
122	XU 18	10 – 20	1	-	-	-	-	-	-	-	1
150	XU 18	20 – 30	-	-	-	-	-	1	-	-	-
151	XU 18	30 – 40	-	3	-	-	-	1	-	-	-
155	XU 18	40 – 50	-	-	-	-	-	-	-	-	1
156	XU 16	40 – 50	1	-	-	-	-	-	-	-	-
160	XU 18	50 – 60	-	-	-	-	-	-	-	1	-
161	XU 18	50 – 60	-	-	-	-	-	1	-	1	-
Total			15	9	1	3	0	9	1	2	16
Percent			37.5	22.5	2.5	7.5	0.0	22.5	2.5	5.0	-
Vertical Distribution											
0 – 10 cm			-	-	-	-	-	2	-	-	
10 – 20 cm			4	1	-	2	-	1	-	-	
20 – 30 cm			1	4	-	-	-	3	-	-	
30 – 40 cm			2	3	-	1	-	1	-	-	
40 – 50 cm			4	1	1	-	-	-	1	-	
50 – 60 cm			1	-	-	-		1	-	2	
Maximum Thickness											
N			18	8	1	3	-	7	-	2	10
Mean			5.5	7.2	6.1	7.5	-	8.9	-	4.2	5,6
Standard Deviation			1.14	1.15	-	1.35	-	1.63	-	0.07	1.50

Table C5. Distribution of Ceramic Bodysherds by Size Grade, Surface Treatment, and Provenience Unit – Site 21KH93.

			Size Grade 1*		Size Grade 2*		Size Grade 3*		
Cat. No.	Provenience Unit	Level	Cord Roughened	Smooth	Cord Roughened	Smooth	Cord Roughened	Smooth	Unknown Split/ eroded
9,14,21	ST 1	0 – 30	-	-	1	-	5	1	3
2,10	ST 2	0 – 40	-	-	-	-	1	1	-
22,28	ST 3	0 – 30	-	-	-	-	2	1	-
35	ST 5	0 – 20	-	-	1	-	1	-	9
31	XU 1	20 – 30	-	-	1	-	5	-	-
48	XU 2	0 – 10	-	-	-	-	1	2	-
54	XU 2	10 – 20	-	-	1	-	6	-	1
59	XU 2	20 – 30	-	-	-	1	4	-	1
64	XU 2	30 – 40	-	-	-	-	3	-	-
71,77	XU 3	0 – 10	-	-	1	1	4	2	4
87	XU 3	10 – 20	-	-	1	-	-	2	2
97	XU 3	20 – 30	-	-	1	-	5	1	7
109	XU 3	30 – 40	-	-	-	-	1	1	1
37	XU 4	10 – 15	-	-	3	5	21	3	12
33	XU 4	10 – 20	-	-	1	-	-	-	1
50,52-55	XU 4	15 – 20	-	1		3	2	5	6
63	XU 4	20 – 30	-	-	-		1	1	-
65	XU 5	0 – 10	-	-	2	-	-	-	-
70,71	XU 5	10 – 20	-	-	2	3	4	-	-
68	XU 5	10 – 15	-	-	3	2	7	2	8
77	XU 5	15 – 20	-	-	2	-	3	4	3
120	XU 6	10 – 20	-	-	1	-	-	1	-
127	XU 6	20 – 30	-	-	1	1	4	-	3
135	XU 6	30 – 40	-	-	-	-	2	-	-
85	XU 7	15 – 20	-	-	-	-	1	-	-
103	XU 7	10 – 20	2	-	2	-	2	2	2
97	XU 8	10 – 20	-	-	1	-	9	3	4
149	XU 8	10 – 20	-	-	1	-	3	1	-
161	XU 8	20 – 25	-	-	-	1	4	1	-
178	XU 8	25	-	-	-	-	1	-	-
168	XU 8	25 – 30	-	-	1	-	-	-	-
172	XU 8	30 – 40	-	-	-	-	2	-	-
201	XU 9	10 – 20	-	-	8	3	13	4	2
209	XU 9	20 – 30	-	-	13	5	18	7	5
233	XU 9	10 – 20	-	-	8	5	16	5	11
Total			2	1	56	30	151	50	85

*** Size Grades: 1 (greater than 1 inch), 2 (greater than ½ inch, less than 1 inch), 3 (greater than ¼ inch, less than ½ inch).**

Table C6. Frequencies of Rimsherds by Catalog Number, Unit, Level, and Decoration Type – Site 21KH93.

			Exterior Rim Decoration Technique							Exterior Rim Surface Treatment			
Catalog Number	Unit	Level	Cordwrapped Object Impressed	Dentate Stamped	Comb Stamped	Cord Impressed	Bossing	Tool Impressed	Havanoid	Vertical Cordmarked	Horizontal Cordmarked	Prairie Village	Indeterminate
35, 40-41	ST 5	-	-	3	-	3	-	-	-	-	-	-	-
64	XU 2	30 – 40	-	-	1	1	-	-	-	-	-	-	-
48	XU 2	10 – 20	-	1	1	-	-	-	-	-	-	-	-
70	XU 3	0 – 10	-	-	1	1	-	-	-	-	-	-	-
86	XU 3	10 – 20	-	-	-	-	-	-	-	-	-	1	-
96	XU 3	20 – 30	-	-	1	1	-	-	-	-	-	-	-
127	XU 6	20 – 30	1	-	-	-	-	-	-	-	-	-	-
135	XU 6	30 – 40	-	-	-	-	-	-	-	-	-	-	1
8	ST 1	-	-	-	-	-	-	-	-	-	1	-	-
50	XU 4	15 – 20	1	-	-	-	-	-	-	1	-	-	-
37	XU 4	10 – 15	-	-	2	-	-	-	-	-	-	-	-
68	XU 5	-	-	1	1	-	-	-	-	-	-	-	-
200	XU 9	10 – 20	-	-	-	1	-	-	-	-	-	-	-
233	XU 10	10 – 20	-	1	-	-	1	-	3	-	-	-	-
232	XU 10	10 – 20	-	-	-	-	-	-	1	-	-	-	-
231	XU 10	10 – 20	-	-	-	-	-	-	-	-	-	1	-
230	XU 10	10 – 20	-	-	-	-	-	-	1	-	-	-	-
229	XU 10	10 – 20	-	-	-	-	-	-	-	-	1	-	-
209	XU 9	20 – 30	-	1	-	1	-	-	1	-	-	-	-
Total			2	7	7	8	1	0	6	1	2	2	1
Percent			5.9	20.6	20.6	23.5	2.9	0.0	17.6	2.9	5.9	-	-
Vertical Distribution													
0 – 10 cm			-	-	1	1	-		-	-	-	-	-
10 – 20 cm			1	2	3	1	1		5	1	-	1	-
20 – 30 cm			1	-	1	2	-		1	-	-	-	-
30 – 40 cm			-	-	1	1	-		-	-	-	-	1
Maximum Thickness													
N			3	5	6	2	1	-	7	1	2	-	1
Mean			5.3	6.8	5.5	6.9	7.3	-	8.0	4.8	6.7	-	4.6
Standard Deviation			1.04	0.80	1.78	0.28	-	-	0.81	-	0.42	-	-

Table C7. Frequency of Ceramic Rimsherd Types for 10 Sites by Decoration Area, Rim Decoration Technique, Rim Decoration Motif, and Lip Decoration Technique (CWOI=Cordwrapped Object Impressed; DS=Dentate Stamped).

Ceramic Type/Exterior Rim Decoration Technique/Main Exterior Rim Decoration Motif/Lip Decoration Technique/Interior Rim Decoration Technique	Complete Rimsherds										Fragmentary Rimsherds									
	21BS22/51	21BS23	21KH93	21KH36	21ME1	21ME1-B	21SN5/6	21ME23	21WR17	21ML11	21BS22/51	21BS23	21KH93	21KH36	21ME1	21ME2 3	21SN5/6	21ME23	21WR17	21ML11
Onamia Series																				
Onamia Cordwrapped Stick Impressed	7	3	56	10	17	10	14	-	8	109	10	1	63	21	93	14	18	6	1	-
Exterior Rim																				
Horizontal CWOI	1	-	5	2	4	-	-	-	1	6	6	-	38	16	69	6	9	3	1	-
Lip CWOI	-	1	2	-	-	-	1	-	1	4	-	-	-	-	-	-	-	-	-	-
Interior CWOI	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Punctates above	-	-	1	-	-	-	-	-	-	-	-	-	-	-	3	-	2	-	-	-
Punctates below	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	1	1	-	1	-	-	-	-	7	-	-	-	-	7	-	-	-	-	-
Diagonal over Horizontal CWOI	-	-	2	1	-	-	-	-	-	4	-	-	11	1	7	-	-	-	-	-
Lip CWOI	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	2	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Punctates above	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip CWOI	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Punctates below	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Bosses	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Interior CWOI	-	1	3	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Punctates above	-	-	-	-	-	2	-	-	-	9	-	-	-	-	-	-	-	-	-	-
Vertical over Horizontal CWOI	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-
Lip CWOI	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	1	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-
Diagonal CWOI	-	-	12	2	1	-	3	-	1	11	-	-	7	3	5	1	3	-	-	-
Lip CWOI	-	-	-	-	-	-	1	-	-	2	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-	-	-	-	-
Punctates above	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Punctates below	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Bosses	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Short CWOI below	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Interior CWOI	1	-	7	1	1	-	-	-	-	31	-	-	-	-	2	-	-	-	-	-
Vertical CWOI	-	-	4	3	-	-	1	-	1	2	-	-	4	-	2	2	3	-	-	-
Lip CWOI	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-
Tool impressions-upper rim	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip CWOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	-	-	-	-	-	-	-	6	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior lip-rim tool impressed	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-

Table C7 (continued).

Ceramic Type/Exterior Rim Decoration Technique/Main Exterior Rim Decoration Motif/Lip Decoration Technique/Interior Rim Decoration Technique	Complete Rimsherds										Fragmentary Rimsherds									
	21BS22/51	21BS23	21KH93	21KH36	21ME1	21ME1-B	21SN5/6	21ME23	21WR17	21ML11	21BS22/51	21BS23	21KH93	21KH36	21ME1	21ME2 3	21SN5/6	21ME23	21WR17	21ML11
Horizontal over Diagonal CWOI	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Lip CWOI	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Punctates above	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip CWOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Horizontal between Diagonal CWOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Diagonal over Vertical CWOI	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Short Diagonal or Vertical CWOI – upper rim	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Lip CWOI	1	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip CWOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Exterior Rim Undecorated	-	-	1	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-
Lip CWOI	2	-	-	-	2	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	1	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-
Interior Rim	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diagonal CWOI	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	1	1	3	-	-	-	-	5	-	-	-	-	-	1	-	-	-	-
Diagonal CWOI	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	2	-	-	-	-
Punctate	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vertical CWOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-
Diagonal over Horizontal CWOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Vertical over diagonal CWOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior Rim	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-
Onamia Dentate	12	5	11	3	5	-	9	-	1	5	12	3	43	12	24	6	2	4	1	-
Exterior Rim																				
Horizontal DS	2	1	2	1			2		1		7	3	31	8	22	6	1	1	1	
Tool impressed lip	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Punctates	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CWOI below	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Tool impressed above	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tool impressed interior rim	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boss	-	1	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Lip CWOI	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior DS	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Lip DS	3	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diagonal DS	1	-	1	2	-	-	-	-	-	-	-	-	3	2	-	-	1	1	-	-
Lip DS	3	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior DS	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior DS	-	-	2	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-

Table C7 (continued).

Ceramic Type/Exterior Rim Decoration Technique/Main Exterior Rim Decoration Motif/Lip Decoration Technique/Interior Rim Decoration Technique	Complete Rimsherds										Fragmentary Rimsherds									
	21BS22/51	21BS23	21KH93	21KH36	21ME1	21ME1-B	21SN5/6	21ME23	21WR17	21ML11	21BS22/51	21BS23	21KH93	21KH36	21ME1	21ME2 3	21SN5/6	21ME23	21WR17	21ML11
Horizontal over short diagonal DS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Diagonal over Vertical DS	-	-	1	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-
Diagonal over horizontal DS	2	-	-	-	-	-	-	-	-	-	4	-	-	-	3	-	-	-	-	-
Lip tool impressed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior DS	1																			
Vertical DS	-	-	1	-	-	-	3	-	-	-	-	-	-	1	-	-	-	-	-	-
Boss/Punctate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior DS	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Horizontal/Diagonal DS	-	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-
Vertical over Horizontal DS	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Interior DS	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vertical over diagonal DS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior DS	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Undecorated Exterior Rim																				
Lip DS	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C8. Frequency of Ceramic Rimsherd Types for 10 Sites by Decoration Area, Rim Decoration Technique, Rim Decoration Motif, and Lip Decoration Technique (CWOI = Cordwrapped Object Impressed).

	Complete Rimsherds										Rimsherd Fragments									
Ceramic Type/Exterior Rim Decoration Technique/Main Exterior Rim Decoration Motif/Lip Decoration Technique/Interior Rim Decoration Technique	21BS22/51	21BS23	21KH93	21KH36	21ME1	21ME1-B	21SN5/6	21ME23	21WR17	21ML11	21BS22/51	21BS23	21KH93	21KH36	21ME1	21ME1-B	21SN5/6	21ME23	21WR17	21ML11
Kathio Series	25	11	42	19	26	18	28	1	8	66	17	2	42	25	87	8	13	8	3	-
Cord wrapped stick impressed																				
Exterior Rim																				
Horizontal CWOI	1	-	2	1	2	1	2	-	-	2	9	-	24	19	68	7	5	5	1	-
Lip tool impressed	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip CWOI	2	1	1	2	2	1	1	-	-	5	-	-	-	-	-	-	-	-	-	
Interior CWOI	-	-	-	-	3	2	1	-	1	3	-	-	-	-	-	-	-	-	-	-
Punctates above	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior Cord Impressed	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip Tool Impressed	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Punctates above	-	-	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip CWOI	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Punctates below	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-
Tool impressions-upper rim	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Short diagonal CWOI below	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	1	-	1	-	1	-	1	4	-	-	-	-	-	-	-	-	-	-
Discontinuous horizontal rows CWOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip CWOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
Diagonal over Horizontal CWOI	1	-	2	1	3	1	2	-	1	5	1	-	1	-	6	-	-	-	1	-
Lip CWOI	-	-	-	3	-	1	2	-	-	10	-	-	-	-	-	-	-	-	-	-
Interior CWOI	1	-	-	-	-	2	-	-	-	16	-	-	-	-	-	-	-	-	-	-
Punctates between diagonal and horizontal	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tool impressions-upper rim	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Interior CWOI	1	-	2	-	-	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-
Vertical over Horizontal CWOI	-	-	-	1	1	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-
Lip CWOI	-	-	-	-	-	-	1	-	-	4	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	1	-	-	-	-	-	-	11	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	3	-	2	-	-	-	-	7	-	-	-	-	-	-	-	-	-	-
Horizontal over/bounding triangular plats CWOI	-	-	1	-	-	-	1	-	-	-	0	-	3	-	-	-	2	-	-	-
Lip CWOI	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Tool impressions-upper and lower rim	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tool impressions-upper rim	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Horizontal over/bounding filled/open Triangles CWOI	-	-	-	-	-	-	-	-	-	-	1	-	-	-	2	-	1	-	-	-
Punctates below	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Horizontal bounding diagonals CWOI	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip CWOI	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cord impressions below diagonals	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C8 (continued).

Ceramic Type/Exterior Rim Decoration Technique/Main Exterior Rim Decoration Motif/Lip Decoration Technique/Interior Rim Decoration Technique	Complete Rimsherds										Rimsherd Fragments									
	21BS22/51	21BS23	21KH93	21KH36	21ME1	21ME1-B	21SN5/6	21ME23	21WR17	21ML11	21BS22/51	21BS23	21KH93	21KH36	21ME1	21ME1-B	21SN5/6	21ME23	21WR17	21ML11
Diagonal or Vertical CWOI	2	-	5	4	2	2	1	-	1	-	4	-	11	6	10	-	3	3	1	-
Interior lip-rim tool impressed	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip tool impressed	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Lip CWOI	1	-	-	-	2	1	-	-	-	10	-	-	-	-	-	-	-	-	-	-
Interior CWOI	9	3	-	-	-	-	-	-	-	6	-	1	-	-	-	-	-	-	-	-
Punctates below	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Punctates above	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip CWOI	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Punctates below	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip CWOI	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Interior CWOI	1	-	3	1	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-
Vertical over diagonal CWOI	-	-	-	2	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Other Complex Horizontal, Vertical or Vertical Mixes CWOI	-	-	1	-	-	-	-	-	-	-	2	1	1	-	-	-	1	-	-	-
Lip CWOI	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	1	1	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
Interior tool impressed	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Horizontal over diagonal CWOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Punctates above	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Diagonals bounding horizontal CWOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip CWOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-
Short Diagonal or Vertical CWOI – upper rim	-	-	1	2	-	-	1	-	-	3	-	-	-	-	-	-	-	-	-	-
Lip CWOI	-	-	-	-	-	-	2	-	-	12	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	-	-	-	1	-	-	-	5	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	-	-	-	-	-	-	-	7	-	-	-	-	-	-	-	-	-	-
Exterior Rim Undecorated	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	-	1	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
Lip CWOI	2	2	2	-	3	2	6	-	-	23	-	-	1	-	-	-	-	-	-	-
Interior CWOI	2	3	1	-	2	1	1	-	-	3	-	-	-	-	-	-	-	-	-	-

Table C9. Frequency of Ceramic Rimsherd Types for 10 Sites by Decoration Area, Rim Decoration Technique, Rim Decoration Motif, and Lip Decoration Technique (DS=Dentate Stamped, CWOI=Cordwrapped Object Impressed; TI=Tool Impressed).

Ceramic Type/Exterior Rim Decoration Technique/Main Exterior Rim Decoration Motif/Lip Decoration Technique/Interior Rim Decoration Technique	Complete Rimsherds										Fragmentary Rimsherds									
	21BS22/51	21BS23	21KI93	21KH36	21ME1	21ME1-B	21SN5/6	21ME23	21LN2	21ML11	21BS22/51	21BS23	21KI93	21KH36	21ME1	21ME1-B	21SN5/6	21ME23	21LN2	21ML11
FOX LAKE COMPLEX	3	1	11	4	-	-	3		-	-	-	-	19	8	22	4	2	3	-	-
Fox Lake Cordwrapped Stick (horizontal cordmarked)	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Exterior Rim Decorated	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Horizontal CWOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Punctates	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vertical/Diagonal CWOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diagonal CWOI, Boss & Interior Rim CWOI	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Fox Lake Smooth	1	-	-	2	-	-	2	-	26	-	-	-	1	-	-	-	-	-	5	-
Undecorated	-	-	-	-	-	-	1	-	15	-	-	-	-	-	-	-	-	-	-	-
Exterior Rim Decorated	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diagonal CWOI & Boss	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Diagonal CWOI, Boss & Interior Rim Trailed	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	3	-
Boss	-	-	-	2	-	-	-	-	3	-	-	-	1	-	-	-	-	-	-	-
Punctate	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	2	-
Punctate and CWOI	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Interior Rim CWOI	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Lip TI	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip TI & Boss	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Fox Lake Vertical Cordmarked	1	1	7	-	-	-	-	-	13	-	-	-	1	-	-	-	-	-	1	-
Exterior Rim Undecorated	-	1	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Boss	1	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
Interior Rim CWOI	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-
Interior Rim Trailed	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Exterior Rim Decorated	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boss	-	-	2	-	-	-	-	-	2	-	-	-	1	-	-	-	-	-	-	-
Lip TI	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Interior Rim CWOI	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-
Fox Lake Horizontal Cordmarked	-	-	5	1	-	-	-	-	14	-	-	-	-	-	-	-	-	-	2	-
Exterior Rim Decorated	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Punctates	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Boss	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-
Punctates & Interior Rim CWOI	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Boss & Interior Rim CWOI	-	-	2	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
Exterior Rim Undecorated	-	-	3	-	-	-	-	-	7	-	-	-	-	-	-	-	-	-	1	-
Interior Rim Trailed	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-

Table C9 (continued).

Ceramic Type/Exterior Rim Decoration Technique/Main Exterior Rim Decoration Motif/Lip Decoration Technique/Interior Rim Decoration Technique	Complete Rimsherds										Fragmentary Rimsherds									
	21BS22/51	21BS23	21KH93	21KH36	21ME1	21ME1-B	21SN5/6	21ME23	21LN2	21ML11	21BS22/51	21BS23	21KH93	21KH36	21ME1	21ME1-B	21SN5/6	21ME23	21LN2	21ML11
Fox Lake Trailed	1	-	1	1	-	-	1	-	23	-	-	-	17	8	22	4	2	3	3	-
Exterior Rim Decorated	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trailed	-	-	-	-	-	-	-	-	-	-	-	-	15	7	21	3	2	3	5	-
Interior Rim CWOS	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-
Lip TI	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Trailed & CWOI	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	1	-
Interior Rim CWOI	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip TI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Trailed/Boss	1	-	-	-	-	-	1	-	-	-	-	-	1	-	1	-	-	-	-	-
CWOI	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	
Interior Rim CWOI	-	-	-	-	-	-	-	-	11	-	-	-	-	-	-	-	-	-	2	-
Interior Rim Trailed	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-
Lip TI	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Trailed/Punctate	-	-	-	1	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-

Table C10. Frequency of Ceramic Rimsherd Types for 10 Sites by Decoration Area, Rim Decoration Technique, Rim Decoration Motif, and Lip Decoration Technique.

Ceramic Type/Exterior Rim Decoration Technique/Main Exterior Rim Decoration Motif/Lip Decoration Technique/ Interior Rim Decoration Technique	Complete Rimsherds										Fragmentary Rimsherds									
	21BS22/51	21BS23	21KH93	21KH36	21ME1	21ME1-B	21SN5/6	21ME23	21WR17	21ML11	21BS22/51	21BS23	21KH93	21KH36	21ME1	21ME1-B	21SN5/6	21ME23	21WR17	21ML11
Havanoid	2	1	11	1	2	6	10	-	1	-	1	-	6	1	9	4	15	-	-	-
Exterior Rim																				
Dentate Stamped																				
Diagonal/Vertical/Horizontal	1	-	3	-	1	-	5	-	-	-	-	-	6	-	2	1	8	-	-	-
Lip DS	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior Rim DS	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior rim Tool Impressed	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bosses	-	-	3	-	-	-	-	-	-	-	-	-	-	1	2	-	-	-	-	-
Rim interior DS	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Punctates	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior lip-rim tool impressions	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diagonal/Vertical/Horizontal Zoned	-	-	1	-	-	-	3	-	-	-	-	-	-	-	4	3	7	-	-	-
Lip – Cordwrapped stick impressed	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rim interior DS	1	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Bosses	-	-	1	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Rim interior incisions	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bosses and Punctates	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bosses	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rim interior DS	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CWOI	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-
Malmo/Kern Series	-	-	4	1	1	2	-	-	1	37	-	-	1	-	-	-	-	-	-	-
Exterior Rim	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Slashes/Incisions	-	-	2	-	-	1	-	-	1	7	-	-	-	-	-	-	-	-	-	-
Punctates	-	-	1	-	-	-	-	-	-	6	-	-	-	-	-	-	-	-	-	-
Interior Rim Punctates	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Bosses	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
CWOI	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
Undecorated	-	-	-	-	-	-	-	-	-	20	-	-	-	-	-	-	-	-	-	-
Slashes and Bosses	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Slashes, Bosses and Punctates	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Slashes interior rim	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Slashes and Punctates	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pokegama Smooth	2	2	5	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exterior Rim																				
Punctates	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bosses	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Undecorated	2	2	4	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Snake River Incised (Smooth Exterior)	-	-	-	-	2	2	-	-	-	2	-	-	-	-	-	-	-	-	-	-
Exterior Rim																				
Incised	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Interior incised	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Punctate	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Incised	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior lip-rim incised	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-

Table C11. Frequency of Ceramic Rimsherd Types for 10 Sites by Decoration Area, Rim Decoration Technique, Rim Decoration Motif, and Lip Decoration Technique (CWOI=Cordwrapped Object Impressed; DS=Dentate Stamped; CS=Comb Stamped; TI=Tool Impressed).

	Complete Rimsherds										Fragmentary Rimsherds									
Ceramic Type/Exterior Rim Decoration Technique/Main Exterior Rim Decoration Motif/Lip Decoration Technique/Interior Rim Decoration Technique	21BS22/51	21BS23	21KH93	21KH36	21ME1	21ME1-B	21SN5/6	21LN2	21WR17	21ML11	21BS22/51	21BS23	21KH93	21KH36	21ME1	21ME1-B	21SN5/6	21LN2	21WR17	21ML11
LAKE BENTON COMPLEX	1	-	23	6	-	-	12	132	-	-	-	-	-	-	-	-	-	11	-	-
Lake Benton Cordwrapped Stick Impressed	-	-	1	-	-	-	-	19	-	-	-	-	-	-	-	-	-	-	-	-
Exterior Rim Decorated	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Horizontal CWOI	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-
Diagonal CWOI	-	-	-	-	-	-	-	8	-	-	-	-	-	-	-	-	-	3	-	-
Punctates	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Vertical CWOI	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diagonal over Horizontal CWOI	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Diagonal over Vertical CWOI	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-
Diagonal over Horizontal over Diagonal CWOI	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
Diagonal between Horizontals	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Lake Benton Dentate	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-
Exterior Rim Decorated	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Horizontal DS	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Punctates	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TI Interior Lip-Rim	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
DS Interior Rim	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Diagonal DS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Punctates	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Diagonal CS	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Lake Benton Vertical Cordmarked	-	3	15	3	1	3	13	46	1	-	-	-	-	-	-	-	-	5	-	-
Exterior Rim Undecorated	1	3	11	3	1	3	13	41	1	-	-	-	-	-	-	-	-	5	-	-
Interior Rim CWOI	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
Lip CWOI	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Interior Rim CWOI	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Interior Rim CS	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Exterior Rim Decorated	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Punctates	-	-	4	-	-	-	1	-	1	-	-	-	-	-	-	3	-	-	-	-
Lake Benton Horizontal Cordmarked	-	-	7	5	-	-	1	18	-	-	-	-	-	-	-	-	-	-	-	-
Exterior Rim Undecorated	-	-	7	5	-	-	1	15	-	-	-	-	-	-	-	-	-	-	-	-
Lip TI	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
Exterior Rim Decorated	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Punctates	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Lake Benton Plain	-	-	-	-	-	-	-	44	-	-	-	-	-	-	-	-	-	3	-	-
Exterior Rim Undecorated	-	-	-	-	-	-	-	30	-	-	-	-	-	-	-	-	-	3	-	-
Interior Rim CWOI	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
Lip CWOI	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Lip TI	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-
Interior Lip-Rim TI	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
Exterior Rim Decorated	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TI Upper Rim	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-
TI Mid Rim	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-

Table C12. Frequency of Ceramic Rimsherd Types for 10 Sites by Decoration Area, Rim Decoration Technique, Rim Decoration Motif, and Lip Decoration Technique (DS=Dentate Stamped, CWOI=Cordwrapped Object Impressed; CS=Comb Stamped).

	Complete Rimsherds										Fragmentary Rimsherds									
Ceramic Type/Exterior Rim Decoration Technique/Main Exterior Rim Decoration Motif/Lip Decoration Technique/Interior Rim Decoration Technique	21BS22/51	21BS23	21KH93	21KH36	21ME1	21ME1-B	21SN5/6	21ME23	21WR17	21ML11	21BS22/51	21BS23	21KH93	21KH36	21ME1	21ME1-B	21SN5/6	21ME23	21WR17	21ML11
ST. CROIX STAMPED SERIES																				
Dentate Stamp Variety	10	4	13	5	13	3	10	1	2	21	16	8	31	7	117	17	13	-	-	-
Exterior Rim	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Horizontal DS	-	-	-	-	1	-	2	-	-	1	11	7	20	7	97	10	10	-	-	-
Lip DS	2	2	-	1	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-
Lip tool impressed	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Punctate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-
Interior DS	-	-	-	-	2	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-
Lip tool impressed	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upper rim tool impressed	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Short DS upper rim	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upper rim tool impressed	-	-	-	1	-	1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior tool impressed	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upper rim CWOI	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-
Lip CWOI	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Diagonal DS	1	-	2	1	1	-	-	-	-	-	-	1	4	-	5	1	1	-	-	-
Lip DS	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior DS	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boss	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior DS	-	-	-	-	3	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
Vertical DS	-	-	-	-	-	-	2	-	-	-	1	-	-	-	-	2	-	-	-	-
Lip DS	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior DS	-	-	-	1	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Horizontal trailed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Diagonal over Horizontal	1	-	1	1	-	-	2	-	-	-	1	-	5	-	6	1	1	-	-	-
Lip DS	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior DS	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior DS	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boss	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior DS	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Vertical over Horizontal DS	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Horizontal over Diagonal DS	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	2	-	-	-	-
Lip DS	-	-	-	-	1	-	-	-	-	1	-	-	-	-	2	-	-	-	-	-
Interior DS	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Lip tool impressed	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--
Horizontal over Vertical DS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip DS	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Boss	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vertical over Diagonal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior tool impressed	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Horizontal embedded with X-hatch, diag., or vert. DS	-	-	-	-	-	-	-	-	-	-	2	-	1	-	2	-	1	-	-	-
Lip DS	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
Interior DS	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Cross hatched DS	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-

Table C12 (continued).

Ceramic Type/Exterior Rim Decoration Technique/Main Exterior Rim Decoration Motif/Lip Decoration Technique/Interior Rim Decoration Technique	Complete Rimsherds										Fragmentary Rimsherds									
	21BS22/51	21BS23	21KH93	21KH36	21ME1	21ME1-B	21SN5/6	21ME23	21WR17	21ML11	21BS22/51	21BS23	21KH93	21KH36	21ME1	21ME1-B	21SN5/6	21ME23	21WR17	21ML11
Exterior Rim Undecorated	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip DS	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Comb Stamped Variety	1	2	17	4	3	1	4	2	1	1	7	2	21	24	43	6	7	3	2	0
Exterior Rim	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Horizontal CS	-	2	1	1	1	-	3	-	1	-	5	-	20	19	34	4	7	1	2	-
Punctate	-	-	-	-	-	-	1	-	-	-	-	-	-	-	4	-	-	-	-	-
Lip CS	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior CS	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diagonal CS	-	-	3	2	-	1	-	2	-	-	-	2	-	4	4	-	-	2	-	-
Lip CS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior CS	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Interior CS	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Vertical CS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Diagonal over Horizontal CS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Punctate	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior CS	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Horizontal over Diagonal CS	1	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
Vertical bounded by horizontal CS	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exterior Rim Undecorated	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip CS	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Punctate	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior CS	-	-	3	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-

Table C13. Frequency of Ceramic Rimsherd Types for 10 Sites by Decoration Area, Rim Decoration Technique, Rim Decoration Motif, and Lip Decoration Technique (CWOI=Cordwrapped Object Impressed).

	Complete Rimsherds										Fragmentary Rimsherds									
Ceramic Type/Exterior Rim Decoration Technique/Main Exterior Rim Decoration Motif/Interior Rim Decoration Technique/Lip Decoration Technique	21BS22/51	21BS23	21KH93	21KH36	21ME1	21ME1-B	21SN5/6	21ME23	21WR17	21ML11	21BS22/51	21BS23	21KH93	21KH36	21ME1	21ME1-B	21SN5/6	21ME23	21LN2	21ML11
Clam River Ware	8	2	61	10	6	-	5	3	1	3	-	1	39	13	14	5	1	3	1	-
Exterior Rim																				
Horizontal	-	-	6	4	1	-	-	1	1	-	-	-	23	9	14	5	-	3	1	-
Lip tool impressed	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Interior Rim cord impressions	1	-	6	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diagonal/Vertical tool impressions above	-	-	4	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Interior Rim cord impressions	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tool impressions above	-	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tool impressions above and below	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
CWOI above	2	-	1	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
CWOI below	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Short cord impressions above	2	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior rim cord impressions	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior Rim CWOI	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip CWOI	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior rim tool impressions	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Punctates below	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Triangular Plats	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diagonal/Vertical tool impressions above	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Curved over horizontal					1															
Diagonals One Direction	1	-	-	-	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-	-
Diagonal/Vertical tool impressions above	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip tool impressions	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cord impressed interior	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-
Diagonals in more than one direction (chevrons)	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diagonal/Vertical tool impressions above	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior Rim cord impressions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip cord impressed	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Horizontal bounding Triangular Plats	-	-	1	-	-	-	-	-	-	-	-	-	7	-	-	-	-	-	-	-
Diagonal/Vertical tool impressions above	-	-	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Short cord impressions above	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior rim cord impressions	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Horizontal bounding Filled/Open Triangles	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diagonal/Vertical tool impressions above	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip tool impressed	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip cord impressed	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Horizontal bounding Diagonals	1	-	2	-	-	-	-	-	-	-	-	-	6	4	-	-	-	-	-	-
Diagonal/Vertical tool impressions above	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior Rim cord impressions	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip tool impressed	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Short cord impressions above	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diagonal over Horizontal	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Vertical over horizontal	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-
Lip cord impressed	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C13 (continued).

Ceramic Type/Exterior Rim Decoration Technique/Main Exterior Rim Decoration Motif/Interior Rim Decoration Technique/Lip Decoration Technique	Complete Rimsherds										Fragmentary Rimsherds									
	21BS22/51	21BS23	21KH193	21KH136	21ME1	21ME1-B	21SN5/6	21ME23	21WR17	21ML11	21BS22/51	21BS23	21KH193	21KH136	21ME1	21ME1-B	21SN5/6	21ME23	21LN2	21ML11
Vertical	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Cross-hatched	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-

Table C14. Frequency of Ceramic Late Woodland Cordwrapped Object Impressed Rimsherd Types for Eight Sites by Decoration Area, Rim Decoration Technique, Rim Decoration Motif, and Lip Decoration Technique (CWOI=Cordwrapped Object Impressed; TI=Tool Impressed).

Exterior Rim Decoration Motif/Lip Decoration Technique/Interior Rim Decoration Technique	21BS22/51		21KH93		21KH36		21ME1		21ME1-B		21SN5/6		21ML11		21LN2	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Exterior Rim Decoration																
Horizontal CWOI	2	6.3	7	7.1	3	10.3	6	14.0	1	3.8	2	5.4	8	3.0	3	12.0
Lip CWOI	2	6.3	3	3.1	2	6.9	2	4.7	1	3.8	2	5.4	9	3.3	-	-
Interior CWOI	1	3.1	2	2.0	-	-	3	7.0	2	7.7	1	2.7	3	1.1	-	-
Punctates above	-	-	1	1.0	-	-	-	-	1	3.8	-	-	-	-	-	-
Punctates below	-	-	1	1.0	-	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	-	-	-	-	-	-	1	3.8	-	-	-	-	-	-
Interior CWOI	-	-	2	2.0	-	-	2	4.7	-	-	1	2.7	11	4.1	-	-
Diagonal over Horizontal CWOI	1	3.1	4	4.1	2	6.9	3	7.0	1	3.8	2	5.4	9	3.3	1	4.0
Lip CWOI	-	-	-	-	3	10.3	1	2.3	1	3.8	-	-	10	3.7	-	-
Interior CWOI	1	3.1	2	2.0	-	-	-	-	2	7.7	1	2.7	16	5.9	-	-
Punctates above	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip CWOI	-	-	-	-	-	-	-	-	-	-	1	2.7	-	-	-	-
Punctates below	-	-	1	1.0	-	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	1	3.1	5	5.1	-	-	-	-	1	3.8	2	5.4	8	3.0	-	-
Punctates above	-	-	-	-	-	-	-	-	-	-	-	-	9	3.3	-	-
Diagonal over Vertical CWOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	12.0
Vertical over Horizontal CWOI	-	-	-	-	1	3.4	1	2.3	-	-	1	2.7	-	-	-	-
Lip CWOI	-	-	-	-	-	-	-	-	-	-	2	5.4	4	1.5	-	-
Interior CWOI	-	-	2	2.0	-	-	-	-	-	-	-	-	11	4.1	-	-
Interior CWOI	-	-	4	4.1	-	-	2	4.7	-	-	-	-	10	3.7	-	-
Vertical over diagonal CWOI	-	-	-	-	2	6.9	-	-	-	-	-	-	-	-	-	-
Interior Rim	-	-	-	-	-	-	-	-	-	-	-	-	3	1.1	-	-
Diagonal or Vertical CWOI	2	6.3	21	21.4	9	31.0	3	7.0	2	7.7	5	13.5	13	4.8	8	32.0
Interior lip-rim TI	-	-	1	1.0	-	-	-	-	1	3.8	-	-	-	-	-	-
Lip TI	-	-	-	-	-	-	-	-	-	-	-	-	1	0.4	-	-
Lip CWOI	1	3.1	-	-	-	-	2	4.7	3	11.5	1	2.7	12	4.5	-	-
Interior CWOI	9	28.1	-	-	-	-	-	-	-	-	-	-	12	4.5	-	-
Punctates below	-	-	1	1.0	-	-	-	-	-	-	-	-	-	-	-	-
Punctates above	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip CWOI	-	-	-	-	-	-	2	4.7	-	-	-	-	-	-	-	-
Punctates below	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip CWOI	-	-	-	-	-	-	-	-	-	-	-	-	1	0.4	-	-
Interior CWOI	2	6.3	10	10.2	2	6.9	2	4.7	2	7.7	-	-	35	13.0	-	-
Other Complex Horizontal, Vertical Mixes CWOI	-	-	1	1.0	-	-	-	-	-	-	-	-	-	-	-	-
Lip CWOI	-	-	-	-	-	-	-	-	-	-	1	2.7	-	-	-	-
Interior CWOI	-	-	1	1.0	-	-	-	-	-	-	-	-	2	0.7	-	-
Interior TI	-	-	1	1.0	-	-	-	-	-	-	-	-	-	-	-	-
Horizontal over/bounding triangular plats CWOI	-	-	1	1.0	-	-	-	-	-	-	1	2.7	-	-	-	-
Lip CWOI	-	-	-	-	1	3.4	-	-	-	-	-	-	1	0.4	-	-
TI – upper and lower rim	-	-	1	1.0	-	-	-	-	-	-	-	-	-	-	-	-
TI – upper rim	-	-	1	1.0	-	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	-	-	-	-	-	-	-	-	-	-	1	0.4	-	-
Horizontal bounding diagonals CWOI	-	-	1	1.0	-	-	-	-	-	-	-	-	-	-	-	-
Lip CWOI	-	-	1	1.0	-	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	2	2.0	-	-	-	-	-	-	-	-	-	-	-	-
Cord impressions below diagonals	-	-	2	2.0	-	-	-	-	-	-	-	-	-	-	-	-

Table C14 (continued).

Exterior Rim Decoration Motif/Lip Decoration Technique/Interior Rim Decoration Technique	21BS22/51		21KH93		21KH36		21ME1		21ME1-B		21SN5/6		21ML11		21LN2	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Horizontal over Diagonal CWOI	-	-	-	-	-	-	-	-	-	-	-	-	1	0.4	-	-
Lip CWOI	-	-	-	-	-	-	-	-	-	-	-	-	1	0.4	-	-
Punctates above	-	-	-	-	-	-	-	-	-	-	1	2.7	-	-	-	-
Lip CWOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	-	-	-	-	-	-	-	-	-	-	1	0.4	-	-
Interior CWOI	-	-	-	-	-	-	1	2.3	-	-	-	-	-	-	-	-
Horizontal between Diagonal CWOI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior CWOI	-	-	-	-	-	-	-	-	-	-	-	-	1	0.4	-	-
Short Diagonal or Vertical CWOI -upper rim	-	-	2	2.0	2	6.9	-	-	-	-	1	2.7	3	1.1	-	-
Lip CWOI	1	3.1	1	1.0	-	-	-	-	-	-	1	2.7	-	-	-	-
Exterior Rim Undecorated	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip CWOI	4	12.5	3	3.0	-	-	5	11.6	2	7.7	7	18.9	43	16.0	2	8.0
Interior CWOI	2	6.3	2	2.0	-	-	2	4.7	3	11.5	1	2.7	11	4.1	1	4.0
Interior CWOI	-	-	7	7.1	2	6.9	4	9.3	-	-	-	-	15	5.6	4	16.0
Punctate	1	3.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Miscellaneous Decorative Motifs	2	6.3	4	4.0	-	-	2	4.7	2	7.7	3	8.1	4	1.5	3	12.0

Table C15. Frequency of Ceramic Rimsherd Types for Seven Sites or Site Groups by Decoration Area, Rim Decoration Technique, Rim Decoration Motif, and Lip Decoration Technique (DS=Dentate Stamped, TI=Tool Impressed, CWOI=Cordwrapped Object Impressed).

Ceramic Type/Exterior Rim Decoration Technique/Main Exterior Rim Decoration Motif/Lip Decoration Technique/Interior Rim Decoration Technique	21BS22/51		21KH93		21KH36		21ME1		21ME1-B		21SN5/6		21ML11	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
ST. CROIX STAMPED SERIES														
Dentate Stamp Variety														
Exterior Rim														
Horizontal DS	2	8.7	2	5.1	1	8.3	1	4.8	-	-	4	18.2	1	3.7
Lip DS	5	21.7	-	-	1	8.3	1	4.8	-	-	-	-	10	37.0
Lip TI	1	4.3	1	2.6	-	-	1	4.8	-	-	-	-	-	-
Punctate	-	-	-	-	-	-	-	-	-	-	1	4.5	-	-
Interior DS	-	-	-	-	-	-	2	9.5	-	-	-	-	-	-
Lip TI	1	4.3	-	-	-	-	-	-	-	-	-	-	-	-
Upper rim TI	-	-	-	-	-	-	1	4.8	-	-	-	-	-	-
Short DS upper rim	-	-	1	2.6	-	-	-	-	-	-	-	-	-	-
Upper rim TI	-	-	-	-	1	8.3	1	4.8	1	33.3	3	13.6	-	-
Interior TI	-	-	1	2.6	-	-	1	4.8	-	-	-	-	-	-
Upper rim CWOI	-	-	-	-	-	-	-	-	-	-	1	4.5	-	-
Lip CWOI	-	-	-	-	-	-	-	-	-	-	-	-	1	3.7
Boss														
Interior DS	-	-	1	2.6	-	-	-	-	-	-	-	-	-	-
Diagonal DS	2	8.7	3	7.7	3	25.0	1	4.8	-	-	-	-	1	3.7
Lip DS	4	17.4	-	-	-	-	-	-	-	-	1	4.5	-	-
Interior DS	-	-	-	-	-	-	-	-	-	-	1	4.5	-	-
Interior DS	1	4.3	-	-	-	-	-	-	-	-	-	-	-	-
Boss	-	-	2	5.1	-	-	-	-	-	-	-	-	-	-
Interior DS	-	-	2	5.1	-	-	3	14.3	-	-	-	-	4	14.8
Vertical DS	-	-	1	2.6	-	-	-	-	-	-	5	22.7	-	-
Lip DS	-	-	-	-	-	-	1	4.8	-	-	-	-	-	-
Interior DS	-	-	-	-	1	8.3	-	-	-	-	-	-	1	3.7
Horizontal trailed	1	4.3	1	2.6	-	-	-	-	-	-	-	-	-	-
Diagonal over Horizontal	3	13.0	1	2.6	1	8.3	-	-	-	-	2	9.1	-	-
Lip DS	-	-	1	2.6	-	-	-	-	-	-	-	-	-	-
Interior DS	-	-	-	-	-	-	2	9.5	-	-	-	-	-	-
Interior DS	1	4.3	-	-	-	-	-	-	-	-	-	-	-	-
Boss	-	-	2	5.1	-	-	-	-	-	-	-	-	-	-
Interior DS	-	-	1	2.6	-	-	-	-	1	33.3	-	-	-	-
Vertical over Horizontal DS	-	-	2	5.1	-	-	2	9.5	-	-	-	-	-	-
Horizontal over Diagonal DS	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip DS	-	-	-	-	-	-	1	4.8	-	-	-	-	1	3.7
Interior DS	-	-	-	-	-	-	-	-	-	-	-	-	1	3.7
Lip tool impressed	1	4.3	-	-	-	-	-	-	-	-	-	-	-	-
Horizontal over Vertical DS	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip DS	-	-	-	-	-	-	-	-	-	-	-	-	1	3.7
Boss	-	-	1	2.6	-	-	-	-	-	-	-	-	-	-
Diagonal over Vertical DS	-	-	1	2.6	-	-	-	-	-	-	-	-	1	3.7
Vertical over Diagonal DS	-	-	-	-	-	-	-	-	-	-	-	-	1	3.7
Horizontal embedded with X-hatch, diag., or vert. DS	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip DS	-	-	-	-	-	-	-	-	-	-	-	-	2	7.4
Cross hatched DS	-	-	-	-	-	-	-	-	-	-	-	-	1	3.7

Table C15 (continued).

Ceramic Type/Exterior Rim Decoration Technique/Main Exterior Rim Decoration Motif/Lip Decoration Technique/Interior Rim Decoration Technique	21BS22/51		21KH93		21KH36		21ME1		21ME1-B		21SN5/6		21ML11	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Comb Stamped Variety														
Exterior Rim	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Horizontal CS	-	-	1	2.6	1	8.3	1	4.8	-	-	3	13.6	-	-
Punctate	-	-	-	-	-	-	-	-	-	-	1	4.5	-	-
Lip CS	-	-	-	-	-	-	1	4.8	-	-	-	-	-	-
Interior CS	-	-	1	2.6	-	-	-	-	-	-	-	-	-	-
Diagonal CS	-	-	3	7.7	2	16.7	-	-	1	33.3	-	-	-	-
Lip CS	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interior CS	-	-	1	2.6	-	-	-	-	-	-	-	-	-	-
Interior CS	-	-	-	-	-	-	-	-	-	-	-	-	1	3.7
Diagonal over Horizontal CS	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Punctate	-	-	4	10.3	-	-	-	-	-	-	-	-	-	-
Interior CS	-	-	-	-	-	-	1	4.8	-	-	-	-	-	-
Horizontal over Diagonal CS	1	4.3	-	-	-	-	-	-	-	-	-	-	-	-
Vertical bounded by horizontal CS	-	-	-	-	1	8.3	-	-	-	-	-	-	-	-
Exterior Rim Undecorated	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lip CS	-	-	1	2.6	-	-	-	-	-	-	-	-	-	-
Punctate	-	-	1	2.6	-	-	-	-	-	-	-	-	-	-
Interior CS	-	-	3	7.7	-	-	-	-	-	-	-	-	-	-