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EASTERN STATES OFFICE

THE ARCHAEOLOGY OF TWO LAKES IN MINNESOTA

by
Christina Harrison

CULTURAL RESOURCE SERIES NO. 2

Cover drawing by Shelly H. Fischman.

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Richard Brook
General Editor
1985

FOREWORD

This report combines under one cover the results of archaeological investigations conducted along two Minnesota lakes -- Birch Lake Reservoir in the north, along which 21-SL-165 is situated, and Lura Lake in the south, along which 21-BE-44 is located. The studies attempt to expand and clarify what is known about the prehistoric period in these two diverse parts of Minnesota. The considerable effort devoted to these projects, funded by the Bureau of Land Management (BLM), highlights the dedication of the Principal Investigator, Ms. Christina Harrison and her assistants. The BLM is very appreciative of the excellent work.

The excavation program at SL-165 was part of the BLM compliance requirements for approval for public sale of the parcel on which the site is located. By contrast, the investigation of BE-44, proposed for transfer to a local municipality under the authority of the Recreation and Public Purposes Act, was prompted by serious erosion problems caused by fluctuating lake levels which threatened to destroy valuable scientific data. The latter project met one of BLM's cultural resource program objectives of "managing (its) cultural resources so that the scientific and socio-cultural values are not diminished but rather maintained and enhanced" (BLM Manual Section 8100).

Although the impetus for the investigations at SL-165 and BE-44 was different, the results provide an engaging contrast. The sites represent adaptations to two different major vegetational zones, specifically, a northeastern coniferous-hardwood forest (SL-165) and a southern prairie zone (BE-44). Interestingly, the principal components on both sites are fairly comparable in time, dating roughly to the late Archaic - early Woodland period. Lithic material recovered from SL-165 suggests that its occupants were involved in a lithic procurement system that obtained, either directly or through trade, source material primarily from the Boundary Waters area and possibly from as far away as the Knife River quarries near Bismarck, North Dakota. By contrast, the lithics found on BE-44 point to the use of oolitic cherts and local glacial till as source material. The settlement picture at BE-44 confirms an existing and more clearly elucidated pattern characteristic of late Archaic-early Woodland occupation in this part of Minnesota. Generally, during this time period, groups occupied islands and peninsulas adjacent to shallow lakes during the spring, summer and fall months and moved to sheltered river valleys during the winter months. The settlement pattern of which SL-165 is a part is less clearly understood but the site appears to have been used seasonally or intermittently.

The contractor has outlined several management recommendations to be considered in reducing or alleviating the erosion problems on BE-44. The mitigation measures that are eventually implemented will require a cooperative effort between the BLM and the eventual recipient (i.e. Blue Earth County) to ensure protection of the remaining scientific values.

It is with pleasure that we offer the second volume in the Eastern States Office (ESO) series of BLM cultural resource monographs. We feel confident that the publication will be of value and interest to the professional community at large, as well as to members of the general public curious about archaeology. It is particularly our hope that the latter audience will share in our concern to protect the vast number of cultural resources found not only on public domain but also on private lands.

Richard Brook
ESO BLM State Archaeologist
Alexandria, Virginia
September, 1985

ACKNOWLEDGEMENTS

Ten persons participated in one or several of the field investigations at 21-BE-44 and 21-SL-165, all of them either active graduate students in Archaeology or graduates with a major in the field at/from one of the following institutions: University of Minnesota (UM), Hamline University (HU), St. Paul, Minnesota, Carleton College (CC), Northfield, Minnesota, University of Colorado (UC) or University of Hawaii (UH). As field assistants: Blythe Williams Carlson (UC), Stephen Wickler (UH) and Randall Withrow (UM); as crew members: Suzanne Dickerson (CC), Matthew Masotti (CC), Leigh Mazion (UM), James Myster (UM), Susan McCanna (UM), Marcia Regan (HU) and Sue Thurston (HU). I am grateful to them all for their good, hard and careful work.

I would also like to thank the following individuals: Richard Brook, BLM - Eastern States Office; Dr. Laila Haglund, of Haglund & Associates, Sydney, Australia, who volunteered her expertise at the work on 21-BE-44 and drew the lithic artifacts from that site; Dr. Christy A.H. Caine, State Archaeologist, and Gordon Peters, Forest Service Archaeologist on Superior National Forest, Duluth, Minnesota, who both read through and commented on parts of these manuscripts; Steve Michel and his staff at the Blue Earth County Highway Department who assisted us in many ways during the work at 21-BE-44, and Ken and Linda Hupila whose assistance and hospitality we enjoyed during our work at 21-SL-165.

Last, but not least, I am very much indebted to Nikki Lamberty, who typed the manuscripts and endured and deciphered numerous last minute revisions with impressive equanimity and efficiency.

Christina Harrison

Principal Investigator

REPORT ON EXCAVATIONS AT ARCHAEOLOGICAL SITE 21-SL-165, ST. LOUIS COUNTY, MINNESOTA, PERFORMED DURING OCTOBER 1983 AND JUNE 1984

By

Christina Harrison

Prepared by Archaeological Research Services, Minneapolis, Minnesota, for the United States Department of the Interior, Bureau of Land Management, under Contract ES-910-MC3-002

ABSTRACT

In July 1983, during a Cultural Resource Class III inventory of eight public domain tracts in Minnesota, a prehistoric site was identified in Bureau of Land Management (BLM) tract St. Louis 023, on a series of rock ledges overlooking the Birch Lake Reservoir, St. Louis County. The site, 21-SL-165, appeared to have considerable research potential and importance for the reconstruction of the regional prehistoric sequence. In order to fully evaluate its significance and possible eligibility for the National Register of Historic Places (NRHP), the site was subjected to more intensive testing during October-November, 1983. The results indicated the presence of a number of features interpreted as fire basins as well as a consistent scatter of lithics in distinctive distribution patterns. Subsequently, the Minnesota State Historic Preservation Office (SHPO) and BLM agreed that the site appeared to be eligible for the NRHP and that a "no adverse effect" determination related to the proposed sale of the parcel would be contingent upon data recovery in accordance with a detailed research design, a decision concurred with by the Advisory Council on Historic Preservation. This third and most intensive of the investigations took place during June of 1984.

This report details the results of all three investigations. After a brief description of the site area and the environmental setting, as well as a summary of the results of past cultural resource investigations in the surrounding region (Chapters II and III), Chapter IV describes the research approach and the field methodology, while Chapters V and VI describe and discuss the cultural evidence. Briefly, the excavation data indicate the presence of three subareas within the boundaries of 21-SL-165, two of which feature the remains of fire basins and surrounding activity areas, while the third appears to represent a lithic workshop. Of nearly 850 lithic items retrieved from the site, most represent flaking debris produced during tool manufacture or tool maintenance, while a rather small number of completed implements suggest the importance of such activities as fishing, the trapping of small animals, hide, meat and fiber processing as well as some bone and wood working. Several of the lithic raw materials represented in the assemblage come from known sources located at a considerable distance from the site, a fact which indicates the existence of a fairly extensive lithic procurement system. The tabulated relationships between attributes such as the type of lithic item, the type of raw material and the provenience, suggest various patterns of clustering or differentiation
the site. These are discussed, as are problems involved in determining
date of the site and its place in the regional prehistoric sequence.

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I. INTRODUCTION

On July 5, 1983, during a Cultural Resource Class III inventory of eight public domain tracts in Minnesota for the Eastern States Office (ESO) of the Bureau of Land Management (BLM), a prehistoric site was identified in the northeastern corner of BLM tract St. Louis 023 (SL 023). This parcel is located in SENE Section 27, T61N, R13W, on a ridge which overlooks Birch River, approximately four miles northwest of Babbitt, St. Louis County (Figures 1 and 2). The site has been recorded as 21-SL-165 (see Appendix A).

The general character of the SL 023 parcel, the survey procedures used and the results have all been described in the report on the cultural resource reconnaissance survey (Harrison, 1983). Briefly restated, the evidence found on the prehistoric site--a lithic scatter, discolorations, charcoal and some fire cracked rock in the soil--suggested the presence of subsurface features and also considerable research potential which might make this site eligible for nomination to the National Register of Historic Places. It was therefore decided that further testing was necessary in order to fully assess this potential eligibility. Such an evaluation was performed during late October 1983. The results from a total of 9 1/4 square meters of formal test units (17 exploratory 50x50cm units, 6 of which were then expanded) indicated the presence of distinct subsurface features like fire basins and what appeared to be deliberately placed boulder formations around them. More than 250 lithics (a few finished implements as well as utilized flakes and numerous pieces of debitage) suggested considerable find density as well as some interesting distribution patterns. Most of this evidence appeared to come from a fairly undisturbed soil matrix. In short, the site seemed to possess considerable integrity and research potential. The results were described in an Addendum to the original report, submitted to BLM and the SHPO during February, 1984; in this Addendum, the Principal Investigator (PI) expressed the opinion that the site should be considered to be eligible for the National Register.

Following the submission of the Addendum report to the BLM, discussions ensued between the Minnesota SHPO and the Contracting Officer's Authorized Representative on how 21-SL-165 should be treated. The Principal Investigator and the BLM both felt, and the Minnesota SHPO agreed, that the site was eligible for the National Register of Historic Places primarily because it contained "information significant in history or prehistory" (36 CFR Sec. 60.4 (d)). Such a determination implied that the property could productively be used for archaeological research, under appropriate circumstances.

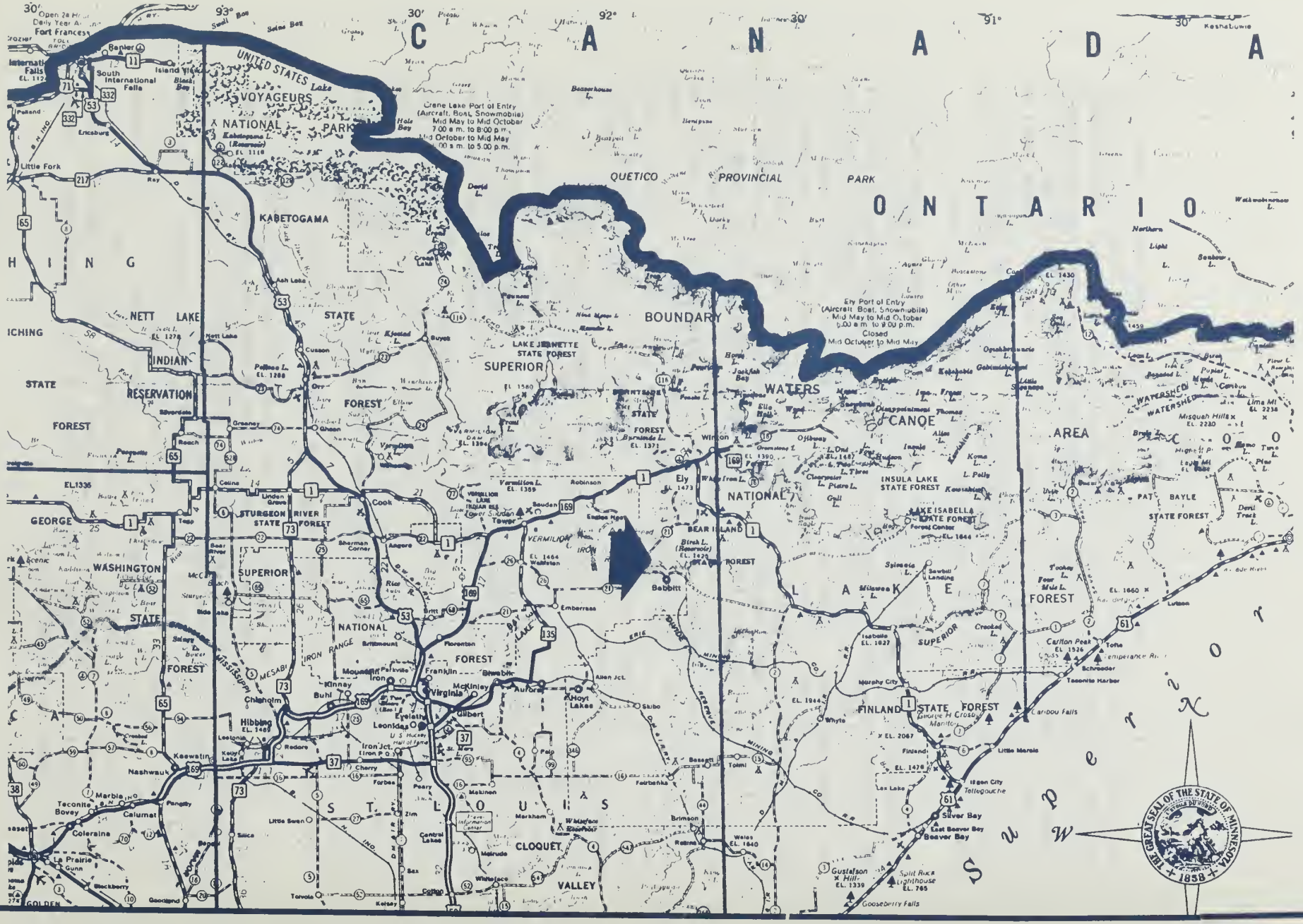


Figure 1. 21-SL-165, Location and General Surroundings.

Figure 2. 21-SL-165, Topographic Setting.

In light of ESO's mandate to dispose of parcels of public lands that are considered difficult and uneconomic to manage (Section 203 of the Federal Land Policy and Management Act (FLPMA)), it was agreed that the circumstances requiring extraction of the significant data on 21-SL-165 existed. Consequently, the SHPO and the BLM concurred in a determination of "no adverse effect" related to the proposed action, i.e. to offer BLM parcel SL 023 for public sale, subject to data recovery of the information on 21-SL-165 in accordance with a detailed research design (Appendix B). This determination was concurred with by the Advisory Council on Historic Preservation (ACHP). Both the SHPO and the ACHP were provided an opportunity to review the data recovery plan prior to its implementation.

In the data recovery plan, it was stipulated that all three sub-areas should be further investigated by a minimum total of at least 11 square meters, and that it should be left to the judgment of the PI to determine what areas were most in need of expansion. A few units should also be excavated in order to further delineate the perimeters of the intensive use areas. This third investigation (Phase III) was accomplished during the first half of June, 1984; a total of 11 1/4 square meters were excavated (hopes of achieving more were dashed by pouring rain during a large part of the field session).

This final report incorporates all pertinent data from the report on the initial reconnaissance survey (Phase I), as well as those found in the Addendum that describes the National Register evaluation (Phase II).

II. DESCRIPTION OF SITE AREA AND ENVIRONMENTAL SETTING

Physiography

The topography of northeastern Minnesota reflects the successive periods of glacial activity during the later Pleistocene period, particularly the last stages of the Wisconsin glaciation. As glacial lobes spread and retreated across this region, they drastically altered the land surface, exposing and scouring much of the bedrock (schists, as well as greenstone and granitic igneous and metamorphic rock as much as three to four billion years old), realigning soil and rock deposits as well as waterways along the glacial path (generally in a north to south/southwest direction) and depositing glacial debris as moraines, eskers, drumlins and outwash plains. The planing action of the ice leveled much of the land and gave it a gently undulating topography, now seen as low highlands alternating with wet lowlands. In some areas, the ice and the meltwater created a more dissected land surface of bedrock outcrops,

moraines, eskers and steep-sided valleys. Blocks of stagnant ice left by the retreating glacier and buried under glacial till where they lasted for a long time, would later melt and create thousands of lake basins. Northeast of the inventory areas, there is also some high and rugged terrain with considerable ranges in elevation (up to 1000 feet), particularly near the northwestern shore of Lake Superior. The following physiographic regions, as outlined by Herbert Wright (1972), are all located around or near the inventoried areas (see Figure 3).

1) To the northwest, north and east from the Birch Lake Reservoir, lies the Border Lakes Area, an approximately twenty-five mile wide belt which extends from the vicinity of the north shore of Lake Superior westwards along the Canadian border. Streams within this area all flow north/northeast into the Rainy River. Most rugged is the eastern third, where ice sheets moving across the area created an east-west linear pattern of lakes and ridges by differentially eroding the bedrock. The central and western thirds, including the vicinity of 21 SL 165, are generally characterized by a more irregular pattern of lakes and uplands formed in glacially eroded bedrock--igneous (granitic) rocks in the north and metamorphic rocks in the southwest, i.e. east/southeast of Lake Vermillion. 21 SL 165 is located along this southwest boundary and the contact zone between the Border Lakes Area and the Chisholm-Embarrass Area as well as the Giants Range.

2) Of these latter two physiographic regions, the Chisholm-Embarrass Area features the least distinctive topography, a complex of low moraines deposited by the Rainy lobe of the Wisconsin glaciation and interspersed outwash plains, many of them quite low and wet.

3) The Giants Range is a highland area of granite which flanks the northern side of the iron ore rich Mesabi range from Babbitt (just southeast of 21 SL 165) southwest towards Hibbing (Figure 1), and which rises 200-400 feet above the surrounding areas. This range forms part of the three-way divide between the Hudson Bay, Great Lakes and Gulf of Mexico watersheds.

Three other physiographic regions are located at some distance to the east and west of the project area but have been included here as the description of each gives an impression of the general physiographic variety of this region.

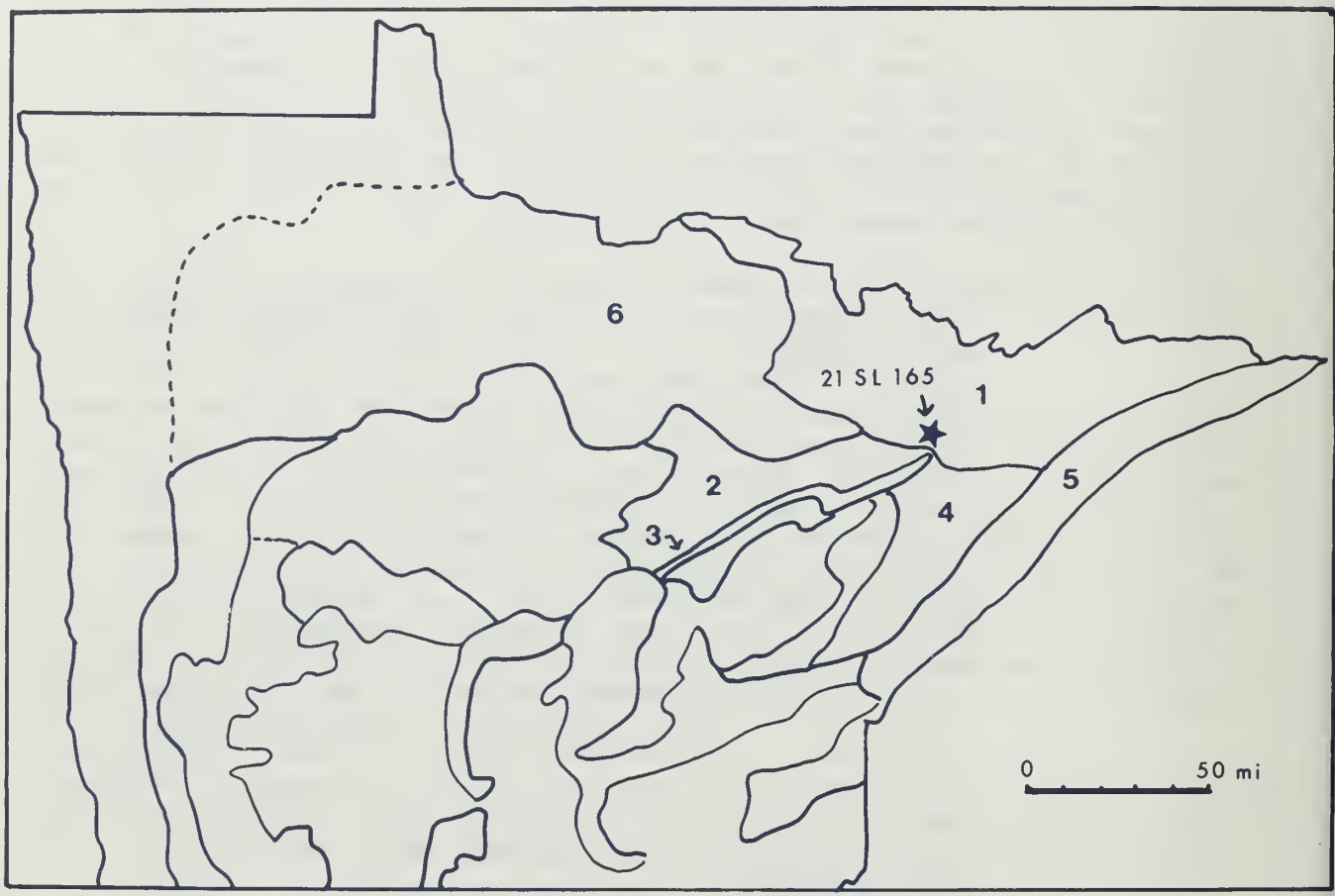


Figure 3. Physiographic Regions of Northeastern Minnesota, as Described in this Report: 1) Border Lakes Area; 2) Chisholm-Embarass Area; 3) Giants Range; 4) Toimi Drumlin Area; 5) North Shore Highland Area; 6) Beltrami Arm of Lake Agassiz (after Wright 1972).

4) The Toimi Drumlin Area, on the east/southeast side of the Giants Range, is characterized by a pattern of low but distinct glacial ridges oriented quite symmetrically in a northeast-southwest pattern and generally measuring approximately 1/4 mile in width, 30-50 feet in height and one-two miles in length. The area is drained towards the southwest by an equally linear pattern of streams, all of them tributaries to the St. Louis River, i.e. part of the Great Lakes watershed.

5) The North Shore Highland Area, which flanks the southeastern edges of the Boundary Lakes and the Toimi Drumlin Areas, consists of a range of hills which overlook Lake Superior all along its northwest shore from an elevation of 900 feet to 1500 feet and which predominantly consists of southeastward dipping basalt and diabase formations dating back to Late Precambrian times. They are dissected by a number of short rivers, ten to fifteen miles in length, which begin as sluggish streams draining the numerous lakes and marshes of the interior; downstream, they descend increasingly steep valleys carved into the hillsides since the lowering of Lake Superior during the last part of the Wisconsin glaciation, usually finishing their downward courses as waterfalls. The receding waters of Glacial Lake Duluth shaped the hillsides also in other ways by leaving behind old shorelines whose beach and near shore deposits of sand, gravel and clay mark many places at higher elevations than the present lake level.

6) To the west of the project area, finally, lies a flat expanse of low and level to gently undulating uplands alternating with extensive wetlands, all part of a physiographic feature left by the Beltrami Arm of Lake Agassiz all across northwestern Minnesota, from the Red River valley to the southwest side of Lake Vermilion. In the eastern part, the flat terrain is locally interrupted by unburied moraines or outcrops of bedrock and by the tributary valleys of the Rainy River drainage.

BLM parcel SL 023, a forty acre unit encompassing approximately twelve acres of water and twenty-eight acres of fairly rugged upland terrain, is located on the upper reaches of the Birch River Narrows, a segment of river channel which has been significantly widened by the creation of the Birch Lake Reservoir immediately downstream (Figure 2). Prior to the regulating of this waterway, what is now the "narrows" may have looked similar to the still

unmodified river immediately upstream: a small and sluggish stream meandering through a swampy valley (as in Section 34 on Figure 2). Today, the "narrows" flow through a channel which generally varies between approximately 150 and 300 meters in width and is flanked mostly by quite steepsided rocky ridges. (Plates 1-5)

The uplands within SL 023 are typical of the area surrounding the Birch River drainage: mostly rugged terrain shaped by dissected bedrock which usually is overlain by deposits of glacial till but emerges as outcrops in a number of places, particularly along the river. Much of the river front within SL 023 features very high and steep slopes - the southeastern side of a distinct ridge which dominates most of the unit. To the northeast of this ridge, and separated from it by a narrow stretch of conifer bog, lies another, somewhat lower and more narrow ridge, the southeastern end of which forms a series of three fairly level terraces formed by partially exposed rock ledges overlooking the Birch River Narrows (Figures 2 and 5; Plates 2-5). All three of these terraces have produced evidence of prehistoric use and have been recorded as three subareas (A-C) of one site (21-SL-165).

Past and Present Flora and Fauna

The natural environment of this area underwent a series of drastic changes for the first few thousand years after the retreat of the Wisconsin glaciation but for the last 3-4,000 years it has remained fairly stable in spite of minor climatic fluctuation. Reconstructions of these events are based on series of radiocarbon dates, pollen cores, and macrofossil plant remains preserved in bogs and lake sediments in northeastern and east-central Minnesota. Table 1 on page 9 summarizes the main climatic periods and is based on information discussed in several pollen studies of the region (Cushing 1967, Hill 1984, Wright and Watts 1969).

As suggested, climatic conditions and floral/faunal distribution patterns have remained fairly stable in Minnesota over the last few thousand years. These patterns fell within three of the four biotic provinces outlined for the Upper Great Lakes region by Cleland (1966:5-12): the Canadian, Carolinian and Illinoian provinces which all transect the state in belts running roughly southeast-northwest. The 21-SL-165 site is located within the Carolinian province, which is characterized by:

- heavily glaciated topography with soils typical of cool, moist northern forests: thin, light-colored, acid, rather low in organic matter, infertile and rich in sand, gravel and rocks;

Climatic period	Approximate Date	Associated Climatic Events and Vegetation Types
Late Glacial	8850 B.C.	Glacial margin retreated, replaced by tundra, in turn replaced by boreal spruce forest. Gradual down melting of blocks of stagnant ice, buried in glacial deposits, created lake basins.
Pre-Boreal	7700 B.C.	Warming and drying trend; abrupt disappearance of the boreal forest which was succeeded by birch and alder followed rapidly by pine.
Boreal	6500 B.C.	Pine climax--pines particularly white pine--pine and birch dominate pollen spectra in Northern Minnesota by 5000 B.C. Prairie extended further northeast than modern range. Lower lake levels. Gradual sedimentation and filling in along shallow lake edges of sedges and conifers, i.e., bog formation.
Atlantic	2700 B.C.	Cooler, moister. Poorly drained areas to the north became blanket bogs. Prairie retreated to modern range. Process of lake-fill began, turning many lakes into bogs. Dominance of mixed conifer forest in the Northeast.
Sub-Boreal	950 B.C.	Reversal to pine climax type forest (mostly red and jack) similar to Pre-Boreal phase pine forest except for the addition of white pine.
Sub-Atlantic		Cooler and wetter but pine remained, particularly white. Increase in wild rice pollen in northern lakes. Essentially "modern" climate.

Table 1. Climatic and Vegetational Changes in Post-glacial Times.

Plate 1. 21-SL-165, View from Area A southeast across Birch River.

- a cool climate, with an average annual temperature of 38-40 F., an average of eighty to one hundred and forty frostfree days and an average of four to ten feet of snow a year, covering the ground for one hundred to one hundred and forty days;

- two types of climax vegetation: a) on higher, well-drained ground, hardwood forest which has been influenced by the temperate climate of the Great Lakes, i.e. Lake Forest (sugar maple, yellow birch, elm, beech, aspen, basswood, hemlock, with important sub-climaxes of white pine); b) on lower, poorly drained ground, black spruce, tamarack, cedar, fir, white pine, white birch and alder;

- varied undergrowth of several hundred species of shrubs, herbs, ferns, mosses and lichens;

- a fauna which typically includes (or included): badger, woodchuck, weasel, beaver, muskrat, marten, fisher, mink, otter, squirrel, lemming, chipmunk, snowshoe hare, porcupine, black bear, wolverine, coyote, wolf, lynx, elk, bison, moose, woodland caribou and deer (though the latter were much less common prior to the late 19th century when logging and homesteading began to create improved browsing conditions); there were also some hundred species of birds, including a variety of game birds, and a wide variety of fish.

Archaeological and ethnographic evidence compiled within the woodlands of Minnesota indicates that prehistoric Indian groups hunted or trapped almost all mammals except small rodents (Shay 1971). They also used a wide variety of wild plants (more than fifty species) for food, medicine and raw materials. The extensive wetlands and networks of rivers and lakes would have provided a number of aquatic resources as well as, seasonally, an abundance of migratory waterfowl. They were also often the source of wild rice which, according to pollen evidence, became more and more abundant in northern lakes during the first millennia A.D. and seems to have been one of the most important staples in the late prehistoric Indian economy of northern and east central Minnesota.

The predominant vegetation type within SL 023 consists of mature hardwoods (mostly aspen and birch with a sprinkling of balsam fir) and a dense understory of beaked hazel, dogwood and alder as well as a ground cover of grasses, broadleaf plants, ferns and mosses. Close to the river, however, the character changes abruptly to a sparse scatter of mature jackpines, a minimum of underbrush and a ground cover of sparse grasses, mosses and lichens. It

seems likely that the 21-SL-165 area has maintained its present character for much of the post-glacial period, in spite of various fluctuations in annual mean temperatures and amounts of precipitation. With its south/southeast exposure and thin soil cover over the rock ledges, this site would always have been comparatively warm and dry, with a predominance of conifers, a fairly sparse understory and a ground cover similar to that of today. In some of the test units, cultural evidence has been found almost immediately on top of bedrock that since have been covered by 40cm or more of soil--a fact which indicates that much more of the site area featured exposed rock ledges during the early phases of prehistoric habitation. Today, the ledges remain exposed only in the immediate vicinity of the river.

III. PREVIOUS INVESTIGATIONS; CULTURAL BACKGROUND

Although much of the information we have about prehistoric and early historic cultural resources in north-central and northeastern Minnesota has been gained through reports from informants, particularly amateur collectors, and from the results of small scale cultural resource reconnaissance surveys, there have been a few coordinated and large scale regional attempts at systematic site survey:

- the Mississippi Headwaters Cultural Resources Inventories performed by the University of Minnesota for the U.S. Army Corps of Engineers (Johnson et al. 1977 and Johnson 1979);

- a regional sampling survey in the Voyageur National Park, Koochiching and St. Louis Counties (Gibbon 1977);

- a series of cultural resource surveys on the Superior National Forest, Cook, Lake and St. Louis counties, beginning with the compilation of historical data by Forest Service historian Wesley White (White 1969) and an "overview" or records/literature search (Woolworth 1977) and then continuing with reconnaissance surveys in the late 1970's and early 1980's (Harrison 1980 and 1981) and a combination of compliance surveys and systematic ecological landtype surveys by Forest Service Archaeologists 1982 and 1983 (Peters et al. 1982 and 1984);

- a series of similar projects on the Chippewa National Forest, Beltrami, Cass and Itasca Counties--an "overview" (Woolworth 1979), as well as various reconnaissance surveys, (Brew 1981 and 1981;

Harrison 1982, 1983 and 1984; Hendrickson and Salkin 1981, 1982 and 1983; Hudak 1979);

The Mississippi Headwaters cultural resource reconnaissance surveys were carried out as fairly traditional and comprehensive shoreline investigations which usually did not extend further inland than approximately 50 meters. A great number of sites were identified, together representing the entire spectrum (as we know it) of prehistoric and historic periods/traditions in north central Minnesota. Many of them, however, have been partly or almost completely destroyed by wind and wave erosion aggravated by fluctuations in the reservoir elevations. A few of the recorded sites have since been tested and evaluated but, on the whole, the results of the Headwaters survey have allowed for little more than a more complete reconstruction of a cultural and chronological framework for the prehistoric and historic periods of this area.

The cultural resource investigations on Chippewa and Superior National Forests have largely been compliance surveys and although they have resulted in fairly intensive sampling of different types of terrain and biotic habitats within both Forests, the sampling has been dictated by silvicultural and recreational management objectives rather than archaeological or historical research questions. Nevertheless the number of sites that have been identified and the number and variety of project areas that have been investigated suggest a distinctive pattern in the distribution of cultural resources across the Forests. Almost all buried cultural deposits are found adjacent to lakes and streams. Historic sites, on the other hand, are frequently found also inland but then usually close to good farmland or pasture, to good supplies of such natural resources as timber and gravel or to early tote and rail roads (an exception to this would be the fairly large number of homesteads on land claims that proved to be unfortunate choices and therefore were settled for very short periods). Considering this distribution pattern, it seems safe to assume that most site locations could be predicted or tentatively identified through the study of topographic and soil maps, early aerial photographs, early land and census records, industrial archives, etc.

At present, cultural resource managers on both Forests are supplementing compliance surveys related to forest management projects with more specific studies aimed at developing predictive models for the locating of cultural resources. On the Superior National Forest, for example, efforts have been made to correlate the presence or absence of buried cultural deposits with specific Ecological Landtype (ELT) zones. The results tie in well with the cultural evidence presently at hand for the the Birch River drainage. The ecological landtypes have been defined by

soil scientists on the Forest and are based on such criteria as terrain, geology, soils, water and vegetation. Parts of the Forest have not yet been mapped for ELT zones and the number of cultural resources that have been correlated with the zones that are mapped is fairly small. Nevertheless, results in hand suggest that buried cultural deposits are found only within three of the ten ELT zones and that those three share certain characteristics (Peters et al. 1983:16-58): they are situated adjacent to water, on well-drained sandy loam or loamy sand in locations where the soils stay warm and dry through the growing season; the typical modern forest cover consists of aspen, paper birch, pine, spruce, and balsam fir (in pre-logging days, however, pine would have been more predominant in most of these areas). No buried sites were identified in any of the upland areas away from water. (As a note of caution, the report on this project emphasizes the fact that although cultural deposits have not been found in lowland areas, this does not mean that they do not exist--they may simply be too deeply buried under thick accumulations of soil and organic matter to be discovered by present day archaeological inventory techniques--Peters et al. 1983:59.

The regional sampling survey in Voyageur National Park, in the northwestern part of the Border Lakes Area, investigated a number of computer generated transects which ran from some point along a lakeshore inland across different types of upland terrain. A number of archaeological sites were identified, all of them within a hundred meters of lakeshore.

The survey projects described above, as well as informant reports and smaller cultural resource investigations have all added a number of cultural resources to the State Site File and they have also generated a considerable amount of information regarding the preferred site locations and the cultural sequence of north-central and northeastern Minnesota. They have also resulted in some more tentative interpretations and hypotheses regarding site functions and settlement/subsistence patterns. What is largely lacking, so far, is more detailed knowledge about particular sites as comparatively few have been subjected to more intensive testing and evaluation.

The following summary of the cultural history of north-central and northeastern Minnesota as well as adjacent parts of western Ontario and east-central Minnesota is based on the results of the research projects described above as well as on more specific local studies of a) the late Woodland Blackduck manifestation (Evans 1961; Lugenbeal 1979), b) the Middle Woodland Laurel Culture (Lugenbeal 1976; Anderson 1979; Stoltman 1973), and c) the late paleo-Indian/early Archaic Reservoir and Lakehead complexes of northeastern

Minnesota and western Ontario (Fox 1980; McLeod 1978 and 1980; Steinbring 1974).

9000 B.C.> 6000 B.C. With the last glaciers gone, grassland adapted paleo-Indian groups of bison hunters roamed northwestern Minnesota. Other groups, gradually adapting to forested environments and subsisting on less specialized hunting as well as fishing, seem to have occupied wooded areas in the east/northeast; cultural evidence such as camp and quarry sites in the lake district north/northwest of Thunder Bay suggests the presence of human groups on the Canadian Shield by at least 7000 B.C. (Fox, 1980; McLeod 1978:5; Wright 1972:13-20). A possible late paleo-Indian component appears to be present in the Reservoir Lakes area northwest of Duluth (Steinbring 1974:64-73); a related cultural complex is known from the Thunder Bay area (the Lakehead Complex, Fox 1980). Paleo-Indian evidence has also been reported from the Mississippi Headwaters region (Johnson et al., 1977:25-26). A number of paleo-Indian projectile points of the Folsom type as well as the later Plano types have been found in east-central Pine County, Minnesota, particularly along the Snake River drainage (Caine 1974:55-59; Harrison 1978); similar finds of particularly Plano points are also common throughout northeastern Min-nesota. Throughout this period, the climate became warmer and drier; boreal spruce forest was replaced by pine and birch. Moose, wood-land caribou, hare and beaver were hunted.

6000 B.C.> 3000 B.C. The dry and warm climate of the post-glacial altithermal continued along with associated pine forests and the presence of small and scattered groups of hunters and fishermen. To the north, a number of sites in Ontario indicate the presence of early Shield Archaic groups, a manifestation apparently developed out of a late paleo-Indian culture base (Wright 1972:33-36). Narrows on lakes and rivers were favored campsites as well as natural caribou crossings, suggesting a dietary importance of this animal. Sites are generally distributed along major waterways as well as on interior lakes and islands which indicates the importance of fishing and also the use of some kind of water craft,

possibly already the dugout canoe. Chipped stone tools similar to the lanceolate points, bifacial knives/preforms and large endscrapers typical of the Shields Archaic and Lakehead Complexes have also been found in northeastern Minnesota, within the eastern Boundary Waters as well as further south around Duluth and into northern Wisconsin (Steinbring 1974:64-73), suggesting a certain cultural uniformity in the northwestern Upper Great Lakes region.

Characteristic of the Archaic period throughout the woodlands of northeastern and east-central Minnesota was an increasing reliance on broad spectrum exploitation of the different resources and habitats described earlier as well as an increasing diversification of technology for hunting, trapping, fishing, foraging and woodworking/plant processing. Chipped stone, particularly projectile points and wasteflakes, still predominate the cultural record but the use of pecked and ground stone tools seem to have caught on quite rapidly. Softer stone (shale, catlinite) was carved into atlatl weights, pipes and ornaments. Towards the end of the early Archaic, native copper began to be cold hammered into tools and ornaments. There are occasional finds of carved bone and antler objects. As in the preceding late paleo-Indian period, the frequent use of non-local lithic raw materials suggests either seasonal quarrying expeditions or some form of fairly organized exchange.

3000 B.C.> ca. 500 B.C.

A cooler and moister climate encouraged the return and predominance of mixed conifer forests. Late Archaic groups continued hunting, fishing and gathering but were, as mentioned above, now also using native copper artifacts made by cold hammer beating. Subsistence practices seem to have become even more focused and seasonal: winter hunting, summer fishing and increasingly specialized and scheduled use of wild plants. Tools and weapons were now more varied and specialized than those of earlier periods: adzes, celts, gouges, grooved mauls, abraders, awls, knives, choppers, scrapers, punches, chisels, drills, wedges, net and line sinkers and projectile points were made by grinding or flaking a variety of metamorphic/igneous or cryptocrystalline siliceous rock. Bone and

antler were used for points, needles and harpoons.

The more substantial sites from the Archaic period are located on reasonably high and well-drained ground overlooking lakes, lake/stream or stream/stream junctions--they may well represent more intensively used base camps. There are also many smaller, aceramic sites characterized by only a few lithics, some firecracked rock, etc.; they are often located further away from such confluences (though usually near at least a minor source of water)--such sites may represent more intermittent or short-term camps associated with seasonal activities or simply travel from one point to another. The Archaic is well-documented from a number of areas in north-eastern and east central Minnesota as well as adjacent parts of Ontario and Wisconsin--within the Border Lakes region, as well as around the Mississippi Headwaters, the Mille Lacs region, the Snake River drainage (Pine and Kanabec Counties) and northern Wisconsin (Caine 1974; Harrison 1978; Johnson 1977; Salzer 1974).

ca. 500 B.C.> A.D. 500/800

Climate and vegetation were by now relatively similar to recent times. Early archaeological manifestations of the Woodland tradition are characterized by the introduction of burial mounds and ceramics and represented by the Laurel tradition in northeastern Minnesota and by more clearly Havana-Hopewell influenced ceramic traditions in southern east-central Minnesota.

Laurel is described as a Middle Woodland manifestation adapted to the lake-forest regions of northern Minnesota, southern Manitoba and western Ontario, with several distinctive characteristics. Ceramics which feature a smooth surface, grit temper, straight rim, unthickened and usually flattened lip, slight or no neck constriction, decoration confined to upper rim and neck and consisting of dentate stamping, bosses, punctates and incisions. Burial mounds some of which are very large, e.g. Grand Mound on the Rainy River. Hunting and gathering subsistence with pronounced seasonality, especially fishing during the warmer periods of the year. Associated artifacts: toggle-headed antler harpoons, cut beaver incisors,

copper artifacts, many flakes but few ground lithic artifacts. (Lugenbeal 1977; Stoltman 1973). Dated to approximately 100 B.C.-800 A.D.

The emergence of a mound building tradition suggests some important changes in social organization during this time, changes from a basically egalitarian hunting/gathering society to one characterized by incipient social stratification:
"First, only some of the Laurel people were buried in the mounds. Second, it probably took a large work force to build the mound. From these observations, we can suggest that some people of the Laurel culture deserved special treatment when they died. They may have been chiefs, priests or some other type of leader" (Peters 1985:12).

Havana Complex ceramics--associated with cultural evidence that reflects strong contacts in general with the Havana-Hopewell "interaction-sphere" of Ohio-Illinois and adjacent areas--are characteristic of the Middle Woodland phase in southern east-central Minnesota (Anfinson 1979:95-102 and 197-202). Although little of the socio-economic and ceremonial complexity that characterizes Havana-Hopewell proper is evident in this part of the Upper Midwest, there are fairly widespread indications of intermittent, possibly seasonal movements of Hopewellian groups or, at least, the exchange of goods and ideas between local Woodland populations and the Hopewellian centers. Finds of Hopewellian artifacts such as Snyder(like) points and platform pipes in northeastern and east-central Minnesota may reflect Hopewellian interest in the native copper sources of this area.

Habitation sites of this period are usually located on low ridges overlooking lakes and permanent streams and often in the vicinity of one or several large conical mounds. A number of Middle Woodland sites along the Snake River drainage in southern Pine County seem to represent a southern blend of Laurel and Havana influences. Further north, the Laurel tradition is well-represented by a number of sites, mostly along the major waterways of the Rainy River/Boundary Waters drainage but also along the major tribu-

taries--in 1982, a Laurel house floor was excavated by Superior National Forest archaeologists on the South Kawishiwi River, some ten miles northeast of inventoried tract St. Louis 023 (Peters et al. 1982: 104-143).

A.D. 500> A.D. 800

While the Laurel tradition continued in most of the area discussed in this report, the regions to its south/southwest were affected by a transitional Middle-Late Woodland manifestation characterized by distinctive stamp decorated St. Croix ceramics (George 1979) and an equally distinctive ceremonial use of linear and circular burial mounds and elaborate grave goods (the "Arvilla Burial Complex"--Johnson 1973). Most of the habitation sites of this period are situated in locations that would be ideal for wild rice harvesting (as well as fishing and the hunting of waterfowl)--a fact which, together with the apparent increase in numbers and density of sites (i.e. population size) suggests a growing reliance on wild rice utilization.

ca. A.D. 800> A.D. 12-1500

The Late Woodland period is characterized by two traditions which both form parts of a stylistic/cultural continuum--Blackduck ware in the north, Kathio-Clam River ware in east-central Minnesota.

Blackduck seems to have developed out of Laurel, featuring the same geographic distribution and considerable continuity in artifacts and burials. New features were the distinctive ceramic tradition, the appearance of wild rice utilization in northern Minnesota and a semi-sedentary village life. The ceramics tend to be globular vessels with rounded base and slightly constricted neck and somewhat flaring rim; the lip is usually thickened, the body marked with cord wrapped paddle impressions (or sometimes net/fabric impressions); the decoration, confined to the neck, exterior rim, lip and sometimes interior rim, consists of cord wrapped stick and punctates, applied over a cord wrapped paddle, smoothed, combed or brushed surface (Evans 1961; Lugenbeal 1979). Date: approximately 750-1500 A.D.

The makers of the closely related Kathio-Clam River ware continued the St. Croix subsis-

tence pattern of wild ricing, hunting, gathering and did it with a degree of efficiency that apparently encouraged both further population increase and a semi-sedentary life style--sites are not only more common but also more substantial with several examples of well-developed housefloors (Gibbon and Caine 1976).

Contemporaneous with Blackduck Ware in northeastern Minnesota are Selkirk ceramics (Prehistoric Cree?). They are distributed from Virginia through the Vermilion Area (and probably much of the Rainy Lake region) to Lake of the Woods.

A.D. 12-1500> A.D. 1750

In north central Minnesota, another type of ceramics, Sandy Lake Ware, coexisted with Blackduck Ware but also survived it, continuing in use into early historic times (as evidenced by finds of Sandy Lake ceramics in association with Historic Sioux and early French contact materials from the seventeenth century)--It is associated with cultural evidence indicating a heavy emphasis on wild rice processing. Sandy Lake ceramics are quite different from the Blackduck Ware (Lugenbeal 1979) as is the other main type of ceramics in the region of this time--the Ogeechie Ware of central Minnesota (Anfinson 1979:143-148). Ogeechie Ware, along with Sandy Lake, Selkirk and Blackduck, have recently been recovered at a wild rice processing site on Big Rice Lake north of Virginia (Peters, personal communication). Both Ogeechie and Sandy Lake ceramics have been found on permanent palisaded villages inhabited by Historic Santee Sioux Indians during the late 17th and early 18th centuries in the Mille Lacs region of central Minnesota.

17th/18th centuries

Historic Sioux and Ojibway

To the north of our area, an apparent westward expansion of Cree and other eastern groups pushed indigenous inhabitants west and south as early as the fifteenth century A.D. and appears to have affected also northern Minnesota (Woolworth 1977:16). Here, Woodland adapted Siouan speaking Dakota Indians, who had dominated Minnesota and western Wis-

consin for hundreds of years until the mid-eighteenth and mid-nineteenth centuries, began to be pushed towards the west and south by Algonquin speaking Ojibway. The latter were closely allied with the French fur traders and therefore bolstered by a better supply of firearms as well as a rewarding involvement in the fur trade. The lifestyle of the Ojibway (Chippewa) was characterized by a seasonal subsistence cycle based on the gathering of wild rice and maple sugar, fishing along Lake Superior and the Border Lakes and hunting and trapping in the interior of fur bearing animals (deer was scarce in the coniferous region before logging had increased the stands of deciduous trees and brush land). The coniferous region in prelogging days, did not offer the same abundance of subsistence resources as the mixed conifer-deciduous forests to the west and south. The fur trade had caused rapid depletion of fur bearing animals, particularly beaver, by the late eighteenth century and the Ojibway population in northeastern Minnesota probably did not exceed a few hundred. These people were mainly concentrated in small villages near Beaver Bay, Grand Marais, Grand Portage, the Boundary Lakes, and some of the larger lakes of the interior, Nett Lake, Pelican Lake and Lake Vermilion (Woolworth 1977:19-20). Between the late 1700's and the 1870's, these Ojibway were the only people living in the area. With the exception of winter hunting camps (located in sheltered wooded areas) and maple sugar groves, Indian sites seem to have been situated near water, especially at stream and lake junctions, or on islands.

ca. 1680
ca. 1761

French Fur Trade

The efforts of French exploration and fur trade were concentrated mainly on the Boundary Waters region and areas further northwest/north/northeast, but there is also more intermittent evidence of their presence elsewhere in Minnesota, particularly around the Mississippi Headwaters and the southwestern part of Lake Superior (Birk 1985; Wedel 1974).

1765>
1868

British and American Fur Trade

This was more extensive and competitive and a number of fur trading posts were established around the Boundary Waters and along the northwest shore of Lake Superior (Woolworth 1977:26-29), as well as in interior northeast/north central Minnesota (Johnson 1977: 30-31 and 1979:27-31).

Three factors determined the locations of fur trading posts: the fact that the fur traders depended on the same natural resources as the Indians and usually bartered with the Indians for them; their dependence on the Indians for skins and furs; their need to be connected to the network of waterways leading to centers like Fond du Lac and Grand Portage (Woolworth 1977:56). Therefore, the posts were always located by water routes and usually in the vicinity of Indian campsites, on dry and elevated ground on islands or near stream junctions.

1830's (south) and 1880's (north) early 1900's

Lumbering

By the 1830's, several decades before Minnesota achieved statehood and was officially opened up for homesteading, scouting teams had been sent out by various lumber companies to explore the area between the Mississippi and St. Croix Rivers. Before long, they had set their eyes and hearts on countless, rich stands of white pine and soon after began logging, at first on an unauthorized basis, which was very much objected to by the Indians, until 1837, when what is now Pine and Chisago counties were included in the first land session west of the St. Croix River, an agreement which made them part of the Wisconsin territory. With this began half a century of intensive logging, first in east central Minnesota along the St. Croix, then the Snake, Kettle and Tamarack Rivers, culminating in the 1880's. Within the next decade, however, the white pines were gone and with them the lumberjacks, but numerous traces remain in the form of dilapidated logging camps, rusting logging hardware in the woods and decaying dams built to regulate water levels and facilitate the rafting of logs downstream to the big sawmills on the St. Croix and Mississippi Rivers. By the late 1800's, the logging boom had moved north--in the Woolworth overview of the

Superior National Forest, for example, over twenty lumbering companies are reported as being in existence between 1884 and the 1940's (Woolworth 1977:35-44) and an additional 130 have since been documented through archival research and field investigations (Peters, personal communication). Like further south, early logging operations were associated with major waterways for easy transport of the timber to the sawmills or to Lake Superior harbors. Lakes and streams were dammed in order to control the water levels for the floating of the logs. Traces of logging camps and logging dams can still be found near/across streams or at stream-lake junctions. Later, when timber supplies were thinned out, operations were moved inland. This, and the increasing emphasis on hardwood harvesting, necessitated the construction of railroads and tote roads which can still at times be traced as they wind their way through the interior. Hundreds of logging camps existed at some time or another throughout the area; often they were of short duration--one or two seasons--but traces of them can still be seen in the form of clearings in the woods, rusted, lost or broken down logging equipment and debris such as rusted cans and broken glass.

1850's

Immigration and Settlement

Once logging had cleared the land and Minnesota had been declared a territory, settlement began on a large scale. The first land surveys in east central Minnesota took place during the early 1850`s. Tote roads, military roads and, in the 1860's, the first railroads opened up the area and villages and towns mushroomed along them--in some cases to survive until the present, in others to last for only a few years as commercial centers shifted to more and more opportune locations along the new railroads.

In the northeast, settlement, like logging, happened quite a bit later. Although this part of Minnesota was opened up to settlement in 1856 and early land surveys were performed during the 1850's (White 1970:IX), settling and prospecting in land did not reach a peak until the last decades of the 1800's, in connection with early mining and lumbering. As a result, homesteads dotted the land-

scape, even in areas that today seem to have had little to offer, and schools as well as commerce centers were established in great numbers. Most of the homesteads have long since been abandoned, but traces of them can be seen throughout the northeast; empty schoolhouses and deserted town sites are also common.

1860's Mining

The search for gold, silver, copper and iron brought prospectors and miners in great numbers to northern and north central Minnesota and mining camps, exploratory shafts, mines, tailing dumps and railroads reflect their activities in various parts of the region. Sites related to such activities left very obvious traces on the land surface. They are also well-documented in the legal records for this area.

Our knowledge of the cultural record of the Birch River drainage is still very sketchy. Although other sites have been recorded in the area, only one other than 21-SL-165 has as yet been subjected to more than reconnaissance level surface collecting and shovel testing. So far, nine prehistoric sites (including 21-SL-165) have been identified along the Birch Lake drainage and its junction with the Kawishiwi River. All were found immediately adjacent to the present shorelines, all except 21-SL-165 on lands belonging to Superior National Forest. Those of the latter that still are in the process of being evaluated and entered into the State Site File, will be referred to here by their Forest Service Cultural Resource Inventory numbers. Their locations are indicated on Figure 4.

One of these sites 09-09-05-106, was recorded on the north side of the Birch River Narrows, approximately 3/4 mile northeast of 21-SL-165 and in a very similar location, on a 20 meter wide terrace rising approximately 10 meters above the river between two higher granite outcrops (Figure 2). It was identified during a reconnaissance survey that did not involve any testing; the evidence, therefore, is very minimal--only one piece of debitage, a flake of Gunflint Silica, similar to a number of items on 21-SL-165.

Five of the sites (09-09-05-129, 130, 263, 292 and 293) are located in the central part of the Reservoir, two of them on what are now small islands near the shore, three on small points protruding into the lake. All are situated on sandy or gravelly terraces between five and ten feet above the water. All five produced lithics (mostly waste flakes) of one or more of the raw materials that were found also on

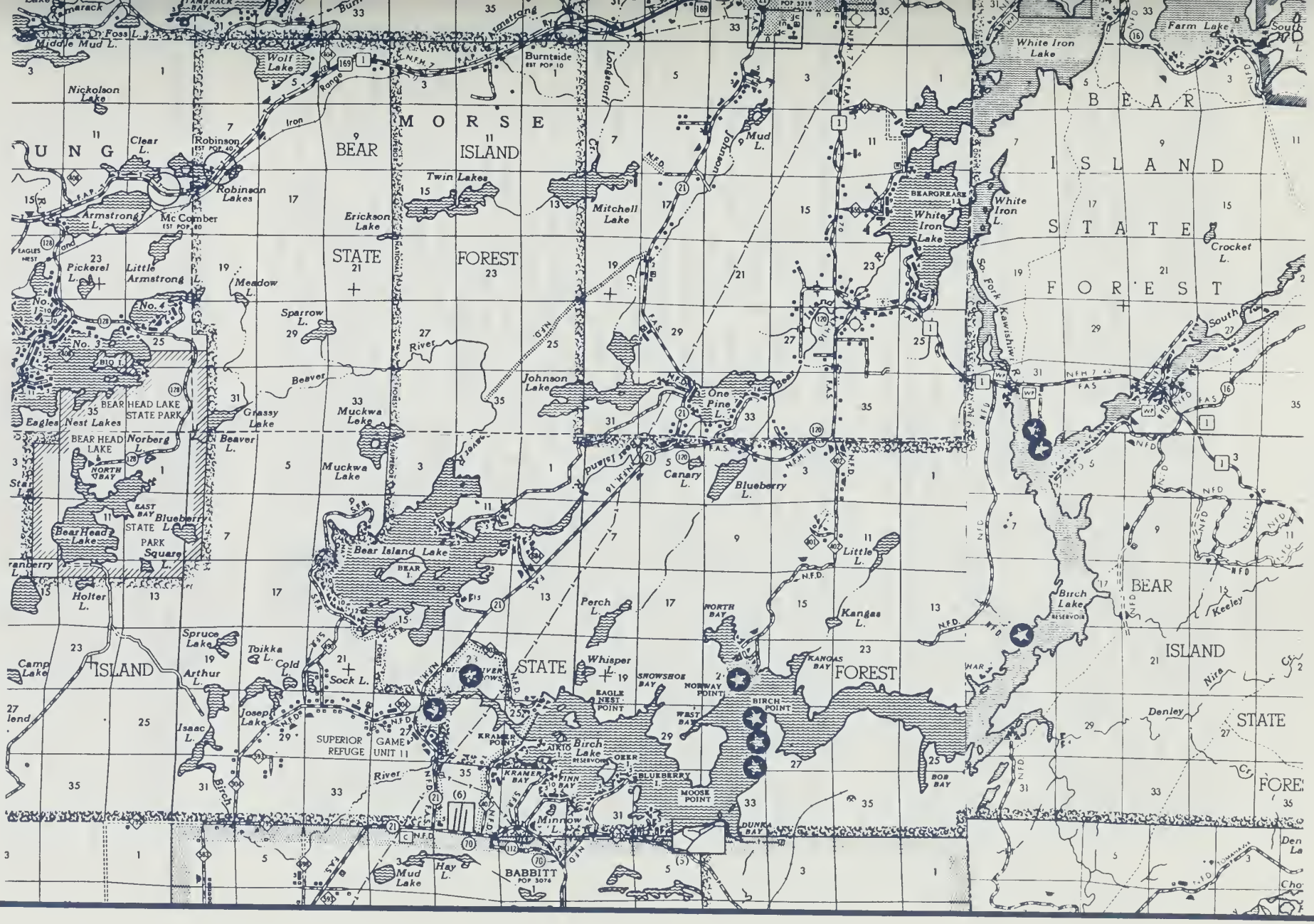


Figure 4. Prehistoric Sites Around the Birch Lake Reservoir and Its Confluence With the South Fork Kawishiwi River.

21-SL-165 (Knife Lake siltstone, jasper taconite, Gunflint Silica, Hudson Bay Lowland Chert, milky quartz). In addition, however, three of them also produced ceramic evidence: what appears to be Laurel Ware on 05-130, and Sandy Lake Ware on 05-293, while the sherds found at 05-292, though badly weathered, appear to have cordmarked exterior suggesting a Late Prehistoric origin (Blackduck Ware or Sandy Lake Ware).

Further downstream, two sites have been recorded along the Kawishiwi River near its junction with Birch Lake Reservoir. Site 09-09-05-105, located on a rocky point along the east side of the river, produced several Laurel Ware sherds as well as a number of flakes of the types of raw material already listed above.

The other site, the River Point site, 21-LA-10, is the only other of these sites that has been subjected to formal testing (Peters et al. 1983). The cultural deposit is located on a sandy terrace at the southern tip of a peninsula created by a bend in South Kawishiwi River, just opposite the junction of the latter with Birch Lake or, originally, with the Birch River--the Birch Lake reservoir was formed by the building of a dam on South Kawishiwi River which raised the level also of the lower Birch River flowage. The site is, basically, a Laurel occupation (with a minor intrusion of early historic fur trade material). Although it has been disturbed to some extent, both by wave erosion due to fluctuations in reservoir level and by the use of the peninsula as a resort, the site still yielded a great deal of evidence from fairly undisturbed deposits: a Laurel house floor, several copper working areas and also other special activity areas connected with butchering and meat/hide processing or tool manufacture. The artifact assemblage includes a number of finished stone tools (scrapers, bifaces, projectile points, wedges, drills), a large amount of debitage, faunal remains (mostly burnt bone), copper in different stages of processing and ceramic evidence in the form of Laurel rim and body sherds. In short, this site seems to represent a fairly substantial, settled and intense occupation. The Laurel ceramics indicate a date somewhere between 100 B.C. and A.D. 500.

Some of the evidence on these sites offer an interesting comparison with 21-SL-165 and will be commented on further below in Section VI.

IV. FIELD INVESTIGATION--METHODS

Phase I (Reconnaissance Survey) 7.5.1983; Phase II (National Register Evaluation), 10.10-14 and 25-29.1983

During the initial shovel testing, a thin scatter of waste flakes was retrieved from the three areas since designated as Areas A, B and C (Figures 5-8). The first task of the second field investigation was to determine with more accuracy the horizontal and vertical extent of these three sub-areas within one general site boundary. Although the total area defined by this boundary extends approximately 100 meters along the shore and 10-12 meters inland, much of it features quite rugged and dissected terrain. Apart from stretches of slope between the three terraces, there are also pockets of rough ground surface within the more level areas. Presumably, the slopes were also much used parts of the site area and must have been traversed with great frequency as people walked from one level rock ledge to another or from the ledges down to the gradually sloping river bank which would have provided more suitable canoe landings than the steep-sided rock ledges. Such use, however, would probably not have left much trace. The outer, more level parts of the rock ledges would also have been used for a variety of activities, many of which, like food preparation, tool manufacture or maintenance etc., might have resulted in a considerable amount of debris. Also, in this case, most traces would have disappeared as subsequent exposure to wind, rain and the feet of people and animals rearranged and destroyed the cultural evidence, particularly near the river where the soil formation seems to have been much slower. Therefore, although the slopes and outer parts of the ledges are part of the site area, they would probably not be worth investigating. Only the inner parts of the ledges, where a considerable amount of soil has been allowed to accumulate, would there be much chance of finding any buried and reasonably undisturbed cultural evidence. Taking all this into account, we concentrated our testing on those parts of each ledge that seemed level enough to have been used for evidence producing activities and sheltered enough to have accumulated a soil cover quickly enough to protect that evidence. The size of these areas was estimated to be 64 square meters for Area A, 52 square meters for Area B and 75 square meters for Area C.

Once the size of the test areas had been assessed at the beginning of the Phase II investigation, a grid of formal 50x50cm test units spaced at 3-4 meter intervals was planned for each. When testing began, each grid had to be considerably modified as we encountered either the pockets of rough, dissected terrain described above or areas where extensive root disturbance seemed to minimize chances of reliable data recovery. On the assumption that more numerous and closely spaced small test units would provide better overall sampling with less disturbance than the use of large ones at somewhat greater intervals, the 50x50cm

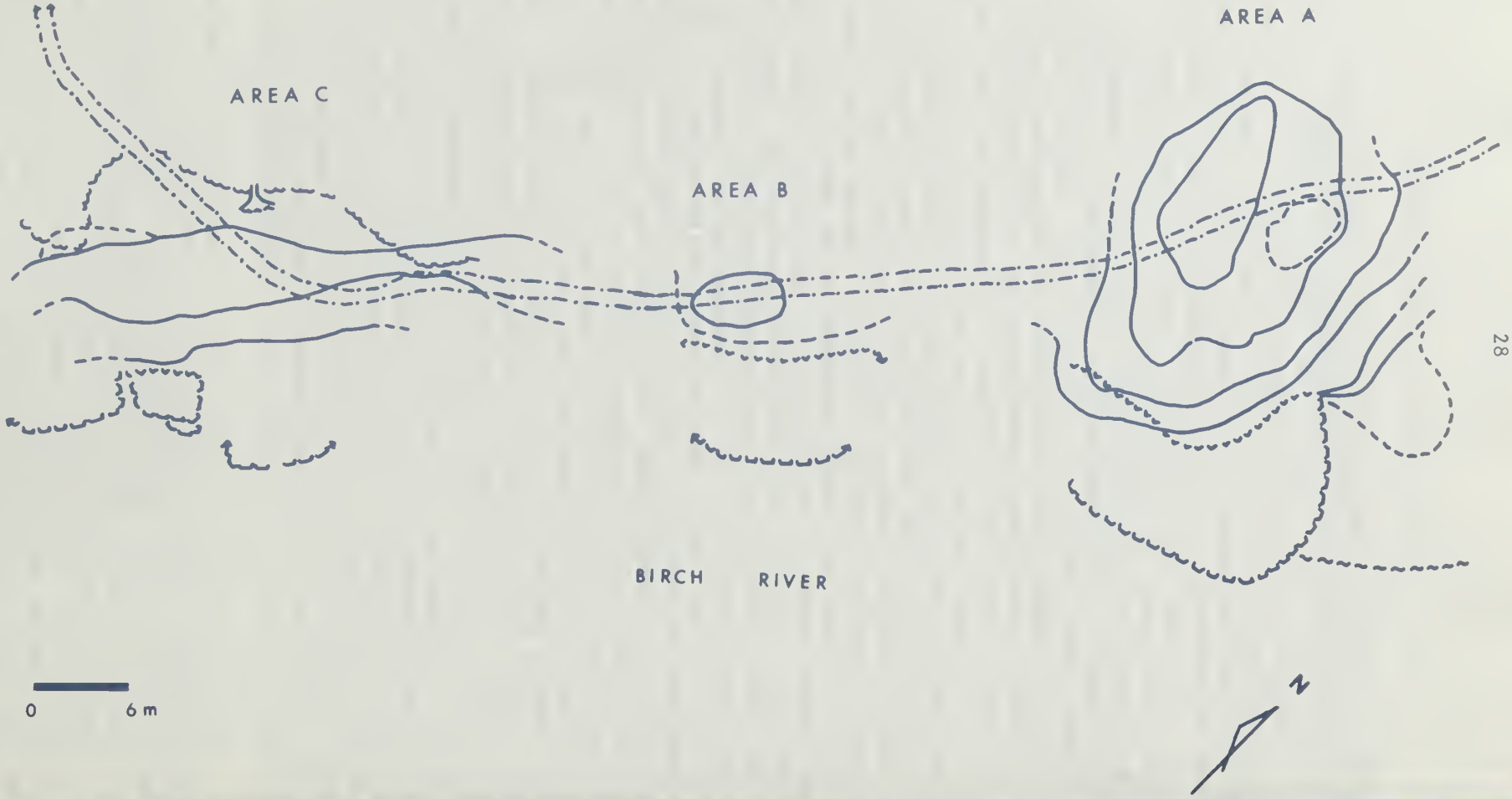


Figure 5. 21-SL-165, Schematic Total View of Areas A, B and C.

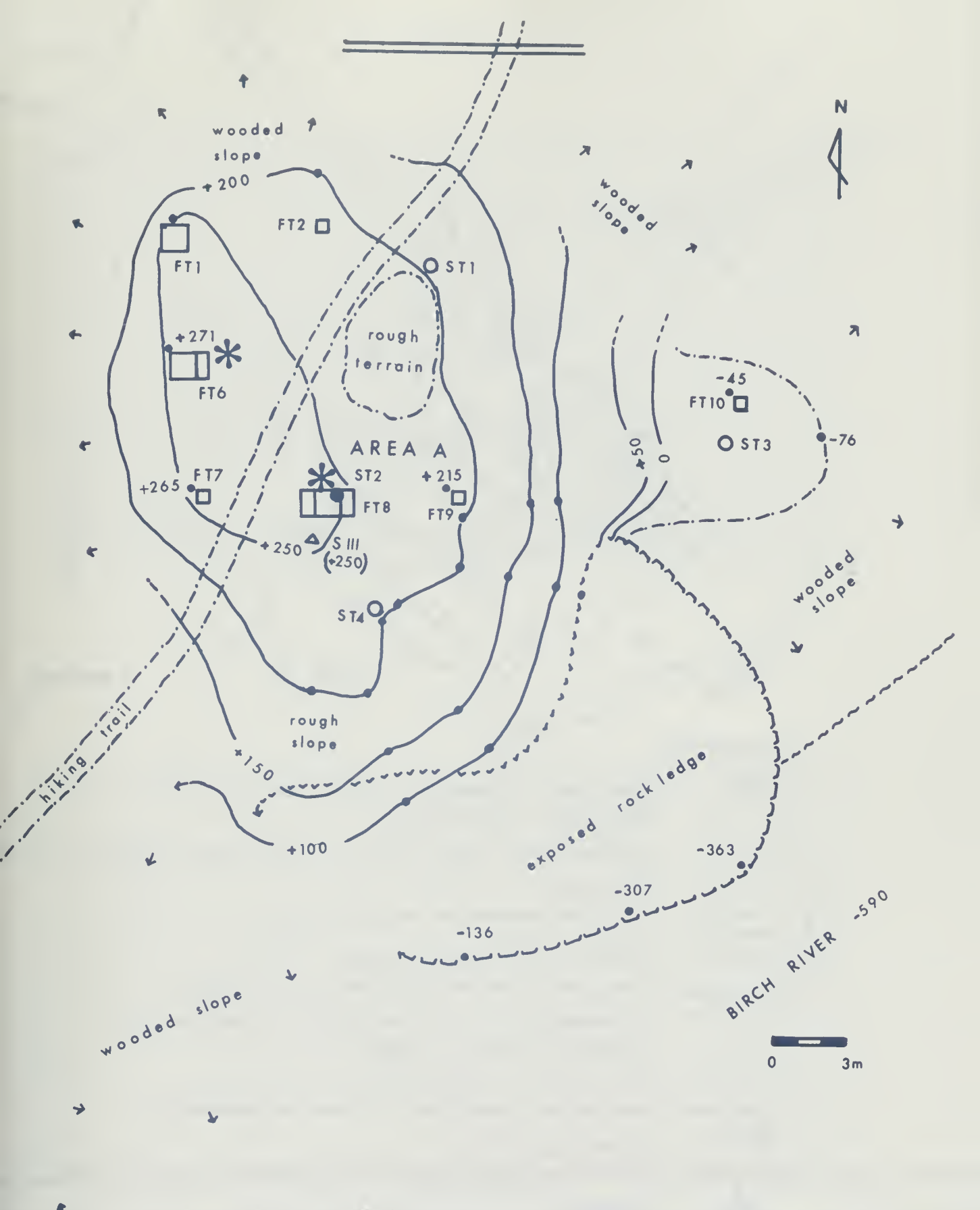
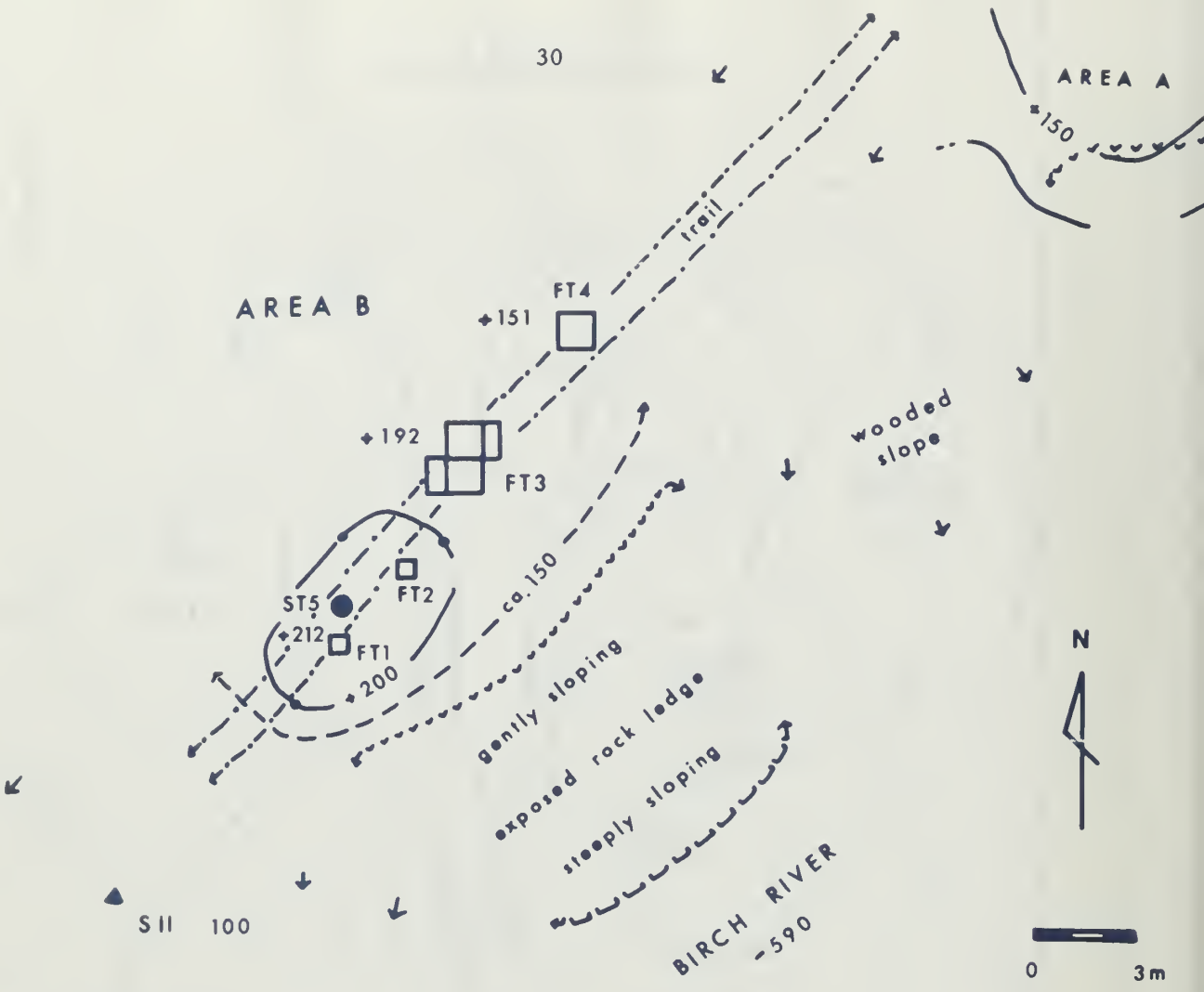


Figure 6. 21-SL-165, Area A. (For explanations, see Figure 7.)



EXPLANATIONS

	approximate N boundary of SE¼,NE¼ Section 27, T61N, R13W.
	inland edge of rock outcrop
	riverward edge of rock outcrop or upper edge of steep drop to riv
	river bank
	estimated boundary of described feature
	wooded, more irregular terrain
●+200	elevation points determined by transit readings
	elevation contour estimated without transit readings
	downward direction of slope
S III	transit station (SI marked on rock outcrop)
+138 -90	centimeters above/below arbitrary datum (±0 at SI)
FT2	formal test unit
ST1 ST2	shovel test (cross lines indicate that test was positive)
	jackpine

Figure 7. 21-SL-165, Area B, with Explanations to All of Figures 5 - 8

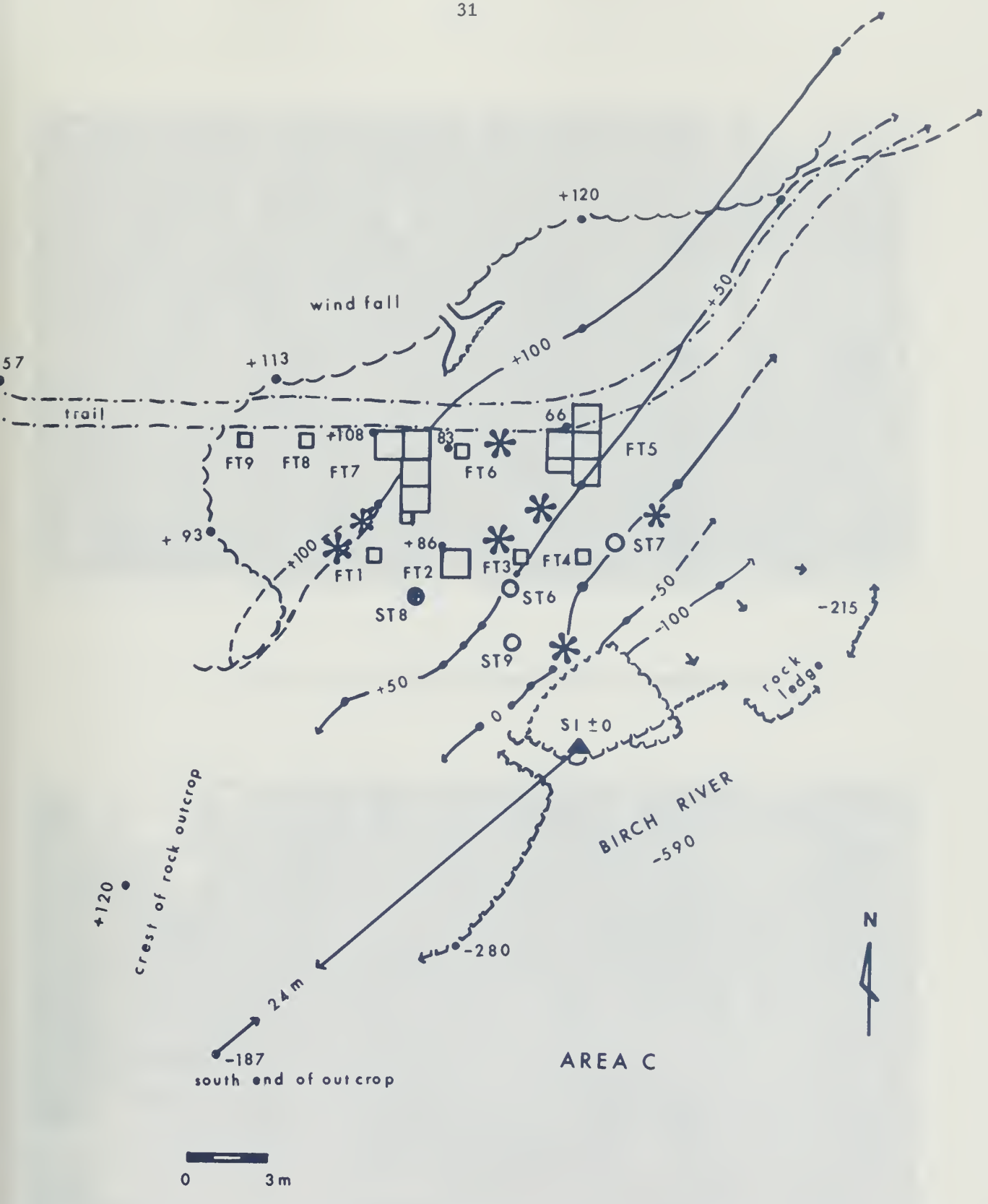


Figure 8. 21-SL-165, Area C. (For explanations, see Figure 7.)

Plate 2. View from Area B towards Area C.

Plate 3. View southwest across Area C.

Plate 4. Area C, view towards the south across Birch River.

Plate 5. Area C, view northeast back towards Area B.

unit was chosen for the initial testing rather than the more traditional 1x1 meter.

After such units had given us a better grasp on the variability in find density within each of the three areas, those units that seemed to have the most research potential were expanded into full 1x1 meter tests. A total of seventeen 50x50cm units were excavated and of them, six were expanded.

All units were hand troweled and the soil matrix screened through 1/4 inch mesh. In addition, an 8% soil sample was taken from each 10cm level and brought back to the laboratory where it was strained through a set of geological screens (#4, 7 and 16, with mesh openings of 4.75, 2.8 and 1.8mm, respectively). All finds and conspicuous features were recorded in situ by metric coordinates whenever possible and then plotted directly on graph paper planview maps (see Figures 9-15 as well as Appendix B). They were also recorded, along with the soil profile, on standardized test content forms (samples included in Appendix B). Photographs were taken a) at the bottom of each 10cm level that had yielded any cultural evidence and b) of some of the soil profiles. Color film was used for both prints and slides in order to pick out also the more subtle differences in soil color.

Finally, the entire area was mapped using a transit. The original plan had been to do this at the beginning and at the same time establish a baseline and grid of metric coordinates that could be used for the spacing of test units and recording of all results. Several days of wet and windy weather at the beginning of this investigation, in combination with the imminent possibility of snow and colder weather, forced us to revise this plan. In order to begin excavating in spite of the bad weather, we spaced all units using compass and pacing and reserved the recording with metric coordinates for use within the units. Later, when the weather improved and it became possible to use the transit, the test units were indicated on the map along with all the other features of the site area. A permanent datum point was established on the main outcrop in Area C--Station I (SI).

Phase III (Mitigation), 6.2-14.1984

Five of the most promising of the Phase II units were expanded: Area A, FT1 and FT6 (by a total of 1 3/4 square meters), Area B, FT3 (by a total of 2 square meters) and Area C, FT5 and FT7 (by a total of 6 1/2 square meters). In addition, a few new test units were excavated in order to better define the perimeters of the more intensive use areas: Area B, FT4 (1 square meter) and Area C, FT8, 9 and 10 (totaling 1 square meter).

All units were hand troweled in the same manner as those of the Phase II investigation. As a fairly large number of small lithics had turned up in the fine mesh used to screen the Phase II soil samples, it was decided that the Phase III data recovery could be improved by water screening all soil through 1/8" mesh. On the other hand, as the Phase II soil samples, as well as an initial series of Phase III samples consistently had failed to turn up any lithic, floral or faunal evidence smaller than what would be caught by 1/8" mesh, we also decided to forego flotation samples for the later Phase III units.

Recording methods were the same as those used during Phase II. The resulting planviews and profiles have been combined and presented here either as figures within the main text (Figures 9 to 15) or as part of Appendix C.

In order to avoid any confusion and mistakes that could have occurred during relabeling of artifact labels and units, we decided to stay with and expand on the initial sub-area/test unit designations rather than to integrate them with an overall site grid/coordinate system after the entire site had been mapped at the end of Phase II. Figures 5 to 8 show the spatial relationship between the subareas and excavation units. Coordinates (expressed in centimeters) have consistently been used for recording within the excavation units.

V. FIELD INVESTIGATION--DESCRIPTION AND INTERPRETATION OF FINDINGS

The typical soil profile at this site shows a fairly thin layer of dark sandy humus (with much poorly decayed organic matter) over 20-25cm of reddish brown silty sand/ sandy loam and then increasingly pale yellowish brown soil of the same texture down to bedrock or boulders which in most units emerge already around 40-50cm. Typical soil profiles are shown on Figures 12 as well as in Appendix C. In this generally light and fine grained sandy soil (Munsell classification 7.5YR 4-3/4 to 10YR 4/4-6), staining by organically enriched soil and charcoal, stands out very clearly. Such features were noted in several of the units. This section of the report begins with a description and discussion of those features and concludes with comments about the artifact assemblage.

Description of Test Units and Cultural or Possibly Cultural Features

Within Area A, the Phase II investigation began with a series of six 50x50cm test units placed across the crest of the ridge, including the peripheral zone of transition between the crest and the distinct downward slope (Figure 6). A seventh test was put in on the small but fairly level terrace that had been tested by means of ST3 on 7.5.1983. After the seventh test had proved negative, like ST3 did earlier, this lower terrace was written off as being culturally sterile. Likewise, after all the tests in the transition zone between crest and slope had yielded negative results (FT2 and 9, ST1 and 4), this zone was excluded from further work. Within the more level part of the crest, three out of four formal tests proved positive.

In Area A, FT1 (at the north end of the ridge, farthest away from the river), 24 pieces of debitage were scattered throughout the 10-20cm and 20-30cm levels (see planview in Appendix C). Because of the apparent lack of either concentrated scatters of artifacts or any other evidence such as charcoal, fire cracked rock (FCR) or dark stains in the soil, the unit was not expanded at this time.

In Area A, FT6 (on the central part of the crest), the upper two levels produced only a couple of flakes but a well made "thumbnail" scraper and two concentrated scatters of debitage turned up in the eastern half of the 20-30cm level, near some fractured rock which may have been fire cracked (see planview in Appendix C). As the unit seemed to have considerable potential, it was extended by another 50x50cm which, however, only produced one flake. Because of the heavy root disturbance in the eastern half of the unit, no further expansion was attempted.

Area A, FT8 (in the southeastern part of the crest area, with a good view of the river) was expanded to a full square meter as soon as the initial 50x50cm unit had yielded a dense scatter of flakes and some charcoal. Unfortunately, the northern part of this expanded unit proved to be badly disturbed by roots but a rich yield of debitage still made the expansion worthwhile: in all, 45 pieces of lithic waste material and one well-made scraper were found scattered throughout the upper four 10cm levels (see planview in Appendix C). In addition, there was a lens of darker soil in the NW 1/4, as well as a number of smaller dark soil stains with numerous pieces of charcoal in the rest of the unit, most of them at a depth of 20-25cm. The small size of most of the stains and the often large size and incomplete carbonization of the charcoal chunks within them seemed to indicate that both were the results of forest fire (burnt roots) rather than the remains of cultural activities. In order to try to determine their origin and to better assess the significance of the larger dark stain, FT8 was expanded again, this time with a 50x100cm unit on both the west and east side.

In the western extension, Area A, FT8/W, the same large dark stain continued throughout the northern half of the unit, again showing up from about 20cm and tapering off through the 20-30 and 30-40cm levels. A number of fractured rocks were scattered within and along the edge of the darker stain--the larger ones have been plotted on the unit map. The smaller dark stains that had been observed in the initial 1x1 meter were lacking in FT8 West. Seventeen pieces of debitage were scattered throughout the upper four 10cm levels, all along or fairly close to the edge of the darker area. In Area A, FT8/E, there were no dark soil stains at all but the scatter of debitage and charcoal specks and chunks continued.

Although no further information was gained about the smaller dark stains in either extension, it still seems most plausible to interpret them as the remains of forest fire. The larger dark stain, however, clearly visible in the northwest part of FT8 and the northern half of FT8/W, may well represent the remains of a fire basin: the way in which the stain tapers towards the base and the north/ northwest suggests a classic basin shape. Throughout both FT8 and the extensions, bedrock began to emerge in the 35-45cm level, first in the northern part. Artifacts were still being found within a few centimeters above the bedrock.

During the Phase III investigation, two of these Area A units were selected for expansion: FT1 (which, although it had not proved very productive, still might serve as a good example of the peripheral part of the use area, located as it is near the innermost, northwest perimeter of the crest) and FT6 (which, although it lacked any dark staining, had

produced a scraper, a core, two clusters of flakes and some firecracked rock). Plans to expand the northwest part of FT8 (which had yielded evidence of the southeast part of a fire basin) were abandoned once soil coring had indicated very massive root disturbance in the area as well as possible impact from pedestrian use of the hiking trail that runs across the crest.

Results of the Area A, FT1 expansion (see Appendix C) were also rather unproductive, indicating minimal use of this innermost part of the crest.

The westward expansion of Area A, FT6, on the other hand (see Appendix C) proved very rich in lithic evidence: a dense scatter of flakes throughout the eastern and northern parts of the unit as well as a couple of particularly distinct concentrations in the northeast, central and southeast parts all of which suggests that this may have been a lithic work area. There were no dark soil stains (other than a root stain or rodent burrow), just thinly scattered specks of charcoal which may or may not postdate the prehistoric occupation--remains of forest fires seem fairly common across the site area.

Three units were excavated during the Phase II investigation of Area B (Figure 7). Near the southwest end of the level part, just above the beginning of the slope towards the river and towards Area C, Area B, FT1 yielded a thin scatter of 7 flakes between 10 and 40cm depth. There was no charcoal or FCR and there seemed to be little point in expanding this unit.

Three meters further northeast, Area B, FT2 proved completely negative.

Area B, FT3 was placed 3 meters northeast of FT2, in the center of the level part of the ledge and a few meters in from the beginning of the steeper slope towards the river. The original 50x50cm unit produced a concentration of 6 flakes in the 20-25cm level. As it was expanded into a full square meter the 10-35cm horizon of the other three quarters yielded another 19 pieces of debitage, mostly from the lower 10-20 and the upper 20-30cm levels (Appendix C). Charcoal was found only in one area, a small and irregular lens of darker soil which, again, could be interpreted as the remains of a burnt root. There were no other dark stains and only one fractured rock, a piece of granite which may or may not have been fire cracked.

The Phase III investigation of Area B focused on FT3 as the most promising of the units. While little was found in the westward expansion, those toward the north and northeast proved to be amongst the most productive units on the site, with a very dense scatter of debitage throughout, as well as

a couple of retouched/utilized flakes. Again, however, there was a complete absence of dark soil stains and fire-cracked rocks. A new test unit, Area B, FT4, excavated just two meters to the northeast of FT3N, produced very little evidence, which suggests that the FT3 area was a rather circumscribed, but intensively used, lithic workfloor (see plan view in Appendix C).

Area C contains the largest number of excavated units (Figure 8). As in the case of Area A, Phase II testing both along the inland periphery of the more level area and in the transition zone between the level area and the slope towards the river proved very unproductive--only one flake from a total of three 50x50cm formal tests and three shovel tests. Within the central part of the level area, on the other hand, one shovel test and three out of four 50x50cm formal tests gave positive results. The positive formal units, Area C, FT2, FT5 and FT7, were expanded into full 1x1 meter units.

Area C, FT2 produced 32 lithic artifacts, most of them from the lower 10-20 and upper 20-30cm levels; a lens of somewhat darker soil in the southwest corner may be the remains of a firepit, an interpretation supported by a scatter of fractured, possibly fire cracked rocks around its periphery on the north/northeast side (see plan view in Appendix C). A dense scatter of flakes in the southeastern corner, all but one of the same raw material, would seem to indicate a lithic work area.

Area C, FT5 was also quite productive in terms of lithics (25 items scattered between 10 and 40cm, with concentrations in the lower 10-20, lower 20-30 and lower 30-40cm levels), see Figure 11. It was also the unit with the most distinctive cultural features on the whole site: three rounded areas of darker soil (almost all of one and a large part of another two), all three with a number of fairly large pieces of charcoal and with many chunks of fractured, probably fire cracked, granite as well as some regular, intact granite boulders within and around the periphery (Figure 9, 10 and 12). All the dark areas began to show up quite clearly in the lower 20-30cm level and had tapered off to considerably smaller, even more distinctly rounded areas by 40cm, suggesting, for all three, a somewhat irregular basin shape. One of the larger rocks, a granite boulder, is particularly interesting. Located just outside the southeastern edge of the large dark stain, it has a flat upper side. Its lower side rests, in part, on the bedrock that lies almost immediately underneath the bottom of the larger dark lens. The other end seems to have been very deliberately propped up with a smaller rock in order to keep the flat upper side horizontal--see top and side view as plotted on the plan view in Figure 9 and the wall profile in

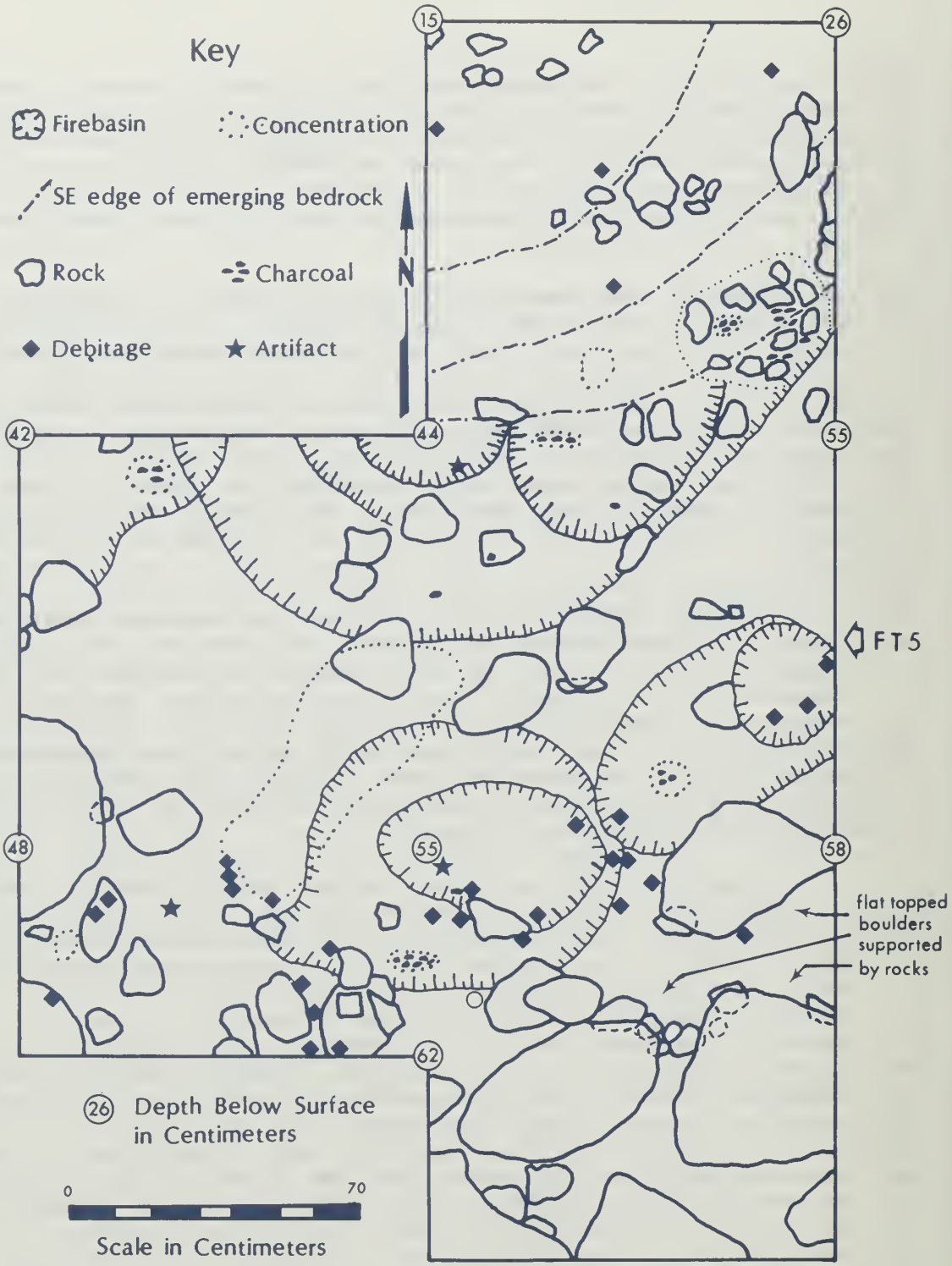


Figure 9. Composite Plan View Map of Area C, FT5 with Extensions (Lithics and Features).

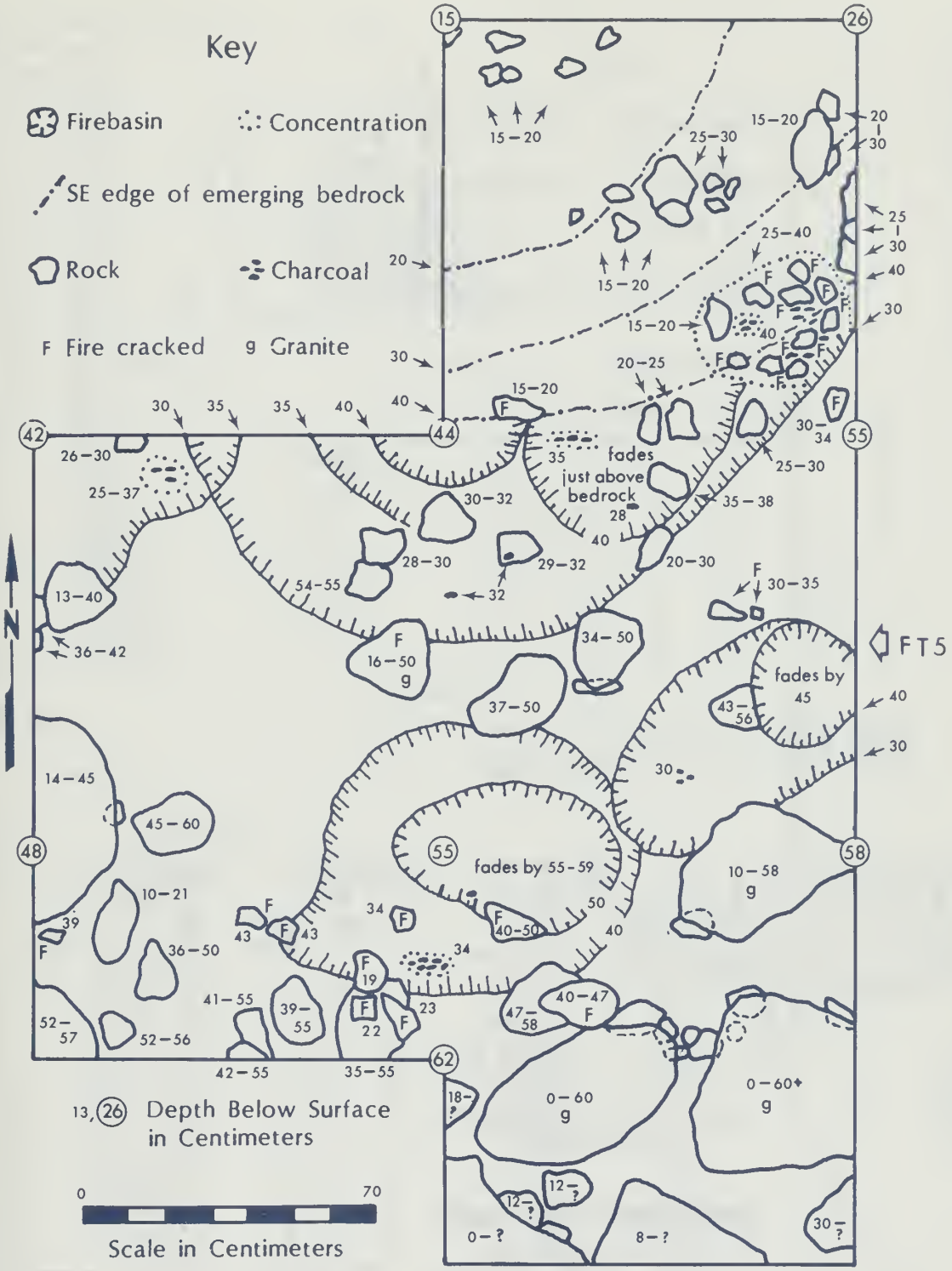


Figure 10. Composite Plan View Map of Area C, FT5 with Extensions (Features).

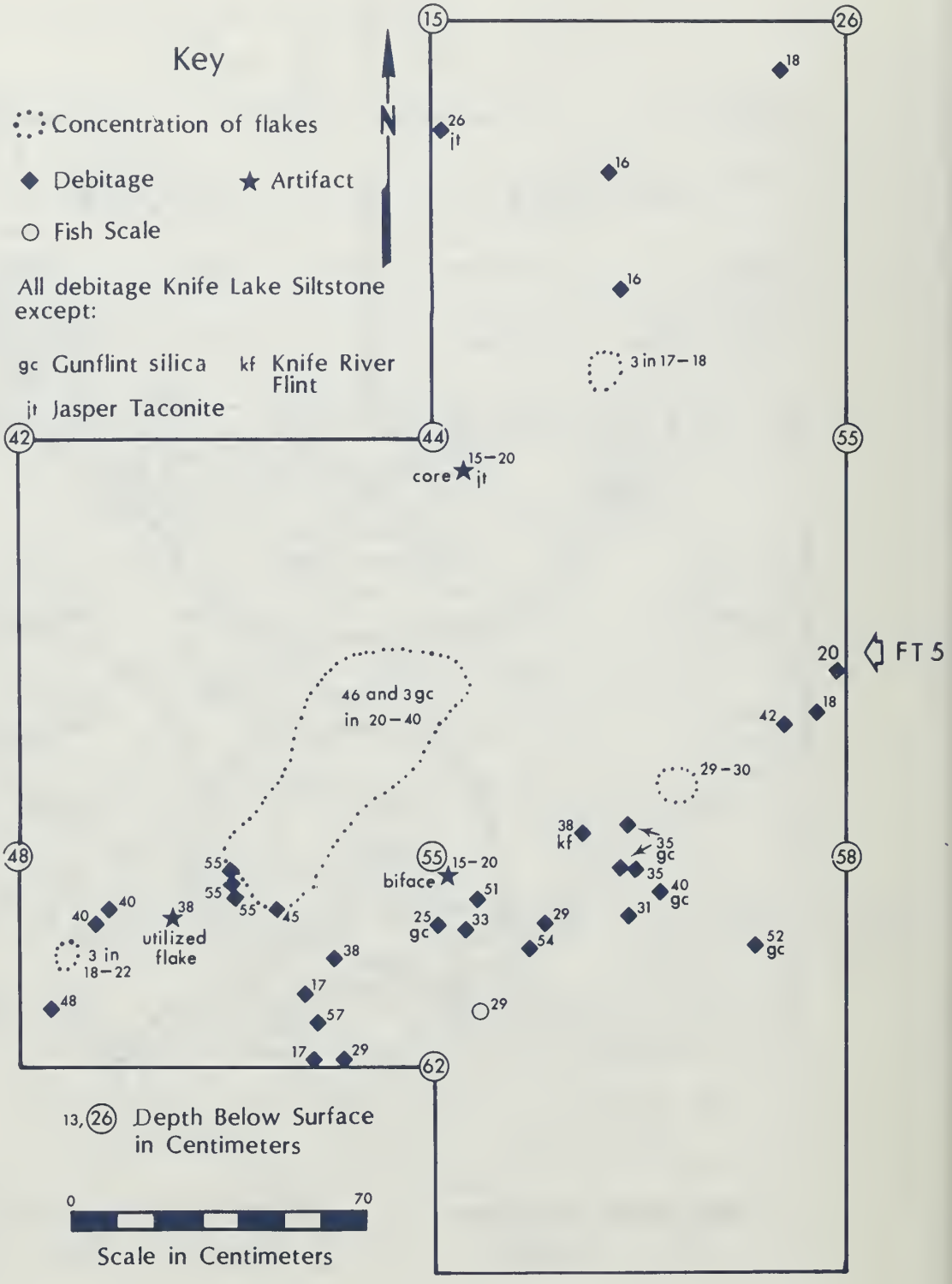
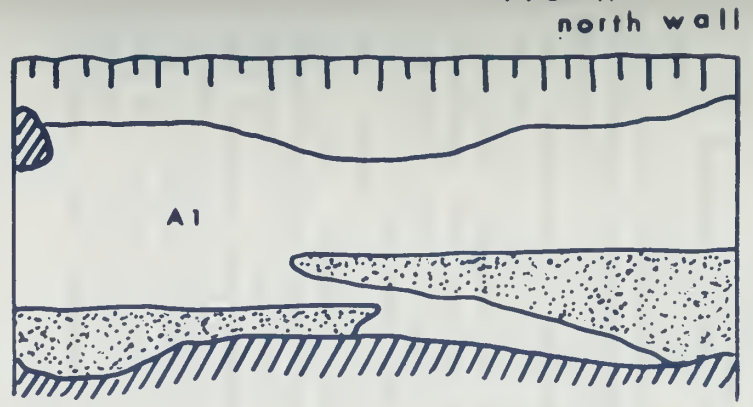
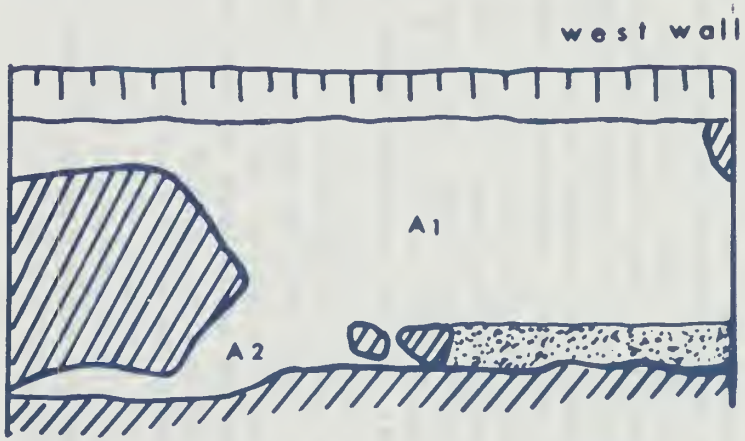
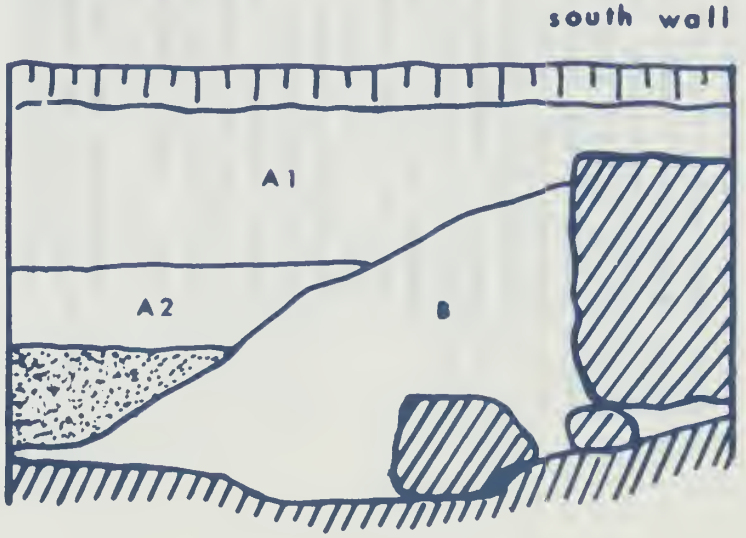
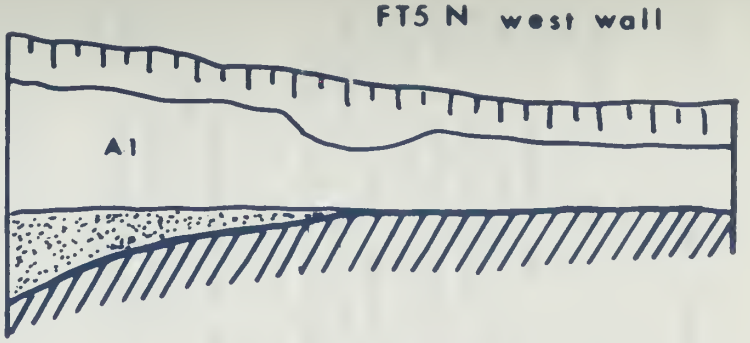


Figure 11. Composite Plan View Map of Area C, FT5 with Extensions (Lithics).









West central FT5: deliberately (?) balanced/wedged boulder.

sod layer and humus (black-dark brown -- 7.5 YR 2/0-3/2)

A1 dark brown silty sand (7.5 YR 3/2-3/4)

A2 brown-dark brown silty sand (7.5 YR 3/4-4/4)

B dark yellowish brown silty sand (10 YR 3/4-3/6)

dark brown silty sand with charcoal specks (7.5 YR 3/2)

bedrock/boulder/cobble

Figure 12. 21-SL-165, Area C, FT5 with Extensions: Selected Profiles.

Figure 12. Possibly, this formed some kind of flat work area next to the fire.

Area C, FT7, finally, produced the highest concentration of lithics of all the Phase II units: 55 items, 51 of them of the same raw material (see below under Artifacts). Almost all came from the lower 10-20cm and the upper 20-30cm levels. Thirty-six of the flakes were found within a small area (less than 10% of the total level) and the majority of the rest came from within about 40cm or less from that concentration. Otherwise, the unit was totally lacking in meaningful patterns or features--an irregular lens of orange soil with a scatter of charcoal is probably the remains of a burnt root (Figure 13).

Two of the Area C units were selected for expansion in the Phase III investigation: FT5 and FT7, the former in order to uncover more of the distinct fire basins and, possibly deliberately arranged, boulder formations, the latter in order to further investigate the nature of the dense lithic scatter.

FT5 was expanded towards the north, west, southwest and south. As a result, another fire basin, originally partially visible in southwest FT5, was completely exposed and excavated along with a large number of fire cracked rocks, some charcoal concentrations as well as numerous scattered specks, a broken biface and a dense scatter of flakes along/outside its west/northwest edge. To its immediate northeast lies the fire basin which was exposed in its entirety in the original FT5 unit; both tapered to a distinct basin shape when excavated, ending/fading just above emerging bedrock. Both are also surrounded by large, flat-topped boulders which appear to have been deliberately propped up with smaller rocks wedged between their rounded bases and the sloping bedrock, possibly to serve as reasonably level work/seating areas, as suggested above on page 27 and shown on the plan view in Figure 9). A much larger fire-stained area began to show up in the northern parts of FT5 and FT5/W--a large dark stain with several smaller dark basin shapes within, possibly part of a living floor. As this stain continues to the north/northeast, it becomes increasingly difficult to distinguish from the surrounding area, due mainly to the fact that the already thin topsoil layer (here only 20-30cm above bedrock) contains much of the naturally darker humus horizon and has been further compacted by pedestrians using the hiking trail that cuts across the north part of the stained area. Finally, a part of another dark area becomes visible in the northwest part of FT5/W. Both of these northern dark stains also contain much firecracked rock and charcoal but neither produced many lithics.

The original Area C, FT7 unit was expanded towards the east and southeast (Figures 13-15). FT7/E and northern FT7/SE yielded a continuation of the lithic scatter first discovered in FT7: a number of flakes as well as a couple of scrapers, a fractured biface and a utilized blade, all scattered within and around a cluster of large granite boulders. Apparently, this area served as a knapping floor as well as, possibly, a work area for some other processing of raw materials. Separated from the above by an area of low find density in southern FT7/SE and the northern two thirds of FT7/SSE, the southwestern corner of the latter, as well as a 50 x 50cm southward extension thereof, both contained the eastern half of a distinct fire basin surrounded by fire-cracked rock and several large granite boulders, including one that appeared to be deliberately propped up by a smaller granite cobble (Figure 13). Very few lithics were found around this fire pit--a few flakes, crude biface and a large retouched flake standing on end as if deliberately wedged into the ground.

Description and Interpretation of Lithic Evidence

A total of 847 items were found during this investigation, all of them lithics. Only 21 are finished implements or flakes with a modified or at least utilized work edge, while the rest represent some kind of debitage, either raw material used or flaking debris produced during tool manufacture or tool maintenance. A number of fractured rocks, mostly granite, were found within and around the darker areas interpreted as firepits (see above); a few were found thinly scattered also in units that contained artifacts but no evidence of past fires. Whether the latter were cracked by fire, frost or some other agent is hard to say; most if not all of the ones found near fire areas probably were cracked by heat. Neither is it very clear how many of the fire cracked rocks should be regarded as artifacts. While some seem to have been deliberately placed by the dark areas and possibly were used as pot boilers, hammer stones, props etc., others may have been exposed to the fire purely by accident.

Nine types of debitage are represented in the assemblage(s) recovered at 21-SL-165. The following brief definition of each type, arranged according to the place of each in the total reduction sequence or manufacturing process, are based on terms used by Bradley (1975), Crabtree (1972), White (1963), and Withrow (1983).

CHUNK: A large piece of suitable raw material which has not yet been modified but appears to have been brought to the site as a potential core.

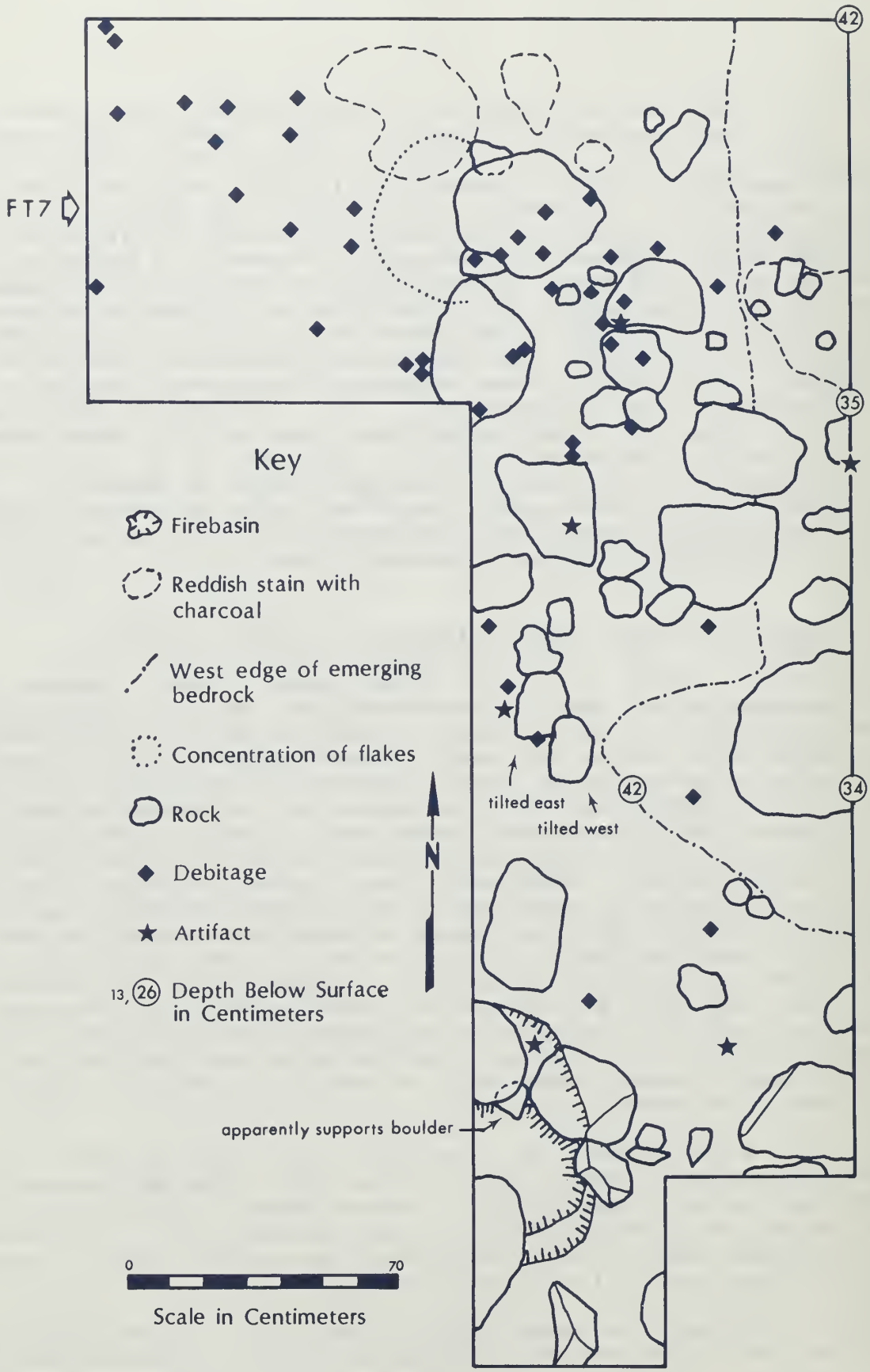


Figure 13. Composite Plan View Map of Area C, FT7 with Extensions (Lithics and Feature).

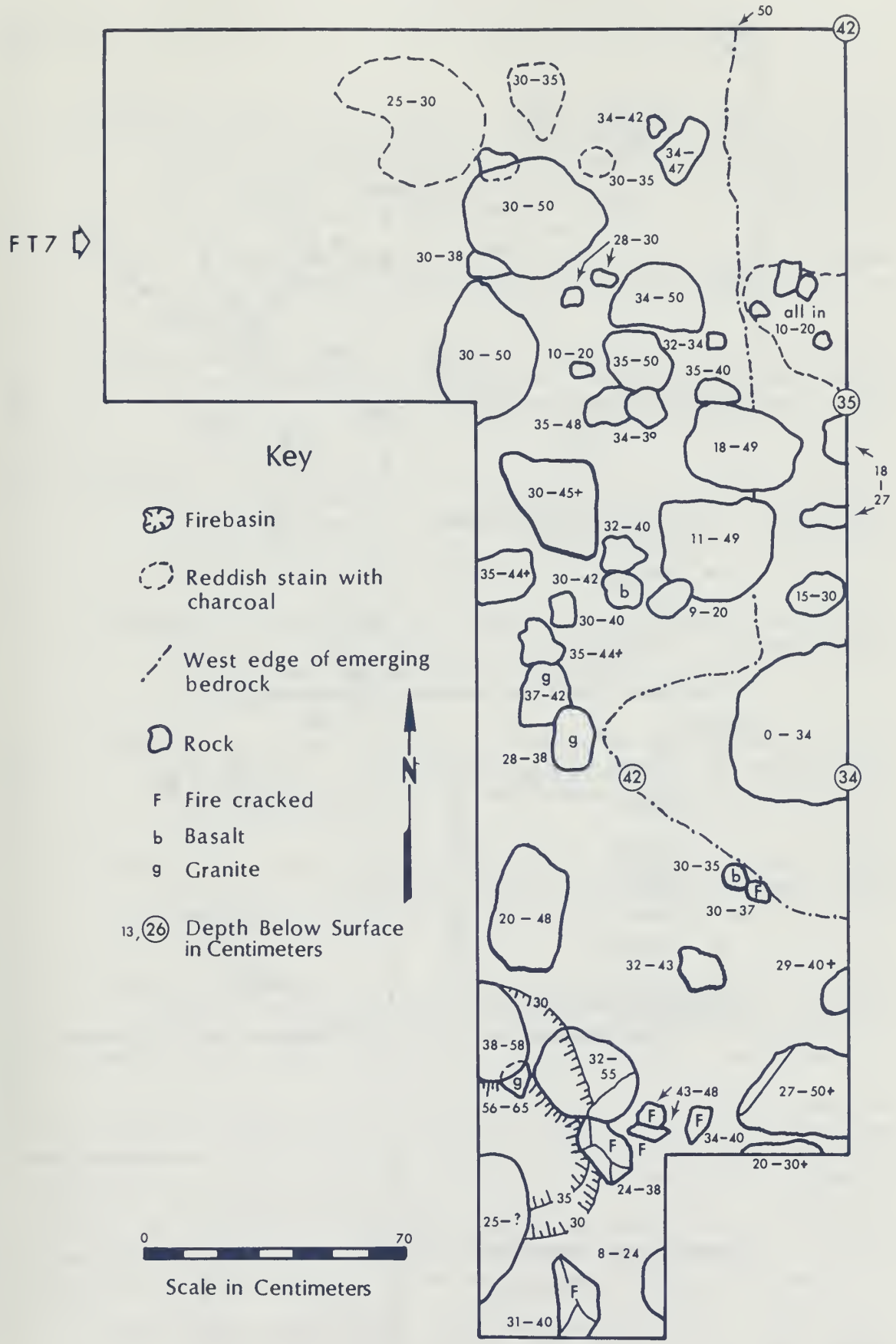


Figure 14. Composite Plan View Map of Area C, FT7 with Extensions (Feature).

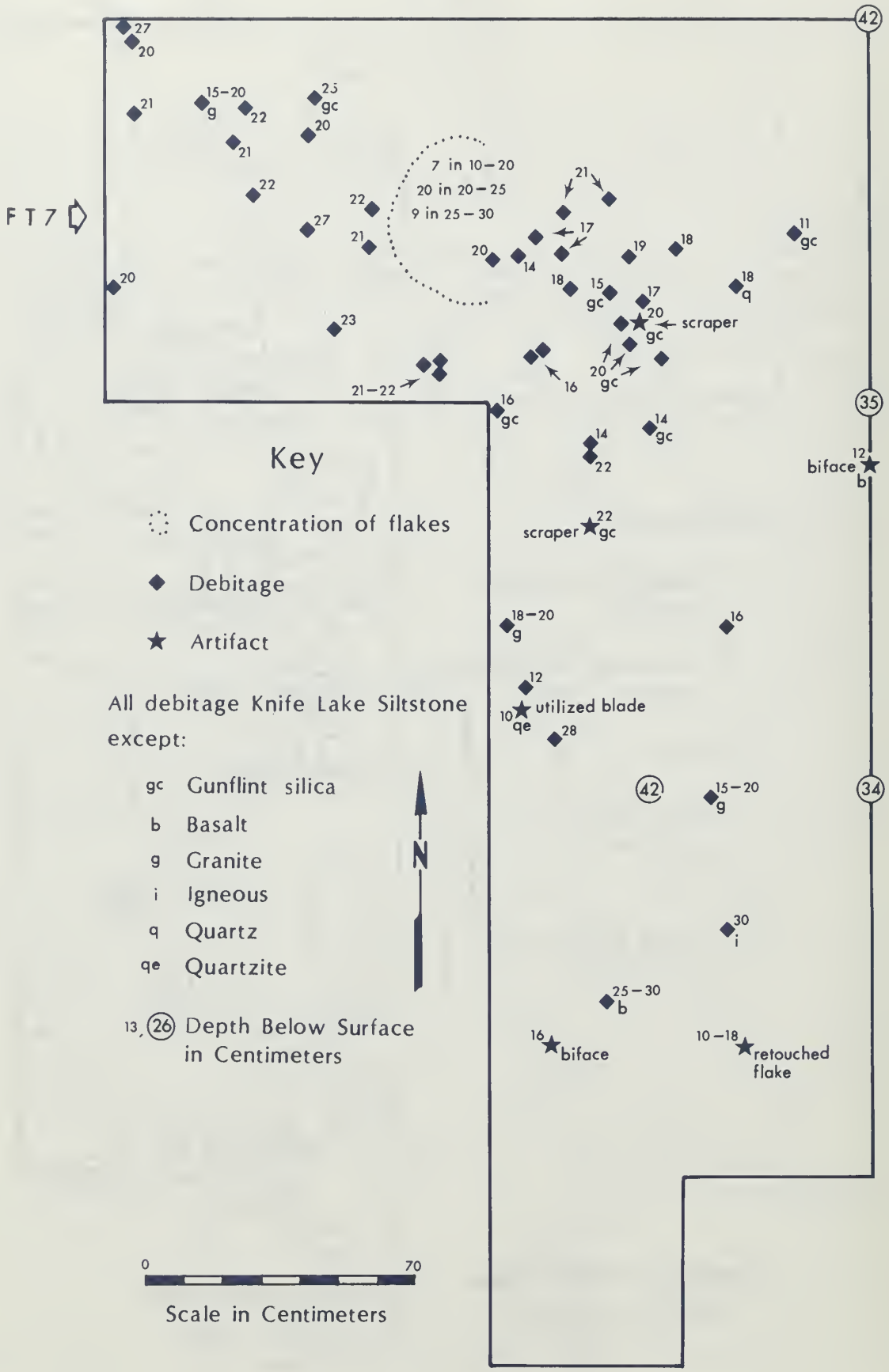


Figure 15. Composite Plan View Map of Area C, FT7 with Extensions (Lithics).

CHECKED PIECE: A chunk of raw material with one or more randomly placed negative flake scars that probably result from a preliminary evaluation of the flaking quality of the material--may be a potential core or a reject.

CORE: A nodule of raw material which definitely has been used for the deliberate production of a series of flakes.

SHATTER: Irregularly shaped pieces of raw material which generally were the by-product of heavy percussion flaking with a hard hammer--lack such flake characteristics as a bulb of percussion etc.

PRIMARY DECORTICATION FLAKE: A flake with a dorsal surface which still is completely covered with the original cortex of the raw material (although small scars from the preparation of a striking platform may be present).

SECONDARY DECORTICATION FLAKE: A flake with a dorsal surface that still is partially covered with cortex but which also features scars from the primary decortication.

REGULAR TERTIARY FLAKE: A flake produced during the modification of the overall shape of an implement, i.e. the reduction stage between decortication and edge modification.

BLADE: A particular type of tertiary flake with parallel or almost parallel lateral edges, the length of which is equal to or more than twice the width.

RETOUCH/REJUVENATION FLAKE: A small, usually thin flake which is the product of either the initial edge modification or subsequent edge rejuvenation rather than the overall shaping of an implement.

The following types of raw material have been used for the lithics from this site; terminology and classification is based on that used by Ontario archaeologists (McLeod, 1978-1980 and William Ross, Regional Archaeologist, Ontario Ministry of Citizenship and Culture, personal communication). Equivalents commonly used in Minnesota are given in brackets. The abbreviations used for each type in this report have been given at the end of each type description.

SILTSTONE (ARGILLITE, ARGILLITE-QUARTZITE, SILICEOUS SHALE): A medium to dark grey, sometimes rather greenish, fine grained, moderately hard siliceous sedimentary rock with good to very good flaking

properties. Can be found in outcrops in northeastern Minnesota and adjacent parts of Ontario, particularly in the Boundary Waters area; may also be found in nodules in glacial drift considerably further south and southwest. Because of the fairly close proximity of 21-SL-165 to the Boundary Waters region, it is likely that the siltstone used on this site is of the Knife Lake Siltstone variety (named after a prolific source near the Canadian border). It is therefore referred to as such throughout the report. (KLS).

JASPER TACONITE (JASPERLITE, OOLITIC TACONITE): A reddish chert which, depending on the iron content and the degree of oxidation of the iron, may vary from bright red to very dark red, even almost black, in color. The oolites are usually quite visible. This material grades into Gunflint silica (see below) and occurs embedded in the shale of the Gunflint Formation along the U.S.-Canadian border where it can be found in a number of outcrops, particularly in the Thunder Bay area. It also occurs as weathered cobbles in glacial till deposits further south. (JT).

GUNFLINT SILICA: Found in the same formation and locations as jasper taconite and often seen grading into it, these silicas come in a variety of colors and shades, from white to light grey, tan, dark grey, brownish grey, bluish black. They generally exhibit one or more planes of cleavage and may have mottled or oolitic inclusions or thin dark bands running through them. They tend to be quite translucent, often with a glossy, waxy texture. 21-SL-165 lithics of this material fall into five distinct varieties which could represent specific cores or sets of cores from particular parts of the Gunflint formation; recent evidence from a quarry on North Lake, however, suggests that such variation may be a function of banding within the deposit rather than of differential location along the formation. They have been designated as GFC a-e. (GFC).

HUDSON BAY LOWLAND CHERTS: These come in an even greater range of colors--different shades of white, cream, yellow, amber, tan, pink, grey, brown or black. Usually, this color is solid but combinations occur and then often in quite wavy and complex banded patterns. There may be small, off-white inclusions or fragments of fossils. Generally, there is no plane of cleavage. They can also be quite translucent but tend to be more opaque than the Gunflint silicas. They often

exhibit remnants of a white and chalk-like cortex which is never found on the Gunflint silicas. These cherts were brought by glacial action from the Hudson Bay Lowlands and are found as cobbles and nodules in deposits of glacial till or gravel. (HBL).

KNIFE RIVER CHALCEDONY (KNIFE RIVER FLINT): High quality chert, often quite translucent, with a smooth and waxy surface after heat treatment. Originating from a source in west-central North Dakota, it seems to have been distributed quite widely and is not unusual on prehistoric sites in Minnesota. A couple of flakes at this site seem manufactured out of such material. (KRF).

QUARTZ OR MILKY QUARTZ: Milky white but often quite translucent, it lacks a specific plane of cleavage and the higher grades, with no or few impurities, have a very distinct conchoidal fracture. Can be found in veins running through the bedrock in most parts of northeastern Minnesota and is a very common raw material on prehistoric sites in this region. (QTZ).

QUARTZITE: A fine grained, rather dark greyish brown quartzite is represented by a number of flakes. The origin is probably glacial. A much more coarse grained, light colored material tentatively identified as a quartzite, is represented by a wider range of debitage including some chunks and a possible core and was also used for what appears to be a broken cutting tool--the origin is almost certainly some local glacial deposit. (QTZE).

IGNEOUS ROCKS: A few flakes of basalt, greenstone and granite suggest intermittent use also of more coarse grained rocks, probably found locally as glacial cobbles. (BAS, Other Igneous).

A complete listing of all the lithic finds, by test unit and level can be found in Appendix D. The discussion in this section will be limited to comments on the patterns suggested by Tables 2-6 which summarize the relationships between size, technological classification, raw materials used and provenience.

Tables 2 and 3 illustrate the clear predominance of siltstone (KLS) amongst the raw materials used at this site, 536 out of 847 lithics are of this material, i.e. about 63% of the total. Table 2 also shows that only three of the 536 are fully modified implements, while two are retouched and/or utilized flakes. The rest are all some form of debitage, mostly either tertiary flakes (and a few blades)

	Finished Implement	Retouched/Utilized Flake	Primary Decortication Flake	Secondary Decortication Flake	Tertiary Flake	Blade	Retouch/Rejuvenation Flake	Flake Fragment	Shatter	Core	Checked Piece	Chunk of Raw Material	TOTAL
KLS		A:1 *		A:4	A:110	A:7	A:33	A:13	A:4				172
					B:66	B:3	B:19	B:16	B:3				107
	C:3	C:1			C:198	C:4	C:31	C:18	C:2				257
JT	A:1		A:2	A:2	A:14		A:1	A:1	A:1				22
		B:4	B:2	B:2	B:15		B:6		B:1				30
		C:2			C:19	C:2	C:2		C:1	C:1			27
GFCa **													0
							B:1						1
			C:2		C:6				C:11				19
GFCb													0
													0
	C:1	C:1	C:2	C:3	C:4		C:1						12
GFCc	A:1	A:1	A:1	A:1	A:4				A;1				9
				B:1	B:3		B:1						5
	C:1				C:4		C:2	C:2	C:2				11
GFCd					A:2		A:6						8
													0
													0
GFCe									C:2				2
HBL			A:2		A:2	A:1	A:4		A:2				11
						B:1	B:3	B:1					5
			C:1	C:1	C:1		C:2						5
KRF					A:2								2
													0
													0
QTZ				A:3	A:13	A:1	A:5	A:3	A:10	A:2	A:2		39
			B:1	B:8	B:15		B:7	B:3	B:15				49
		C:1	C:1		C:1			C:1	C:4				8
Grey QTZE					A:3		A:1						4
					B:15	B:2	B:4	B:3					24
		C:1		C:1	C:2								4
Coarse grained QTZE					A:2							A:1	3
													0
	C:1				C:1					C:1		C:1	4
BAS													0
													0
					C:2								2
Other Igneous													0
													0
	C:1		C:1		C:2				C:1				5
TOTAL:	9	12	15	26	506	21	129	61	60	4	2	2	847

Table 2. Raw Materials -- Type and Frequency of Occurrence within Specific Lithic Categories.

* A, B and C stand for Areas A, B and C respectively.
** Varieties described on Table 3.

	AREA A							AREA B						
	FT1 1m²	FT6 50x100cm	FT6/W 1m²	FT8 1m²	FT8/W 50x100cm	FT8/E 50x100cm	FT2,7,9 & 10 each 50x50cm	FT1 50x50cm	FT2 50x50cm	FT3 1m²	FT3/W 50x100cm	FT3/N 1m²	FT3/NE 50x100cm	Sub-total
KLS	29	7	74	34	9	19		5		8	3	82	4	274
JT	9	1	12							5		11	9	47
GFCa														
GFCb														
GFCc			4	2	3								5	14
GFCd			8											8
GFCe														
HBL			7	1		3		1		2		2		16
KRF					2									
QTZ		8	19	9	3					10	8	21	9	87
Grey QTZE	1	2	1					1				23		28
Coarse grained QTZE		3												3
BAS														
Other Igneous														
TOTAL:	39	21	125	46	17	22	0 0 0 0	7	0	25	11	139	27	452

Table 3 a. Lithic Raw Materials -- Type and Provenience (for Area C, refer to Table 3 b).

AREA C

	FT4 1m²	FT2 1m²	FT4 50x50cm	FT5 1m²	FT5/N 1m²	FT5/W 1m²	FT5/SW 50x100cm	FT5/S 1m²	FT7 1m²	FT7/E 1m²	FT7/SE 1m²	FT7/S of SE 1m²	FT9 50x50cm	FT1,3,6,8 (50x50cm) FT10 (50x100 cm)	TOTAL
KLS	5	12	1	16	6	41	65	29	51	26	7	2	1		536
JT	5	17		2	1	1				1			5		79
GFCa	1			3		12	2		2						20
GFCb								4		4	4				12
GFCc				1		4	1	2		2	1				25
GFCd															8
GFCe						2									2
HBL				3		1							1		21
KRF															2
QTZ	1					2	1	1		4					96
Grey QTZE					2				1		1				32
Coarse grained QTZE		3							1						7
BAS												1	1		2
Other Igneous											2	3			5
TOTAL:	12	32	1	25	9	63	69	36	55	37	15	6	8	0 0 0 0	847

Table 3 b. Lithic Raw Materials -- Type and Provenience (for Areas A and B, refer to Table 3 a).

JASPER TACONITE

Level	AREA A		AREA B		AREA C	
	FT1	FT6&6W	FT3 w. Ext.	FT4	FT2	FT9
0-10cm						
10-20cm	3	1	2	2	4	
20-30cm	2	11	21	3	13	2
30-40cm		1	2			2
40-50cm						1

QUARTZ

AREA A		AREA B	Level
FT6&6W	FT8&8W	FT3 w. Ext.	
			0-10cm
6	3	6	10-20cm
19	3	34	20-30cm
2	6	8	30-40cm

GFC, Type A

Level	AREA C
	FT5 w. Ext.
0-10cm	
10-20cm	1
20-30cm	9
30-40cm	5
40-50cm	2
50-60cm	

GFC, Type B

AREA C	
FT5/S	FT7/E&SE
	7
1	1
2	
1	

GFC, Type C

AREA A		AREA B	AREA C	
FT6/W	FT8&8W	FT3/NE	FT5 w. Ext.	FT7/E&SE
	1			
	2		1	2
4	1	4	6	1
	1	1	1	

GFC, Type D

Level	AREA A, FT6/W
0-10cm	
10-20cm	
20-30cm	5
30-40cm	3

GFC, Type E

AREA C, FT5/W
2

Table 4. Vertical Distribution of Selected Lithic Raw Matrial Categories.

	AREA A							AREA B							
	FT1 1m²	FT6 50x100cm	FT6/W 1m²	FT8 1m²	FT8/W 50x100cm	FT8/E 50x100cm	FT2,7,9 & 10 each 50x50cm	FT1 50x50cm	FT2 50x50cm	FT3 1m²	FT3/W 50x100cm	FT3/N 1m²	FT3/NE 50x100cm	FT4 1m²	Sub-total
Implement		1	2	1								2	1	1	8
Primary Decortication Flake			4		1							2	1		8
Secondary Decortication Flake	1		6	3							5	1	5		21
Tertiary Flake	30 (10)*	14 (9)	56 (21)	28 (15)	12 (9)	12 (5)		6 (4)		15 (11)	6 (5)	67 (27)	12 (4)	8 (0)	266 (120)
Blade	1			2	1	5		1				5			16
Retouch/ Rejuvenation Flake	7	3	27	9		4				3		33	2	3	91
Flake Fragment			17							1		20	2		40
Shatter		1	12	2	2	1				6		9	4		37
Core		1		1											2
Checked Piece			1		1										2
Chunk of Raw Material		1													1
TOTAL:	39	21	125	46	17	22	0 0 0 0	7	0	25	11	139	27	12	491

Table 5 a. Lithics -- Type and Provenience (for Area C, refer to Table 5 b).

AREA C

	FT2 1m²	FT4 50x50cm	FT5 1m²	FT5/N 1m²	FT5/W 1m²	FT5/SW 50x100cm	FT5/S 1m²	FT7 1m²	FT7/E 1m²	FT7/SE 1m²	FT7/S of SE 1m²	FT9 50x50cm	FT1,3,6,8 (50x50cm) FT10 (50x100cm)	TOTAL
Implement	1				1	1	2		2	3	2	1		21
Primary Decortication Flake					3		2		1		1			15
Secondary Decortication Flake							1	1	1	1		1		26
Tertiary Flake	24 (18)	1	15 (4)	9 (3)	29 (3)	48 (10)	27 (3)	48 (17)	22 (6)	10 (1)	2 (2)	5 (0)		506
Blade	1		1			2		1				1		21
Retouch/ Rejuvenation Flake	4		8		4	11	2	5	3	1				129
Flake Fragment					12	6			3					61
Shatter					14	1	2		5		1			60
Core	1		1											4
Checked Piece														2
Chunk of Raw Material	1													2
TOTAL:	32	1	25	9	63	69	36	55	37	15	6	8	0 0 0 0	847

Table 5 b. Lithics -- Type and Provenience (for Areas A and B, refer to Table 5 a).

	Sub Area	Total Number of Complete and Damaged Flakes (Fragments excluded)	Tertiary Flakes Preserved to Their Original Length (Includes Blades and Retouched/Utilized Flakes).									
Max. length (in mm)			5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-50	50-60	60+
KLS	A	(117)	9	25	5	7		3		2		1
	B	(69)	2	17	7			2	2	1	1	
	C	(202)	16	24	7	5	3					
JT	A	(14)	1	3	2	1	1		1			
	B	(15)		1	1	1			1	1	2	
	C	(21)	2	6	2	1						
GFCa	C	(6)	1	1								
GFCb	C	(4)				1						
GFCc	A	(4)	1		1	1						
	B	(3)		2								
	C	(4)			2							
GFCd	A	(2)	1									
HBL	A	(3)				1						
	C	(1)			1							
KRF	A	(2)			1							
QTZ	A	(14)	2	1	1		2	1				
	B	(15)		4	3		2					
	C	(1)	1									
Grey QTZE	A	(3)	1						1			
	B	(17)	1	5								
	C	(2)	1								1	
Coarse grained QTZE	A	(2)		1		1						
	C	(1)										1
BAS	C	(2)	1									
Other Igneous	C	(2)						1				

Table 6. Complete Tertiary Flakes -- Type of Raw Materials/ Ratio of Complete to Damaged Flakes/Maximum Length

or smaller retouch/rejuvenation flakes; apart from nine pieces of shatter, four secondary decortication flakes and, possibly, some twelve to fifteen of the largest tertiary flakes, there is no waste material of siltstone that represents the initial reduction process. The majority of the tertiary flakes fall within the small to medium ranges (5-24mm in maximum length)--see Table 6. This suggests that the siltstone was brought to the site in the form of prepared blanks or preforms. Elsewhere in northeastern Minnesota siltstone is frequently found in the form of ovoid or leaf-shaped, rather crudely fashioned bifaces. The majority of these can probably be interpreted as blanks manufactured closer to the best sources of this material (the outcrops along the Boundary Waters) in order to facilitate transport.

Jasper taconite is third in frequency with 79 items (approximately 9% of the total assemblage). Although the specimens of this material span the entire reduction process, from the core in Area C, FT5 to the well-made little scraper in Area A, FT6, most of them fall in the tertiary flake and retouch/rejuvenation flake categories. There are only a few pieces of shatter and a few primary and secondary decortication flakes. Again, this suggests that most of the initial reduction took place closer to a productive source of the material, probably somewhere along the Gunflint Formation, even though smaller cores like the one found at this site may have been carried around. Most of the undamaged tertiary jasper taconite flakes have a maximum length in the 5 to 24mm range (Table 6); only five are longer than 30mm, most of them in Area B where they all show either intentional edge modification or use wear.

Second in frequency with 96 items (11% of the total assemblage), milky quartz differs from the previous two by being represented by a fairly balanced range of items: two checked pieces, a couple of cores, thirteen decortication flakes and numerous pieces of shatter--as many as there are tertiary flakes. There are no finished implements, just a retouched flake, but a dozen retouch/rejuvenation flakes within Areas A and B indicate that final shaping and edge modification did take place on this site. In short, the entire reduction sequence is well represented, including its initial stages, a fact which is not surprising, considering the local availability of the raw material.

Gunflint Silica and Hudson Bay Lowland Chert occur in a combined total of 88 items. Most of these are some form of debitage--no cores but a few pieces of shatter, fourteen decortication flakes and about fifty tertiary and retouch/rejuvenation flakes. Except for one somewhat larger retouched tertiary flake, none of these items exceed 24mm in maximum length. Although the sample is rather small, it suggests that most of these cherts were brought to the site

in the form of moderately sized, roughly prepared cores. It also supports a general impression that Gunflint silicas, because of their highly homogenous texture, were particularly sought after for the manufacture of small and extensively modified artifacts. Projectile points and small scrapers of this material are common in archaeological assemblages of northeastern Minnesota and adjacent western Ontario and although Gunflint silica items make up less than 8% of the total number of lithics at 21-SL-165, they account for approximately 25% in the finished implement/modified flakes category.

Two flakes are made of a very homogenous, glossy and translucent brown chalcedony which has been tentatively identified as Knife River Chalcedony from North Dakota. It is also possible, however, that they represent an atypical form of Gunflint Silica, i.e. one with very sparse inclusions. Finds of Knife River Chalcedony are quite common in Minnesota, where it seems to have been a choice material for artifacts that required precision flaking.

The dark grey, fine-grained quartzite with darker inclusions is represented by 32 items distributed over all three subareas, although a concentration was found in Area B. Except for one secondary decortication flake, all represent the final stages of lithic reduction. The distinctive character of this material suggests that it derives from one core or a set of cores from a particular source, probably either a large glacial cobble or a non-local quarry site.

Several units, in Areas A and C produced an unusual raw material, a core, a few tertiary flakes and what appears to be a crude biface, all of a coarse-grained material tentatively identified as a crude quartzite. The material has very poor flaking properties and must have been used as a last resort. Its origin is almost certainly local, as suggested earlier, probably some nearby glacial deposit.

Basalt, greenstone, and granite were apparently also used on occasion--a few flakes have been found as well as what appears to be a crude biface, all within Area C. All three rock types could have been found locally either as glacial cobbles or, in the case of the latter, as fragments of the local granite bedrock.

As seen in Table 3, KLS is the only raw material that seems to have been used consistently and frequently all over the site area. Jasper taconite, for example, was found concentrated to four specific areas: in the north half of Area A, the northeast part of Area B and the northwest and southwest parts of Area C. Elsewhere, it was either completely lacking or very sparse, even in the otherwise lithic rich FT5 and FT7 units (as expanded) in Area C.

Hudson Bay Lowland Silica and most of the different varieties of Gunflint Silica occurred in specific concentrations, often just in one particular unit. GFC, Type C, is the only exception, it was found in all three sub-areas. Quartz was found in considerable concentration in Areas A and B but, like jasper taconite, was curiously absent amongst the many lithics from the FT5 and FT7 units in Area C. The grey quartzite was found in four particular, rather limited concentrations--the latter, however, were distributed within all three sub-areas. Items of coarse grained quartzite were found in Areas A and C, those of basalt, greenstone and granite only in Area C.

This type of differential distribution may reflect intrasite variability indicative of separate work areas and/or different periods of occupation. The fact that two of the more specific raw materials--Gunflint Silica, Type C, and the grey, fine-grained quartzite, both of which may derive from one particular core or set of cores--occur within the central parts of all three sub-areas would suggest that all three were occupied or used at the same time for at least part of the cultural sequence.

Table 4 may give some indication of the problems inherent in any attempt to determine whether 21-SL-165 represents a long, continuous occupation or the accumulated cultural debris of intermittent use. This table illustrates the concentrations of those raw materials that are distinctive enough to possibly represent a reduction sequence from a single core or a set of cores from a particular source, i.e. concentrations presumably dating from one period of occupation. In general, each concentration shows a distinct clustering either entirely within one or two adjacent levels or within one level but with a few items also in the levels immediately above and/or below. As post glacial soil deposition/formation appears to have been relatively slow, however, often less than 60cm above bedrock, such a vertical spread of up to 15-25cm for material from one particular period in time seems odd (except in the lower levels of the units with fire basins where considerable disturbance through scraping out and backfilling of fire pits could account for such vertical displacement). Roots may have been a major cause of post occupational displacement--massive jackpine roots in some of the units gave us ample evidence of how much disturbance can be caused by just one tree. Because of such frequent vertical displacement, it would be difficult to reconstruct a sequence of segregated occupation levels if they ever existed.

Table 5, which summarizes the range of lithic types as well as their provenience, also illustrates the find density in different parts of the site:

- Within Area A, FT1 at the northern part of the crest, FT6 and FT6W in the central part, and FT8, (with extensions) at the southeastern part all show a considerable density of lithics (10, 24 and 10 items respectively per 50x50cm unit)--a distribution which indicates a fairly consistent use of the entire crest area, although with a definite concentration, possibly a lithic work floor, in the center. Nothing was found on the outer part of the main ledge or on the lower, intermediate terrace.

- Within Area B, FT3 with extensions produced an average of 17 items per 50x50cm area, a concentration which seems quite limited in horizontal extent and peters out very quickly towards the southwest and northeast where FT1 and FT4 respectively yielded only 3-6 items per 50x50cm. The absence of fire pits and firecracked rock as well as the dense concentrations of certain types of raw materials (JT, GFC, HBL and QTZ) within FT3 with extensions suggest that this was a lithic work floor, rather than a habitation area.

- Within Area C, there are at least three zones of marked find density: FT2 (ca. 8 items/50x50cm), FT5/SW and W (35 and 16 items respectively/50x50cm) with adjacent FT5 (9 items/50x50cm) and FT7 and FT7/E (14 and 9 items respectively/50x50cm). All three are separated by areas which yielded little if any evidence. FT2 and FT5 (as expanded), with their fire basins, may represent separate living floors within what appears to have been the main occupation area of 21-SL-165.

As mentioned earlier, the vast majority of flakes are tertiary ones (521,[3] i.e. ca. 61% of the total assemblage) and mostly in the small and medium range of maximum length. Table 5 summarizes the maximum length categories for all longitudinally undamaged tertiary flakes (including blades and retouched flakes). Unfortunately, fractures perpendicular to the longitudinal axis were the most common; in many of the raw material categories, anywhere from a third to half and, at times, even more of the flakes have been damaged in such a fashion. A supplementary review of the preserved maximum width in longitudinally broken flakes[4] did suggest, however, that the damaged flakes also would have fallen mostly in the small and medium ranges. All but eleven had a preserved or estimated maximum width of anywhere between 5 and 24mm, only four were wider than 35mm.

Retouch/rejuvenation flakes account for the next largest group of lithics (127[5], i.e., nearly 15% of the total). This category may, in fact, be somewhat under represented asmore than half of the smallest flakes (3-5mm) that were found during the Phase II investigation came out of waterscreened soil samples representing only 8% of the total level. This suggested that a number had slipped through the 1/4" dryscreen used for the rest of the soil matrix, and also that the figure for retouch/rejuvenation flakes in the final Phase II tally (15%) probably was much too low. It was later assumed that waterscreening through 1/8" mesh for all Phase III units would improve the recovery rate and bolster the 15% figure quite considerably. A number of small items were also found in the Phase III water screening but not as many as expected, and of those that were recovered, many proved to be either fractured tertiary flakes or unclassifiable flake fragments. In the end, the ratio figure for retouch/rejuvenation flakes in Phase III turned out to be the same as in Phase II, i.e. 15%. Nevertheless, small flakes were undoubtedly missed in some of the Phase II units and the overall percentage figure for retouch/rejuvenation flakes should almost certainly be increased by at least 5%.

Although many of the flakes in this category seem to derive from the rejuvenation of either the striking platform or dulled/damaged waste edges, quite a number appear to be the waste products of final retouching.

While random flakes predominate in this assemblage, there are also a few that feature the nearly parallel sides and dorsal ridge(s) as well as the 2:1 minimum length:width ratio of a classic blade or lamellar flake. It seems generally agreed that such blades are created by a more controlled flaking technique than that which produces random flakes. It is surprising, therefore, to note that nearly 3/4 of the blades found at this site are of the raw materials which have comparatively poor flaking properties, i.e. siltstone and milky quartz.

Finished implements (including preforms) make up a very small part of the total assemblage: five scrapers, and four bifaces used or intended as cutting/chopping tools. In addition, there are retouched flakes as well as a number of flakes which display either rather haphazard retouch or simply use wear.

The implements, as well as a sample of the retouched/ utilized flakes are shown on Figures 16 and 17. The locational information and basic measurements can be found in Appendix D.

Four of the scrapers are small--less than 25mm in maximum length--and quite elaborately finished. The one

from Area A, FT8, Figure 16:c is made from a fairly large tertiary flake of the medium grey variety of Gunflint Silica (GFCc). It features continuous, even and fairly steep dorsal retouch all along the convex distal end, retouch which continues well back onto the curved lateral edges. An even smaller, but differently shaped scraper of the lighter grey GFCb variety came from Area C, FT7/E (Figure 16:b). Flared all around into a steep dome or hogback shape, it is probably, in fact, a microcore which has been further modified by very minute steep retouch all around the edge--possibly in order to rejuvenate the striking platform angle but more likely in order to improve the edge for a scraping function. Another scraper from the same area has been fashioned from the basal portion of a GFCc flake. Dorsal, continuous, fairly regular and steep retouch extends all along the distal edge of the truncated flake and continues around a pronounced corner onto and all along the left lateral edge. The fourth scraper in this group (from Area A, FT6) is a small, snub-nosed specimen made on a tertiary flake of jasper taconite; roughly trapezoidal in outline, it has been steeply and dorsally retouched along the distal and both lateral edges (Figure 16:a). These small scrapers may simply have been held between the thumb and the second and third fingers--with all of them, it is possible to get a good firm grip that way. It is also possible that the three that were made on flakes once were hafted with wood or bone handles; in the case of the jasper taconite specimen, this is quite strongly suggested by the fact that the butt end, the end opposite the central and most distinct of the three edges, has been broken off. These small and delicately made scrapers probably would have been better suited for fiber and woodworking than for bone and the preparation of hides (Peters 1984:287). Scrapers like these were widely used for long periods of prehistory and are not diagnostic for dating; they have been reported from Blackduck and Laurel sites in both western Ontario and northern Minnesota (Evans, 1961, McLeod, 1978, and Stoltman, 1973) as well as from much earlier Archaic sites (Bleed, 1961, Shay, 1971 and J. V. Wright, 1972).

A fifth scraper, (from Area C, FT7) is a much larger specimen, made on a large tertiary flake of siltstone. Irregularly trapezoidal before the proximal end was damaged, it features fairly steep, continuous but rather irregular dorsal retouch along the distal edge, rather minimal dorsal retouch along part of the right lateral edge and small, continuous but irregular ventral retouch along the somewhat concave and only slightly bevelled left lateral edge (Figure 17:b). Such large flake scrapers, usually of siltstone, are common in Plano and early Archaic complexes of northern Minnesota and adjacent parts of Ontario and Manitoba (see references above). The combination of both dorsal and ventral unifacial retouch is quite common as is the

combination of different types of scraping edges. While the steeper edges presumably were used during butchering and hide preparation, the flatter, somewhat concave type of edge has proven very effective during the scaling of fish and during wood and bone working.

Of the four bifaces, only one, from Area C, FT5/S, had been given a fairly refined shape--made of a bifacially retouched, quite thin tertiary siltstone flake, it seems to be the tip of a lunate knife (Figure 16:f). The other three, all from Area C, FT7 (with extensions), all have a much more unfinished appearance, probably in part because of the coarse texture of the raw material (siltstone, greenstone, and coarse-grained quartzite, respectively). The siltstone specimen, approximately one half of what used to be a crude ovate with very shallow and very irregular flakescars on both sides, may have been a preform or a crude chopping tool--irregular damage around the edges could have been caused by either cultural use or later, natural soil disturbing processes. Made of a coarse grained, heavy and iron rich greenish grey igneous rock, probably a local greenstone, the second specimen also forms approximately half of an ovate; it is more regular in outline than the siltstone one but with a more weathered surface without distinctive scarring (Figure 17:a). The more asymmetrical quartzite specimen appears to have been a rather crude cutting implement.

The retouched and/or utilized flakes and blades vary considerably in size but with few exceptions they all seem to have been used in the same fashion, as improvised cutting implements:

- a large tertiary siltstone flake from Area A, FT6, shows some use wear along the naturally sharp distal edge, while one of the lateral edges, rather thin, features fairly continuous, steeply nibbled unifacial retouch (Figure 17:c);

- a fragmented, small and thin tertiary siltstone flake from Area C has a thin distal edge with minute and irregular serrations, probably caused by use;

- four tertiary jasper taconite flakes and blades from Area B all have naturally very sharp lateral edges which show intermittent, minute scarring as well as some patches of sheen or use polish (Figure 16:d and e); one of them, a long, thin and somewhat curved linear flake, also shows partial, steep, minute ventral retouch;

- a chunky, asymmetrical cortical jasper taconite flake from Area C, FT9, appears to have been

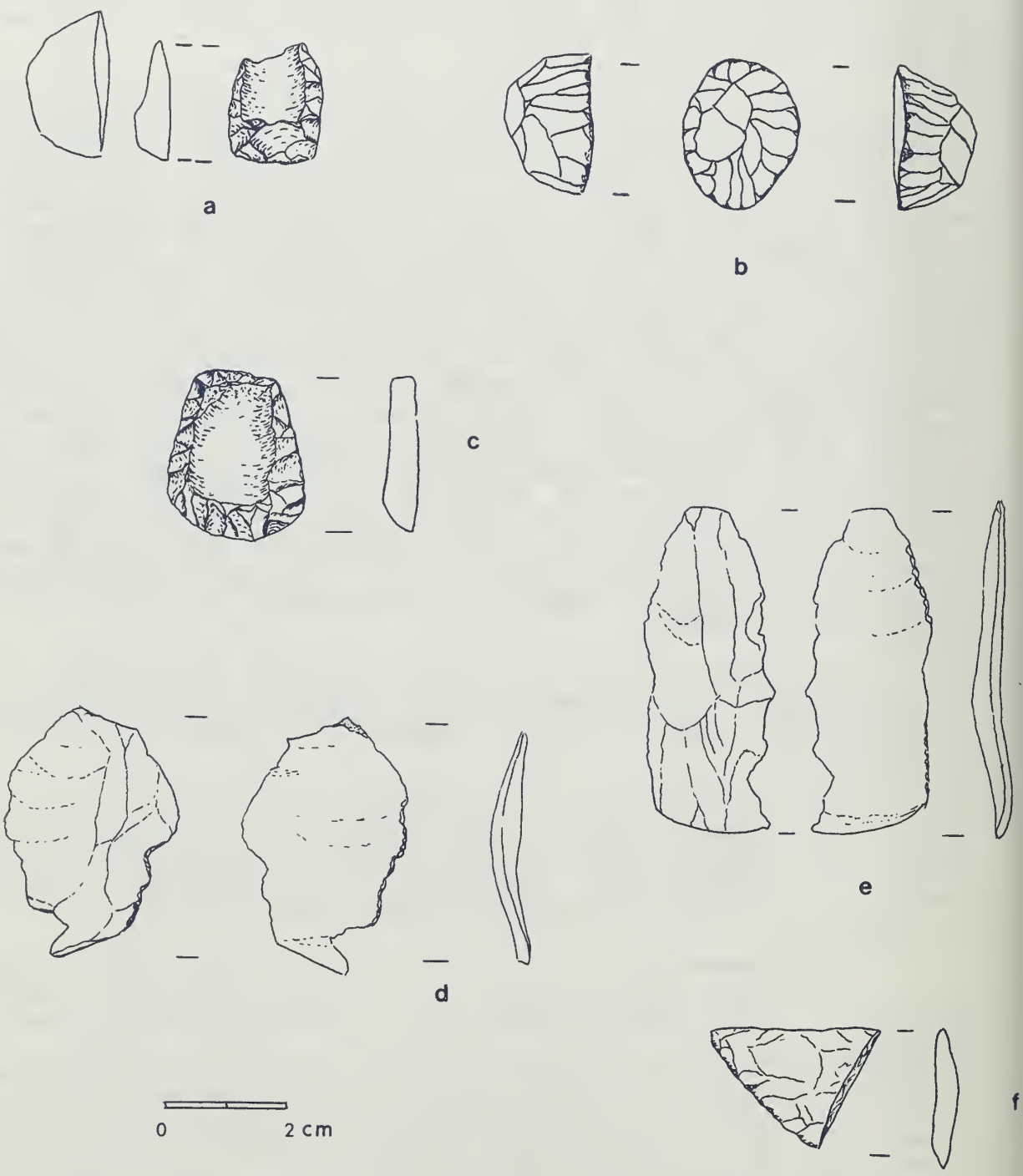


Figure 16. Lithic Artifacts from 21-SL-165.
a-c: scrapers from Area A, FT6 (JT), Area C, FT7/E (GFC) and Area A, FT8 (GFC); d-e: retouched flakes from Area B, FT3 (JT); f: tip of biface from Area C, FT5/S (KLS).

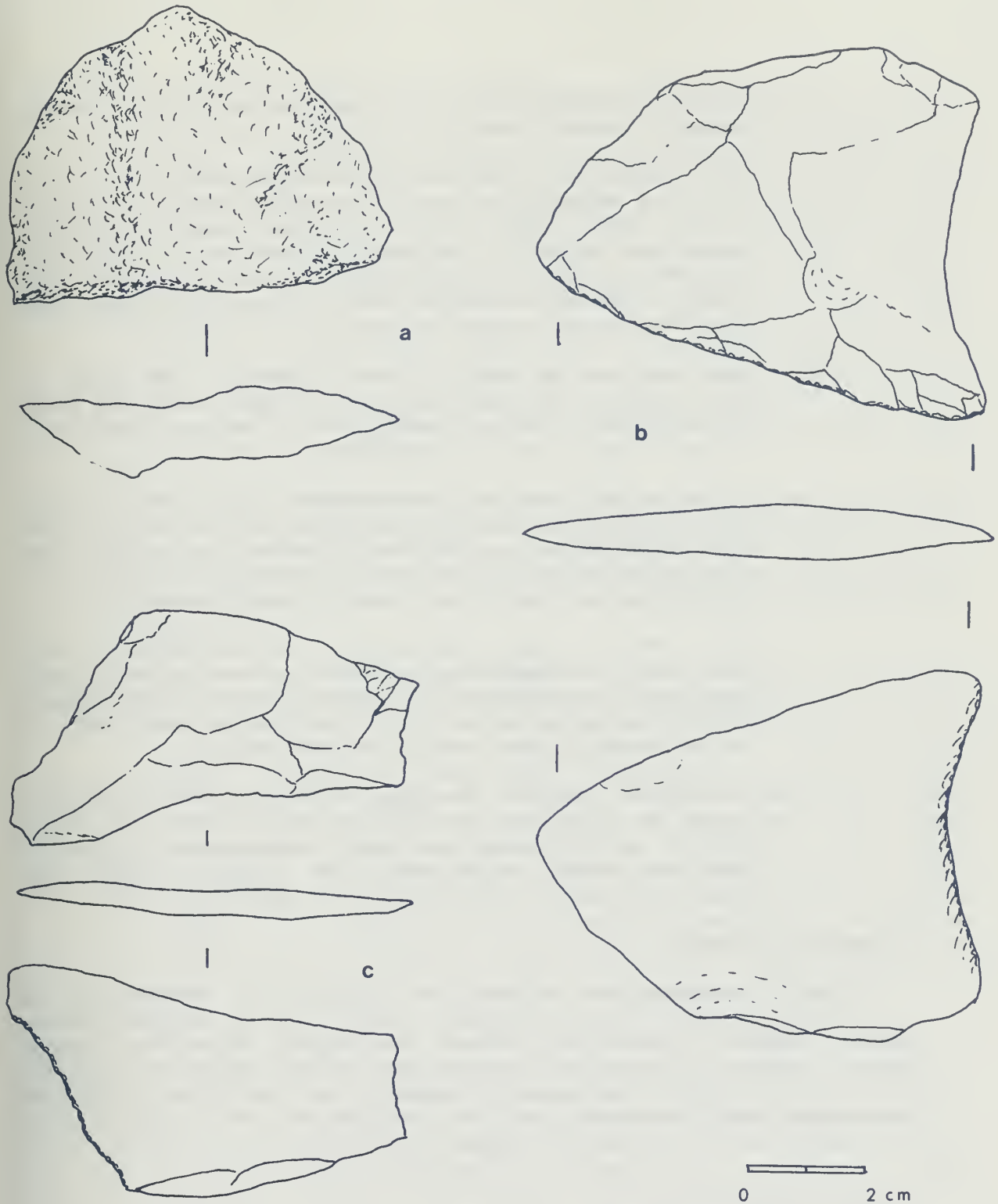


Figure 17. Lithic Artifacts from 21-SL-165.
a: Fractured biface from Area C, FT7/SE (IGN); b: scraper/scaler from Area C, FT7/S-SE (KLS); retouched flake from Area A, FT6/W (KLS).

minimally modified at one end to serve as a crude gouge or endscraper;

- a small jasper taconite flake from Area C, FT7, features minute bifacial scarring and use polish along one edge and a unifacially, minutely retouched notch on another; a pronounced negative percussion bulb on the ventral side allows the flake to be held very firmly between the thumb and the second and third fingers;

- a long and narrow split flake of GFCb, from Area C, FT5, can be interpreted as a flake which has been modified with minute and fairly steep unifacial retouch into a drill or engraver.

- a rather chunky tertiary GFCc flake from Area A, FT6, features concave and very sharp lateral edges with what appears to be some very minute scarring; the preserved dorsal faceting suggests that the tip, now missing, would have made a good perforator.

- a long, fairly thin and narrow and somewhat curved blade of fine grained quartzite seems to have been used as a knife as it shows fairly continuous, minute bifacial scarring along the straightest of the naturally very sharp lateral edges;

- an elongated, rather chunky, secondary decortication flake of milky quartz from Area C, FT5, has been roughly modified at one end, apparently to serve like a crude endscraper or gouge (like the cortical jasper taconite flake in Area C, FT9).

Organic Evidence

Such evidence was minimal on this site. There was no trace of any bone--not even burnt bone--in any of the units. Apart from the charcoal, which was fairly abundant though usually very fragmentary, there was only one other example of organic matter in apparent association with the cultural evidence--the fragment of a fish scale (too small for species identification) in Area C, FT5/S.

Summary of Comments

The excavated features, as well as the distribution of the lithic evidence, all indicate a pattern of distinct activity areas:

A total of seven fire basins (one in Area A, the rest in Area C) all feature a roughly circular to ovoid outline, a maximum diameter of at least fifty to sixty

centimeters and a distinctly basin-shaped cross-section, usually with a central depth of fifteen to twenty centimeters. All are characterized by fire-darkened soil with charcoal occurring as scattered specks and occasional concentrations of larger chunks. Almost all feature fire-cracked and heat-discolored rocks both within and around the basin, and most of them are partially surrounded by large granite boulders. Some of the latter appear to have been propped up with smaller cobbles or wedge shaped rocks, partly in order to simply stabilize their position on the sloping bedrock controlled ground surface, partly in order to ensure that the top of the boulder would provide a reasonably level surface, presumably for sitting or working on.

Scatters of debitage as well as some lithics modified for scraping, cutting and perforating, all suggest that lithic tool manufacture/maintenance as well as a variety of food and raw material processing activities took place around the fire basins and the large granite boulders.

Because of the considerable width of the preserved southern end of the largest of these features (in the northern Area C, FT5 area), it is tempting to interpret that feature as a possible house floor. Unlike early house floors that have been documented in northeastern Minnesota and western Ontario, however, this one does not feature the peripheral scatter of rocks that would have weighed down the base of the walls, nor were there any signs of anomalies in soil color and texture that could have been interpreted as post molds (c.f. Peters 1983:111). In addition, all of the smaller fire basins within the larger stain lie very close to its southeastern perimeter which makes it very improbable that this edge could mark the location of a wall.

Area B, as well as the west/northwestern part of Area A and the northwestern part of Area C, were all rather different in character from the ones described above. All produced quite dense scatters of debitage, as well as, in Area A, FT6 (with expansions) and Area C, FT7 (with northern and central expansions), a few finished scraping and cutting implements and some utilized flakes. None featured any evidence of fire. Apparently, these were work areas somewhat out of the way of the central living and cooking areas--the locating of lithic tool manufacture and maintenance as well as of various other processing activities.

The occurrence, in all three subareas, of two of the most distinctive types of lithic raw material (GFC, Type C and grey quartzite), both likely to derive from the same

specific core or set of cores, was mentioned above as one indication of at least partial contemporaneous use of all three areas. On the whole, however, the lack of diagnostic artifacts and reliable stratigraphic segregation makes it impossible to tell from horizontal and vertical distribution patterns to what extent the site represents one or several fairly intensive and lasting occupations, repeated short-term seasonal use over a long period or just intermittent, fairly erratic stop overs. On the basis of the existing evidence, we can only draw some rather tentative conclusions about the date and duration of 21-SL-165. It appears that:

- the entire assemblage appears to be aceramic, probably preceramic, although it can be argued that ceramic vessels, because of their fragility, may not have been brought to very temporary special activity habitation sites occupied by normally ceramic using groups, there is, by now, quite abundant evidence of pottery also on quite small and isolated northern Minnesota sites--sites that would have been considerably harder to reach than 21-SL-165;

- an early date is suggested also by the fact that much of the cultural evidence lies either directly or just a few centimeters above bedrock--even in protected areas where post-glacial formation would have begun early;

- there is little overlap between the various fire basins in Area C, FT5 (with expansions) and that these basins, as well as the one in Area C, FT2, all tend to become visible at the same depth (30-35cm)--all indications that these features date from approximately the same time period;

- the more shallow find-depth of the corresponding feature in Area A (i.e. the fire basin in FT8 which begins to show up already at 15-20cm) not necessarily indicates a more recent date for this use area--it is quite likely that soil accumulation was slower within Area A (the crest of the knoll) than within Area C (located on a gradual slope below a somewhat higher inland area);

- some lithic distribution patterns suggest at least partial contemporaneity for all three subareas.

As several of the fire basins produced good size radiocarbon samples (to be submitted for analysis during 1985/86), it should be possible to get a series of reliable dates for what appears to be the main occupation level.

Even the more finished and distinctive of the lithics on this site--the five scrapers--are of too general a type

to allow precise dating; together with the four bifaces and the retouched/utilized flakes and blades, however, they do, at least, give an indication of the type of activities carried out at this site. It has been suggested that smaller thumbnail or rounded scrapers (like the four found at this site) would have been used for fiber processing, while larger flake scrapers like the one found in Area C would have served best for bone/wood working and leather processing. Of the four bifaces, only one (the lunate shape in Area C, FT5) is made of a raw material that appears hard and micro-crystalline enough to have retained any distinct usewear. The same appears true of some of the retouched/utilized flakes, particularly those of siltstone, jasper taconite and Gunflint Silica. Such analysis has not, as yet, been completed but preliminary analysis suggests that most of these edges were used for the cutting of rather soft materials as there is little sign of chipping and/or striations along the edges. A couple of flakes appear fashioned for piercing and engraving--possibly during bone or leather working. The cruder three of the bifaces, finally, all found in the same vicinity as the large flake scraper, would appear best suited for chopping and/or meat processing.

The complete lack of projectile points in any of the excavated areas, although it may not apply to the rest of the site, along with the apparent evidence of meat and hide processing, may indicate that trapping was the more important activity at 21-SL-165 (beaver, muskrat and a variety of other small furbearing animals are still very evident in the vicinity of the site).

Some of the working edges on both the finished tools, e.g. the large flake scraper and the lunate knife, as well as on some of the modified flakes, are very similar to edges used experimentally as fish scalers. This, along with the fragmentary fish scale in Area C, FT5/S, seems to support the reasonable assumption that fishing was another important activity.

In short, it would seem that fishing, trapping, hide/meat and fiber processing as well as some bone and wood working may have been important at the site. The organic evidence for such activities would generally not last very long in sandy, well-drained sites like those at 21-SL-165--with the exception of burnt bone, a type of remain which is quite abundant in very similar soils at the River Point Site ten miles northeast of and downstream from 21-SL-165. Although the cultural deposits at River Point--initial Woodland (Laurel)--may be considerably younger, the contrast with the complete lack of even burnt bone at this site is still striking and curious.

By contrast, the abundance of well-preserved lithic evidence, particularly debitage, presents a clear, if biased, testimony to the importance of lithic workmanship at this site. To briefly summarize the description/discussion above:

A fairly wide variety of lithic raw materials, most of them of non-local origin, were used at this site; listed in order of apparent importance (expressed in terms of percentage of total assemblage), they are: Knife Lake Siltstone (KLS), 63%; Quartz (QTZ), 11%; jasper taconite (JT), 9%; Gunflint Silica (GFC), ca. 8%; grey quartzite (QTZE), nearly 4%; Hudson Bay Lowland Chert (HBL), ca. 2.5%, and Knife River Chalcedony (KRC), coarse grained quartzite (crude QTZE), basalt (BAS) and other igneous rock (IGN), each less than 1%.

The ratio between debitage which represents the initial reduction process and that which, along with finished artifacts, represents the later reduction process, as well as the known sources of these materials, suggest that: a) KLS (probably mostly deriving from quarries along the Border Lakes area, ratio 28:508) and JT (probably mostly from quarries in the eastern part of the same area and along the northwest shore of Lake Superior, ratio 12:67) were brought to 21-SL-165 as blanks, preforms or fairly prepared cores processed closer to the source; b) QTZ (locally available, represented by entire reduction sequence) was brought in from nearby sources with little or no prior modification; c) GFC (from the Gunflint Formation along the eastern Border Lakes area, ratio 26:41) and HBL (available as cobbles in glacial till, ratio 6:15) were processed mostly at the site but, judging by the size and look of the decortication flakes, from fairly small cobbles (HBL) or roughly prepared cores (GFC); d) grey quartzite (from non-local quarry or large as one core or a set of prepared cores from one particular source; e) KRF (from source in North Dakota, ratio 0:2) was brought in as a prepared core or preform. The least represented materials (coarse grained quartzite, basalt and other igneous rocks), all locally available as cobbles in the glacial till or embedded as bedrock, with ratios of 2:5, 0:2 and 2:3, were probably brought in as cobbles/chunks with little or no prior modification.

Finally, the number of finished/partially modified items within each raw material category suggests that Gunflint Silica (7.5% of total) and grey quartzite (3%) were preferred materials for the smaller, more elaborately flaked tools while other material with equally good flaking and edge retention properties, e.g. jasper taconite and higher

grade siltstone, are represented by very few finished artifacts on this site.

VI. EVALUATION OF SITE SIGNIFICANCE FROM A REGIONAL PERSPECTIVE

As mentioned earlier (p. 24), quite a few prehistoric sites have been recorded in the region surrounding 21-SL-165, but most have not been investigated beyond the initial surface reconnaissance and/or shovel testing that led to their discovery. The River Point Site at the northeastern end of the Birch Lake Reservoir is the only other prehistoric deposit in the area that has been subjected to more intensive excavation. Because of this paucity of comparative excavation data, most of the research questions formulated for the investigation of 21-SL-165 had to be concerned with fairly basic research goals (Appendix B). Two interlinked series of questions seemed particularly significant:

1) What were the temporal and cultural affiliations of 21-Sl-165, specifically its relationship to the River Point Site and the other sites around the Birch River drainage? Would there be enough evidence for such temporal/cultural relationships to allow at least a tentative reconstruction of such aspects of local and regional prehistory as settlement patterns, the scheduling of subsistence activities and the nature/range/location of exploited resources?

2) During the Phase I and II investigations, 21-SL-165 had yielded lithic evidence which appeared to include both local and non-local raw materials. Archaeological evidence elsewhere in the upper Midwest has indicated that a considerable variety of non-local lithic materials, often from quite specific and distant sources, were in common use during the early and middle prehistoric periods, procured either directly through quarrying expeditions or indirectly through a well-established exchange network. To what extent could careful analysis of the lithics from 21-SL-165 assist in the reconstruction of a) regional exchange systems or other procurement patterns, and, b) within a more limited spatial context, the relationship between this site and neighboring settlements/groups?

So far, most of the sites that are in fairly close proximity to 21-SL-165 lie along the shores of the same drainage system (the Birch Lake Reservoir and adjacent parts of the South Kawishiwi River)--although a number of smaller

lakes and streams exist all around this main drainage way, even less is as yet known about their prehistory.

Of the eight other sites known around Birch Lake and the Birch River/South Kawishiwi junction, seven are still rather poorly known at this stage. Only three appear to be aceramic, and only one is comparable to 21-65-165 also in terms of environmental setting. Until further testing has been accomplished on these sites, little more can be said about their relationship to 21-SL-165.

The best known of the eight, the River Point Site (21-LA-10), was recorded during a reconnaissance survey in 1981 and subjected to more intensive test excavation during 1982 (Peters, et al. 1983; 104ff). As mentioned earlier on p. 24, the site is located on the sandy southern tip of a peninsula created by a bend in South Kawishiwi River, just opposite the junction of the latter with Birch Lake, i.e., originally, with the Birch River. Most of the evidence dates from a Laurel occupation: a house floor, several copper working areas, as well as special activity areas connected with butchering and meat/hide processing or tool manufacture. The artifact assemblage includes a number of finished stone tools (scraper, bifaces, projectile points, wedges, drills), a large amount of debitage, faunal remains (mostly burnt bone), copper in different stages of processing and, in contrast to the 21-SL-165 site, ceramic evidence in the form of Laurel rim and body sherds. This site clearly represents a much more substantial, settled and intense occupation than 21-SL-165. With its initial Woodland date of about 100 B.C.-A.D. 500 it also seems considerably younger than aceramic, apparently Archaic, 21-SL-165. Stratigraphic comparisons suggest the same temporal difference: at River Point, most of the cultural evidence, including the Laurel floor, was found above a depth of 30-35cm, while at 21-SL-165, the earliest evidence occurs around 40cm or somewhat below. One is obviously on shakey ground when comparing the depth of soil and cultural deposits on two sites located this far apart, even though their topographic setting and vegetation cover is quite similar: on terraces of sandy loam in association with rock outcrops and a mixed hardwood-conifer cover, with comparatively warm and dry conditions due to south exposure. It is interesting to note, however, that if there was any appreciable difference between the two sites in the rate of soil accumulation, it would presumably be that of a faster deposition at River Point which is located on a terrace below a slope and would have received more sediments through runoff. In other words, this means that the 30-35cm level at River Point could represent a considerably younger date than the same level at 21-SL-165.

Although these differences between the two sites were quite obvious already at the end of the Phase II

investigation, it still seemed possible a) that ceramic evidence may still turn up at 21-SL-165, or, b) that continued lack of ceramic evidence, but in combination with indications of only sporadic use of the site, would suggest that the two sites still were at least partly contemporary, with 21-SL-165 used only on an intermittent/seasonal basis by Laurel groups who left their pottery vessels at base camp. The notion of contemporaneity seemed to be supported by several similarities, albeit rather general ones, between the two sites: the range and comparative proportions of the lithic raw materials used; the fact that scrapers, particularly the small thumbnail variety of jasper taconite, Gunflint silica or chalcedony, represent the most common lithic artifact category on both sides; the size and shape of the dark soil lenses. At this point, it is still difficult to say whether these similarities have such a wide temporal and spatial range that they are of little or no value for intersite comparison. While evidence now in hand seems to verify beyond any doubt that 21-SL-165 is aceramic, the second possibility cannot be ruled out until more precise carbon-14 dates allow us to determine the age(s) of its cultural deposit(s).

The results of 21-SL-165 contribute more to the elucidation of the second set of research questions, i.e., those concerning the pattern of lithic procurement. A comparison between a) the data for River Point and 21-SL-165, b) the much more sketchy information from the other sites nearby, and c) assemblages recently studied elsewhere in northeastern Minnesota and western Ontario, suggests very strongly the Archaic/Initial Woodland existence of either a well-established system of seasonal/intermittent quarrying expeditions or a well-developed network of barter between adjacent groups. On the one hand, studies are now underway to map and collect reference samples from quarry sites throughout these regions (G. Peters and W. Ross, personal communication). On the other, the statistics for the lithic assemblages at sites like River Point and 21-SL-165 are beginning to form a better picture of such aspects as preferential selection, the logistics of raw material procurement, etc. For the earlier, aceramic periods with their limited range of preserved evidence, such lithic analysis may also present our only opportunity for the reconstruction of cultural interaction and exchange.

While several additional research questions remain largely unanswered because of the continued paucity of relevant evidence, particularly in the case of the paleoenvironment and the organic natural resources available to the occupants of 21-SL-165, some of those unknowns can probably be reconstructed through future extrapolation from and cross reference with other sites or information sources.

Other questions, e.g. those regarding the stratigraphy and the temporal relationship between different parts of the site, proved harder to answer than expected due to a fairly high degree of natural soil disturbance. Nevertheless, the Phase III investigation did appear to confirm the previously indicated existence of horizontal distribution variability and distinct activity areas.

On the whole, however, the site proved to be a valuable source of data and a useful, and supplementary counterpart to the previously excavated River Point site. It is hoped that future reconnaissance surveys and site evaluations in the region, particularly on undisturbed National Forest land, might round out the picture and allow for a systematic regional reconstruction.

FOOTNOTES

[1] Based on radiocarbon dates.

[2] Based on pollen cores and macro fossil evidence, particularly from Weber Lake in the Toimi Drumlin Area (Wright 1969).

[3] The earliest forms of Woodland ceramics have not yet been found north of southeastern Minnesota.

[4] Formal test units and shovel tests have been designated with the abbreviations FT and ST respectively.

[5] This figure does not, of course, include the large number of flake fragments that could derive from either retouch/rejuvenation or tertiary flakes.

[6] Not tabulated -- the measurements that were studied are given in Appendix D.

[7] See footnote 5.

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Appendix A: Minnesota Archaeological Site Form for 21-SL-165

MINNESOTA ARCHAEOLOGICAL SITE FORM

UNTY	SITE NAME	FIELD NUMBER	STATE NUMBER
St. Louis		SL-023-1	21-SL-165

NER
USDI - Bureau of Land Management

U.S.G.S. QUAD
Babbitt, MN

E LOCATION
On series of rocky ledges above W bank of Birch River

LEGAL DESCRIPTION
NESENE Section 27, T61N, R13W

E TYPE
Probably a short term habitation

PROBABLE CULTURAL COMPONENTS:
Appears to be aceramic

E DESCRIPTION
Located on the southeasternmost part of a 150-200m wide ridge which extends NW-SE, bounded by swamp on all sides except the SE which overlooks Birch River. Cultural evidence was found on a series of three rocky ledges with SE exposure and good view of river. Sparse scatter of mature aspen and jack pine. Little or no underbrush. Grass g.c.-- exposed rock ledge near river. Sandy soil.

E CONDITION
Undisturbed

CURRENT LAND USE
Recreational - local residents use hiking trail. Proposed for public sale during FY 1984

SITE AREA
Ca.1000-1200m²
Extends ca.100m NE-SW/10m NW-SE

URE OF NEAREST WATER
Birch River here almost 300m wide, narrows from Birch Lake 10 wide

DISTANCE TO WATER
5-10m
ca. 1½mile downstream

DIRECTION OF SITE FROM WATER
NW of river

VATION OF SITE: Ca. 1440-1450'

ELEVATION OF NEAREST WATER: Ca. 1418'

URE, EXTENT OF NVESTIGATION:
Initial reconnaissance 7.5.83 -- 9 shovel tests
Evaluation 10.11-14 and 25-28.83 -- 17 formal test units

IFACTS OBSERVED, RECOVERED:
A total of over 200 waste flakes, plus shatter and 5 possible cores; one small thumbnail scraper. Siltstone most common material also quartz, jaspilite, chert. FCR in some units. Also dark stains in soil, with charcoal (some probably due to forest fire)

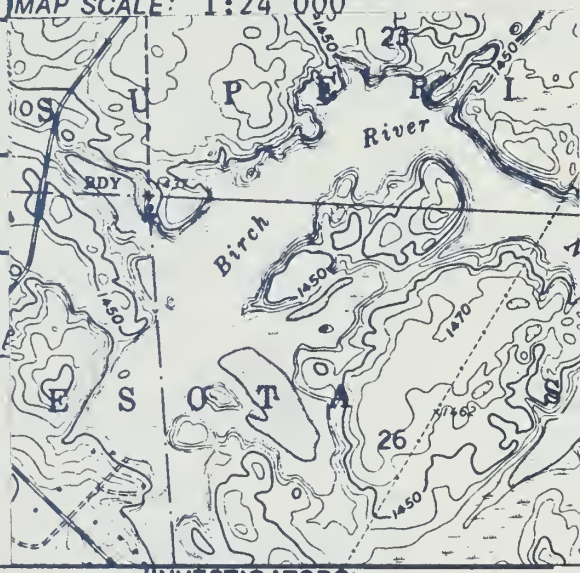
CAL COLLECTIONS, INFORMANTS:

TTEN REFERENCES
C. Harrison, 1983 Report on Class III Intensive Field Inventory of Select Public Tracts Proposed for Public Sale in FY'84

MMENTS:
also Addendum to that report; both submitted to Eastern States Office, USDI - Bureau of Land Management, Alexandria VA

One, possibly two of the formal units yielded evidence of firepits -- dark soil lenses, FCR, charcoal specks; stained soil and larger pieces of charcoal in some of the other unit looked more like the result of root burning during past forest fire(s).

MAP SCALE: 1:24 000



ACCESSION NOS.	PHOTO NOS.	REPOSITORY:	INVESTIGATORS:
pending	See report	Hamline University, St. Paul, MN	C. Harrison
		PROJECT:	DATE: 12.29.1983

Appendix B: Data Recovery Plan

APPENDIX B

PROPOSED DATA RECOVERY PLAN FOR ADDITIONAL INVESTIGATIONS ON SITE 21-SL-165 DURING THE 1984 FIELD SEASON

I. Introduction

Prehistoric site 21-SL-165 was discovered during a cultural resource reconnaissance survey on BLM (Bureau of Land Management) Tract SL 023 on 7/5/1983 (Harrison, 1984a). At that time, shovel testing indicated the presence of a sparse scatter of lithic evidence (debitage only) within three distinct subareas, i.e. three more level terraces, located on rock ledges overlooking Birch River to the S/SE and separated from each other by short stretches of more rugged riverward slope.

Further work was carried out on the site during October-November, 1983, in order to evaluate its eligibility for the National Register of Historic Places. This time, a number of formal test units placed across the three subareas produced a much denser scatter of lithics, sometimes in close association with charcoal and rounded, basin-shaped areas of darker, charcoal stained soil; fire-cracked rock and some large boulders along the periphery of some of the darkened areas strengthened the impressions that these areas were firepits, probably used during fairly short term occupation(s) of the rock ledges during seasonal subsistence activities or travel along the river. Some interesting patterns of internal variation and clustering in the distribution of the lithic evidence suggested the potential for further documentation of either repeated occupations on the site or the existence of different activity areas within one occupation level. The preferred use of certain lithic raw materials from rather distant sources suggested the significance of this site for the reconstruction of prehistoric exchange systems in the region. Because of what seemed to be considerable research potential within a largely undisturbed cultural deposit, the conclusion was drawn that the site would qualify for nomination to the Register (Harrison, 1984b).

Of several options available to the Bureau of Land Management, one may be further data recovery for a determination of "no adverse effect," (pursuant to 36 CFR Sec. 800.4). Several arguments can be made in support of such an action:

- the importance of the site lies in the prehistoric data it contains;

- there are no known nonarchaeological reasons why it should be preserved--it does not appear to carry any importance for any local ethnic or interest groups, nor does it have any potential as an educational exhibit in situ;

- the archaeological data contained within this cultural deposit can easily be retrieved with current techniques and with fairly moderate expenditure of money and manpower--almost all the data consists of lithic artifacts which can be easily removed and spatial associations which can be easily recorded; the few features that exist also seem fairly uncomplicated and could be recorded without any loss of data using the methods described below under Section III;

- the area seems to be quite intensively used by the general public: a well-beaten hiking trail runs right across the center of all three subareas and campfire remains as well as scatters of recent garbage on one of them suggest its use as a picnic spot--continued public use of the area, which would be very hard to prevent, may well cause considerable damage to the cultural deposit;

- further data recovery in the manner described under Section III would be expected to contribute a great deal to the interpretation of local as well as regional prehistory, as suggested below in Section II.

II. Research Questions

As mentioned in the two reports on the identification and evaluation of site 21-SL-165 (Harrison 1984 a and b), a number of prehistoric sites have been recorded in the surrounding region but few have been investigated beyond the initial surface reconnaissance and/or shovel testing that led to their discovery. In spite of this paucity of data, results so far on 21-SL-165 and, to some extent also on other sites in the area (particularly on the nearby River Point Site, see below), do suggest various research questions which, if pursued, could aid a great deal to the reconstruction of both local prehistory and that of the western Upper Great Lakes region in general. Two such research questions, or rather interlinked series of questions, seem particularly significant in this context:

1) What are the temporal and cultural affiliations of site 21-SL-165? Specifically, what is its temporal and cultural relationship to the River Point Site, 21-LA-10? If such a relationship is proven (and certain similarities already suggest that it may exist), how could this information be used for the reconstruction of such aspects of local/regional prehistory as settlement patterns, the scheduling of subsistence activities, the range and location of exploited resources, etc.?

In the report on the evaluation of 21-SL-165 (Harrison 1984 b:25). There is a brief description of the River Point Site, recently discovered and evaluated for the National Register by Superior National Forest archaeologists (Peters et al. 1982). The description is followed by a comparison between that site and 21-SL-165. The River Point Site, located at the NE end of the Birch River/Birch Lake Reservoir, approximately ten miles northeast of 21-SL-165, is multicomponent with cultural evidence ranging from initial Woodland to the early historic period (fur trade material). By comparison, the data retrieved from 21-SL-165 seems less varied and more inconclusive. At this site, there is, at least so far, a complete lack of both ceramics and copper but certain other features, e.g. the presence and shape of the fire stained soil deposits as well as the preference for certain lithic artifact types and raw materials, correspond closely to those at River Point. These similarities and differences, as well as the internal variation within 21-SL-165 in the distribution of lithic artifacts and the use of lithic raw materials, can, at this point, be interpreted in several ways. For example:

- 21-SL-165 may represent one or several preceramic occupations (Archaic or even late Paleo-Indian);

- if the cultural evidence at this site is verified as being preceramic, this would indicate that its period of occupation was different from and earlier than that of the River Point Site;

- on the other hand, even if further data recovery at 21-SL-165 should confirm the lack of ceramics and copper, this in itself would not preclude contemporaneousness or even cultural affiliation with the River Point Site in its initial and/or Woodland phases--21-SL-165 may simply represent occasional or regular seasonal/special activity use of these rock ledges by people normally

located at more substantial settlements like that at "River Point," people who, for various possible reasons, left their ceramics or copper at basecamp.

It seems fortuitous that the only two sites in this area that have been more intensively tested should be located at the same waterway and in such close proximity that evidence of temporal and cultural affiliation, if proven, might be interpreted as close linkage within one settlement/resource exploitation system. Judging by the report on the River Point Site, the testing there was more extensive than that undertaken on 21-SL-165. If a sounder basis for comparison was established by further data recovery on the latter, we would presumably be in a better position to judge similarities and dissimilarities and to establish a) whether a close relationship does exist between the two sites and, b) if it does, how this evidence could be applied to the interpretation of initial Woodland lifeways in this region.

Several types of data and specific study topics would be particularly relevant to this research question. It would be important to establish:

- whether the lack of ceramics and copper finds during the 1983 season reflects a real situation at 21-SL-165 or simply insufficient data recovery;

- whether the apparent variation in the distribution of the lithic evidence (artifacts and raw materials) reflects a real situation or would disappear with more comprehensive excavation (for a discussion of this possibility, see Harrison 1984b:20)--unless this is determined, it would be impossible to tell whether 21-SL-165 represents one, a few or a number of discrete assemblages, i.e. probable activity areas or repeated occupations;

- whether more diagnostic artifacts could be found that would allow a closer comparison with the evidence at the River Point Site? As suggested in Harrison 1984b:26, the preference for certain lithic raw materials and the extensive use of certain types of small scrapers at the River Point Site correlate closely with the preferred range of raw materials at 21-SL-165 as well as the fact that similar small scrapers are the only artifacts found so far on this site. Such similarities could be quite time and tradition specific or they could be too general to be used

as indicators of cultural affiliation. More distinctive evidence would certainly be necessary in order to define the relationship, if any, between the two sites.

- whether a) other activity specific artifacts than scrapers and b) paleoenvironmental evidence could be retrieved from 21-SL-165? A considerable amount of faunal evidence was found at River Point which features soil and preservation conditions comparable to those at 21-SL-165, where, so far, only charcoal has been found. Such evidence also from the latter site, combined with the results of a more detailed analysis of the location, topographical setting and likely prehistoric distribution of plant and animal resources around both sites, would be crucial for the reconstruction of individual site function as well as the role of each site within a larger economic pattern.

2) The lithic evidence at 21-SL-165 appears to include both local and non-local raw materials. To what extent can closer analysis of this evidence assist in the reconstruction of regional exchange or other procurement patterns and, on a smaller scale, the relationship between this site and neighboring settlements/cultural groups?

As described in the evaluation report (Harrison 1984 b:14-19), some of the lithics at 21-SL-165 represented local raw materials such as milky quartz, which occurs in veins in the local bedrock or quartzites and so-called Hudson Bay Lowland cherts which can be found in nearby glacial deposits. Others, however, in fact the clear majority, were produced from non-local materials such as siliceous siltstone from outcrops along the Boundary Waters to the north/northeast, jasper taconite and so-called Gunflint silicas from the Gunflint Formation along the border between northeast Minnesota and Ontario as well as what looks like Knife River Flint from a quarry in North Dakota.

Such preference for and intensive use of non-local raw materials is not unique to 21-SL-165; it is, in fact, a common occurrence in both northern Minnesota and adjacent parts of Canada. A problem with most of this evidence, however, is the fact that it usually derives from a poorly known context--from surface-collected eroding shorelines, from perfunctorily tested sites etc. Consequently, our knowledge of the logistics that brought about this

distribution of certain raw materials remains sketchy. A number of interlinked questions need to be asked, for example:

- Were any of these raw materials more frequently and widely used within certain cultural periods/traditions?

- To what extent can links be established between specific raw materials (or varieties thereof) and specific outcrops or other types of sources?

- What were the means of extraction and distribution--direct procurement through quarrying expeditions and/or indirect procurement through exchange?

- To what extent, if any, does the distribution of these lithic raw materials correlate with the distribution of other cultural evidence such as ceramic types, copper, settlement patterns etc. or with certain waterways/canoe routes?

- When comparing sites and lithic assemblages within the general range of distribution of any of these raw materials, is it possible to discern definite differences in the type/degrees of refinement in lithic reduction techniques? Such differences, if identified, may suggest the spatial relationship between

    - quarry sites;

    - primary reduction sites;

    - sites where most of the reduction debris represents the final shaping of blanks and preforms as well as the resharpening/reshaping of used/fractured implements (as seems to be the case at 21-SL-165, see Harrison, 1984 b);

    - sites/findspots where large numbers of crude bifaces seem to represent caches, possibly for trading purposes, of such blanks/preforms (Harrison 1984 b).

Some of the questions can be at least tentatively answered by looking at a representative range of lithics from individual sites. Others, such as those concerned with the "fingerprinting" and matching of dispersed artifacts with specific sources of raw

material, can obviously only be resolved through a comprehensive and interdisciplinary research program. As for the possible links between the exchange of lithic raw materials and specific periods, cultural traditions etc., such links could only be reconstructed through comparison between a number of well-preserved, investigated and documented sites.

In short, the most urgent prerequisite for all of this research would be the systematic compiling of relevant data from a wide geographical and temporal range of carefully sampled and excavated prehistoric sites. At this point, such sites are rare. As a majority of prehistoric sites seem to be located adjacent to waterways, many have already been partly or completely destroyed by a combination of modern land use and wave erosion aggravated by the frequent raising of water levels in the lake/river systems of northeast Minnesota (the River Point Site is a good example, partly destroyed by the creation of the Birch Lake Reservoir and the building and use of the River Point Resort). Other sites are undoubtedly still awaiting discovery or at least more intensive investigation but it is obviously impossible at this stage to predict how many of those will prove to be as undisturbed and rich in lithic evidence as 21-SL-165--a large number of sites in northern Minnesota are quite small and fairly sparse in evidence.

III. Data Recovery: Proposed Overall Strategy; Recovery and Recording Methods

Taking into account the results of the 1983 evaluation and the topography of site 21-SL-165, the total extent of the three subareas or cultural deposits has been estimated as approximately 180 square meters (60, 50 and 70 for Areas A, B and C respectively). During the evaluation, a total of seventeen formal test units were excavated, together comprising approximately ten square meters:

- in Area A, an initial series of seven 50 x 50cm units, three of which were positive, two of which were expanded into a 50 x 100cm and an 100 x 200cm unit respectively;

- in Area B, three 50 x 50cm units, two of which proved positive, one of which was expanded into a full square meter;

- in Area C, seven 50 x 50cm units, four of which proved positive, three of which were expanded into full square meter units.

During a discussion with the State Historic Preservation Office of the results of the evaluation and the possible need for further data recovery, it was determined that another series of at least eleven formal 1 x 1 meter units (or, at least, formal testing of areas totalling eleven square meters) would be necessary in order to adequately investigate those areas of significance that have been defined as well as possible additional discoveries. Eleven square meters would represent a bit more than 7% of the total number of square meters remaining once we have deducted from the 180 a) the ten that have been excavated plus b) an estimated 10%, i.e. 18 square meters, of rough or disturbed terrain that exists in small pockets within each subarea.

Clearly, it would seem desirable to make the sample larger than 7%, preferably at least 10%, i.e. fifteen one square meter units. Because of the possibility of receiving volunteer assistance from two or three paraprofesionals in addition to the scheduled work force, (see further under Section IV), there is, in fact, a very good possibility that fifteen units could be excavated. The budget estimate, however, which does not need to take such volunteer work into account, is based on a goal of eleven one square meter units or units totalling the equivalent area.

Five of the formal test units excavated during 1983 seemed particularly promising in terms of information yield (Area A, FT8, Area B, FT3 and Area C, FT2, 5, and 7). Each of these would seem worth expansion by 100-200%.

In accordance with the guidelines for National Register evaluations, testing was kept to the minimum necessary for determination purposes. Consequently, there are parts of all three subareas which require further checking in order to ensure that all significant parts of the cultural deposits have been identified. The estimated extent of these areas is quite small, no more than 10-15% of each subarea. They should also be tested by means of small formal test units at the beginning of the next field session in order to determine whether any of those small units would need further work or whether time and manpower could be concentrated on the original five areas of significance.

The excavation techniques used during the 1983 season (skim shoveling down through the uppermost sterile or near sterile 20cm followed by hand troweling of all deeper levels and screening of all soil from all levels

through 1/4 inch mesh plus the standard taking of 10% soil samples in all 10cm levels) proved very efficient for the recovery of items larger than ca. 5mm--most were found in situ rather than in the screen. Smaller items (retouch/rejuvenation flakes and pieces of charcoal) were also often found in situ but, when not, probably had a tendency to slip through the screen--this is at least suggested by the fact that few of them were found in the regular screen while quite a number were retrieved from the soil samples when the latter were taken back to the laboratory and screened through a set of geological sieves (Harrison 1984 b:8). It seems doubtful whether even more careful troweling would improve the recovery rate of small items by much and the loss of cost effectiveness would be considerable. Because of this, and the importance of such micro-evidence as small flakes, possible charred seeds and bone fragments, it would seem more feasible to use a small, portable pump with moderate water pressure in combination with an 1/8 inch mesh screen for the routine water screening of all find levels. This would seem even more appropriate considering that the site is located next to an abundant source of water. If the soil was removed and water screened by 25 x 25 x 5cm sections, it should still be possible to record water screened evidence with considerable accuracy.

A consistent effort will be made to record and bag all evidence by exact location. For the sake of speed and accuracy, depth determinations of level floors, features and artifacts would be done using a transit. Positions within a unit would be recorded by metric coordinates down to the centimeter degree of accuracy and then plotted/noted on soil/excavation profile forms and plan views prepared for each level.

Color slides and prints would be used to record differentations in soil coloring (and, if conditions allowed, also infrared film). Black and white photographs would be used to document the site area, feature and artifact associations and any diagnostic artifacts.

IV. Staff

Christina Harrison, who acted as Principal Investigator during the 1983 evaluation, would continue in that role, with Blythe Williams Carlson and Stephen K. Wickler as field assistants, both of whom have quite extensive excavation experience (see attached resumes). The fourth regular team member would be a student from Hamline University, St. Paul, MN, who had at least one

full season of excavation experience and would work as a supervised crew member. In addition, efforts would be made to secure the voluntary cooperation of two or three paraprofessionals trained through the certification program run jointly by the Council for Minnesota Archaeology and the Minnesota Archaeological Society.

For experts available for consultation, see below under Section V.

V. Analysis

In addition to standard morphological/typological description and classification of all artifacts and the determination of lithic raw materials used, it is hoped that there would be a possibility of doing some microwear analysis (few of the lithics retrieved so far have shown any evidence of such wear).

If any copper were found, it would be submitted to the Archaeometry Laboratory of University of Minnesota-Duluth, which, in cooperation with the University of Wisconsin, is involved in a comprehensive attempt to "fingerprint" artifacts and sources of native copper in the Upper Great Lakes region.

Judging from the size and quality of the charcoal retrieved during the 1983 season, it would be worthwhile to attempt to identify the type of wood used on/available around the site. In addition, it should be possible to recover a few more good C-14 samples. It is possible that some of the amount budgeted for analysis and contingency could be used to run a few dates from this site--if not, it may be possible to receive one of the few grants available for this purpose within the State.

As mentioned earlier, it seems very possible that faunal evidence could have been preserved on this site. If any should be found in an identifiable state, it would be analyzed by an outside expert, see below.

Most of the routine laboratory analysis would be undertaken at the Archaeological Laboratory at Hamline University, St. Paul or at the Archaeometry Laboratory of University of Minnesota-Duluth, both of which are staffed and equipped to handle the cleaning, restoring, preserving and macro/microscopic analysis of artifacts and ecofacts. The Archaeometry Laboratory also has elaborate facilities for soil, mineral, pollen and macrofossil analysis.

The following specialists would be consulted in case of need:

- Dr. Christy Caine, State Archaeologist and Forest Service Archaeologist (prehistoric ceramics);

- Dr. Orrin Shane, Curator, Science Museum of Minnesota, St. Paul, (faunal analysis);

- Drs. Charles Matsch and George Rapp, University of Minnesota-Duluth (geomorphology, petrology, native copper);

VI. Accessioning/Curating

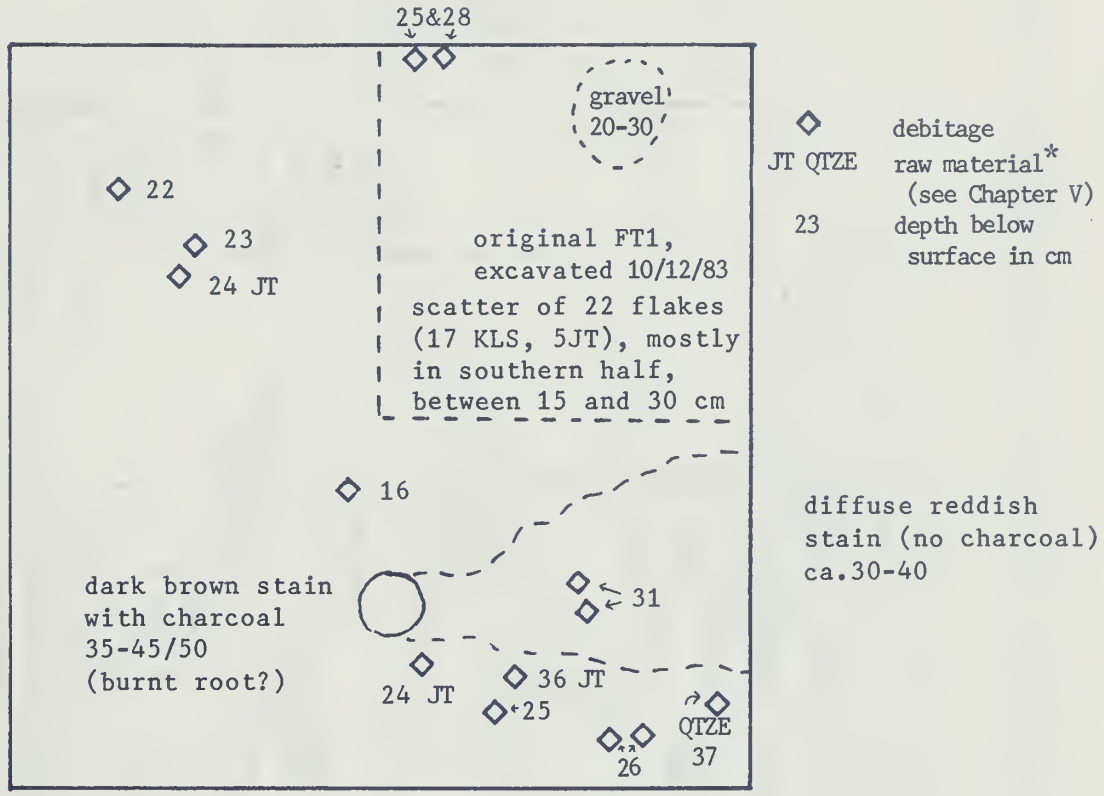
Like the evidence from 1983, that from future data recovery would be accessioned into the Hamline University system and curated at that facility. The facilities at this institution meet all the requirements set forth in 36 CFR, Sec. 66.3. Hamline University already has curating agreements with other federal agencies such as the Fish and Wildlife Service. As part of the State Archaeologist Office, it also works closely with the State Historic Preservation Office on matters of site recording, etc.

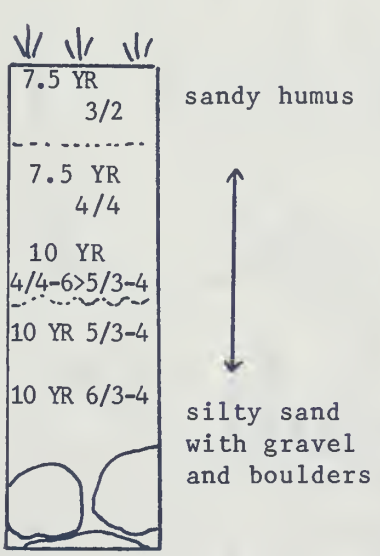
Appendix C: Maps and Profiles for Positive Excavation Units

21-SL-165, AREA A, FT1 (10/12/83; 6/12/84)

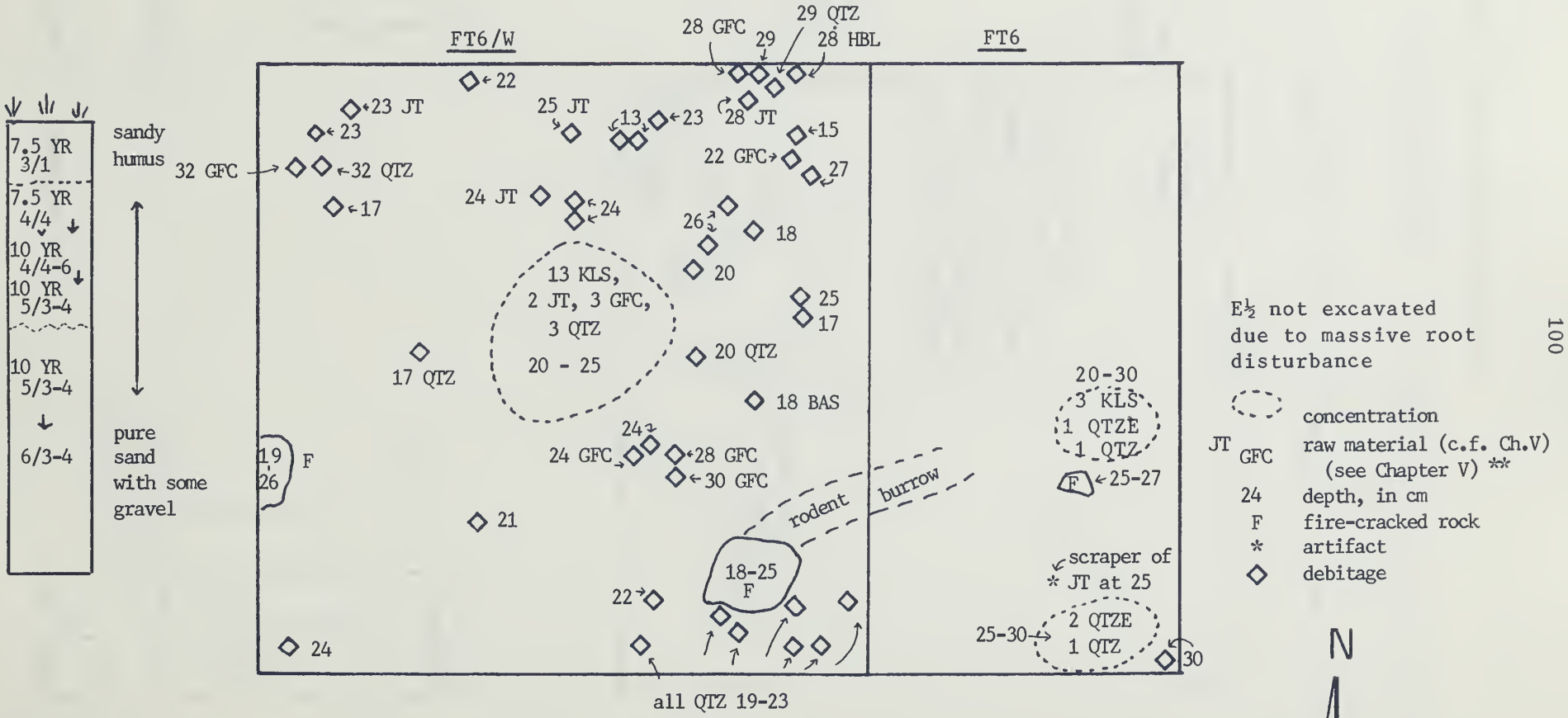
Composite Plan View

Screen (10-20 cm): NW¼, 1 KLS flake; SE¼, 1 KLS & 1 JT flake.





* not indicated in the case of KLS



Screen: *
0-10 cm: 3 KLS, 1 QTZE
10-20 cm: 13 KLS, 1 JT, 3 HBL, 3 QTZ
20-30 cm: 21 KLS, 4 GFC, 4 QTZ, 1 QTZE
30-40 cm: 3 KLS, 3 GFC, 1 HBL, 1 JT, 2 QTZ

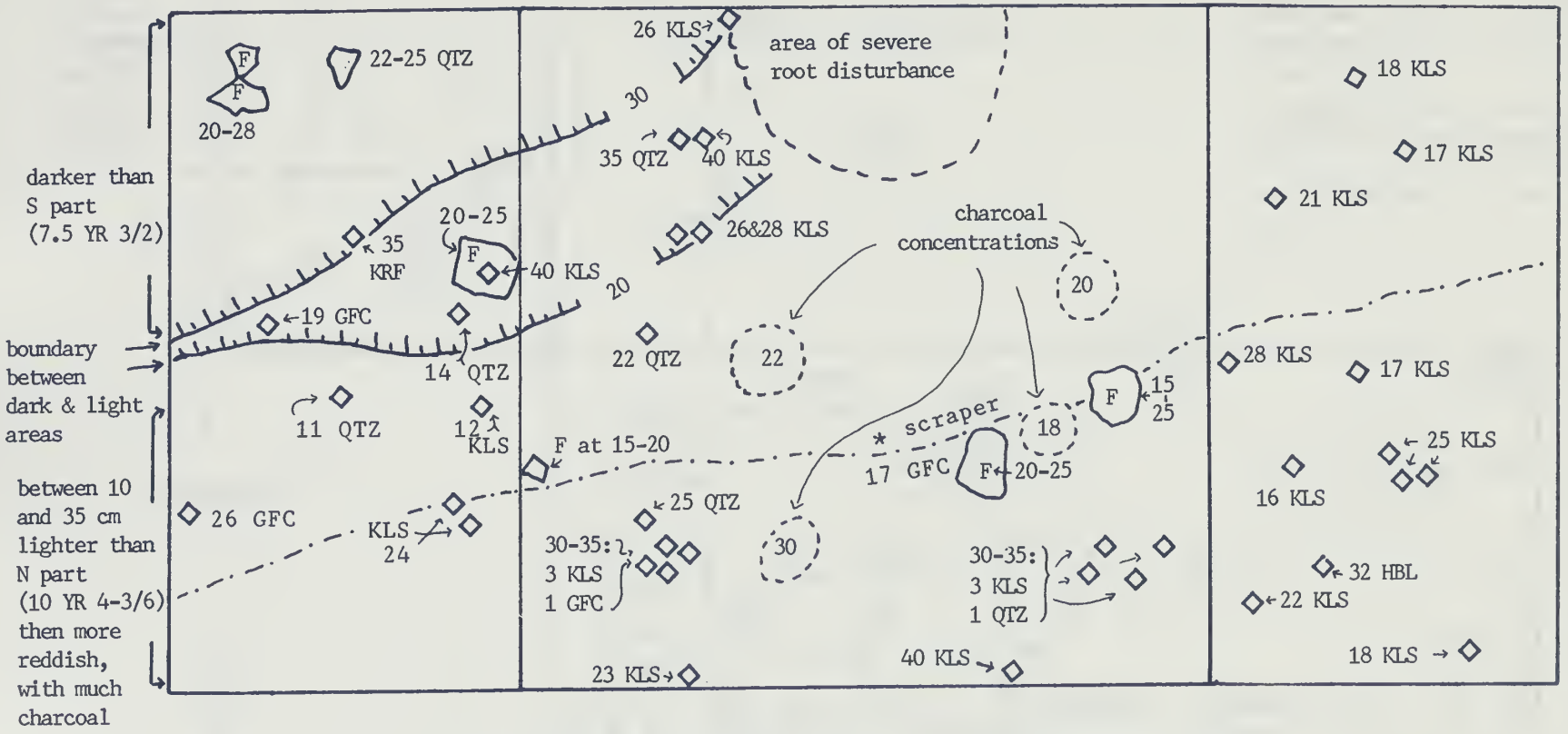
* mostly small flakes and flake fragments found in water screen
** not indicated in the case of KLS

Composite Plan View of
21-SL-165, AREA A, FT6 and FT6/W (10/12/83; 6/11-12/84)

Screen:
0-10 cm: 10 KLS, 1 GFC, 1 HBL
10-20 cm: 12 KLS, 2 HBL, 1 QTZ
20-30 cm: 6 KLS
30-40 cm: 6 KLS, 4 QTZ

N edge of reddish soil with much, apparently recent, charcoal.

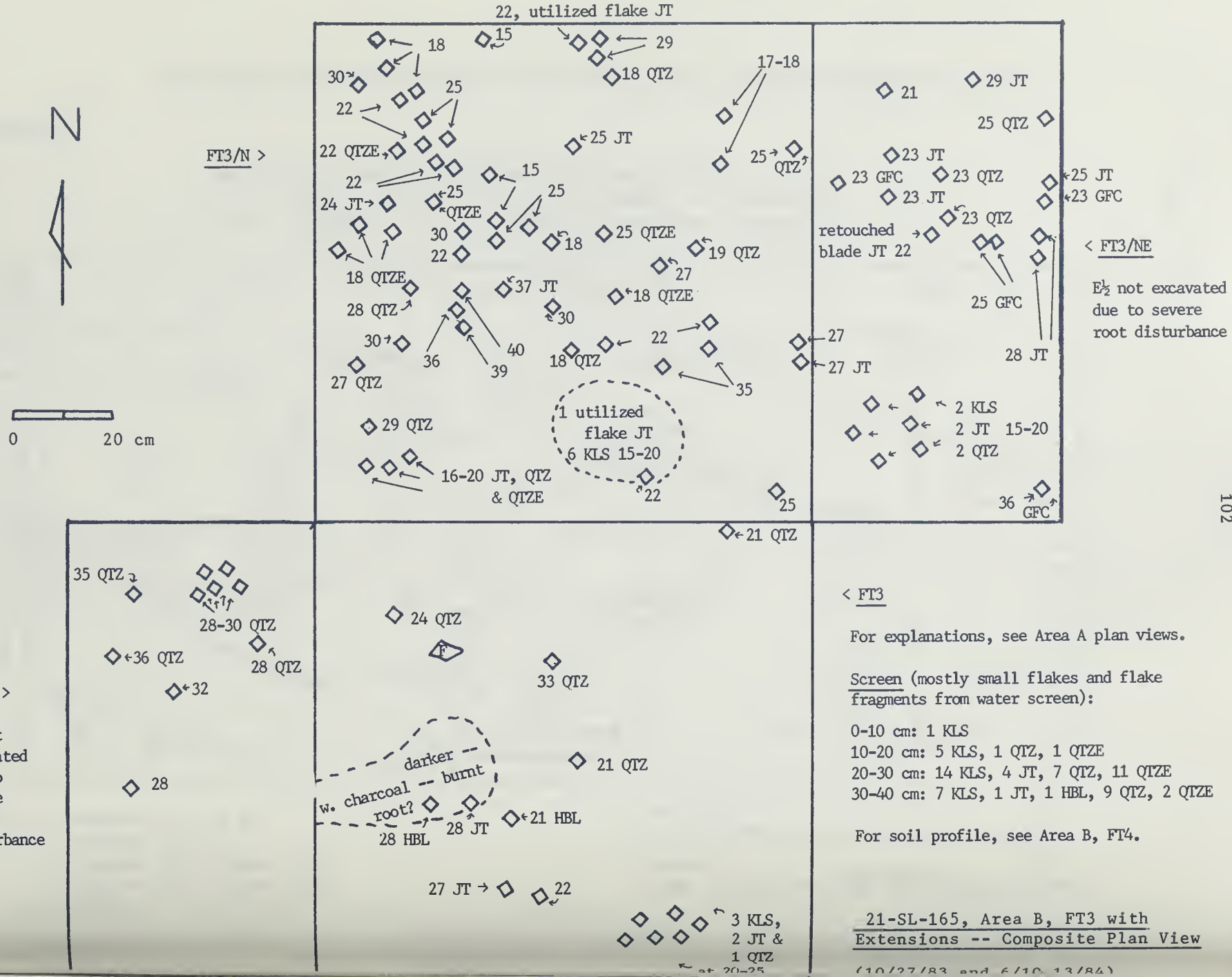
For other explanations, refer to plan view for Area A, FT6.



Bedrock emerges between 35 and 40 cm throughout, beginning in the northern part. Much root disturbance in northeastern part. Reddish soil in southern part contains fairly recent charcoal -- possibly the result of forest fire.

0 20 cm

21-SL-165, Area A, FT8, FT8/W & FT8/E (10/ 11-12 & 27-28/83): Composite Plan View



For explanations, see Area A plan views.

Screen (mostly small flakes and flake fragments from water screen):

0-10 cm: 1 KLS
10-20 cm: 5 KLS, 1 QTZ, 1 QTZE
20-30 cm: 14 KLS, 4 JT, 7 QTZ, 11 QTZE
30-40 cm: 7 KLS, 1 JT, 1 HBL, 9 QTZ, 2 QTZE

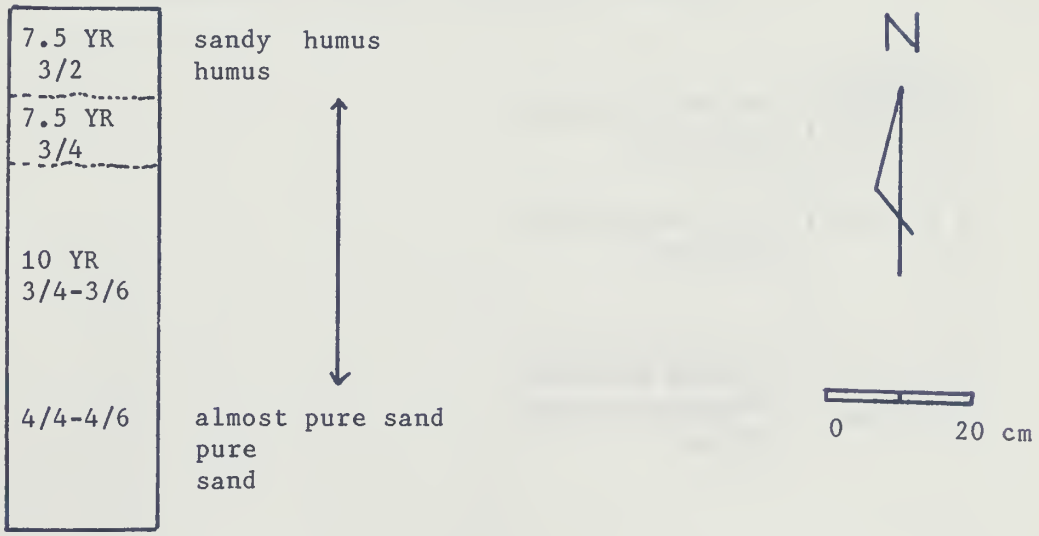
For soil profile, see Area B, FT4.

21-SL-165, Area B, FT3 with Extensions -- Composite Plan View

(10/27/83 and 6/10-13/84)

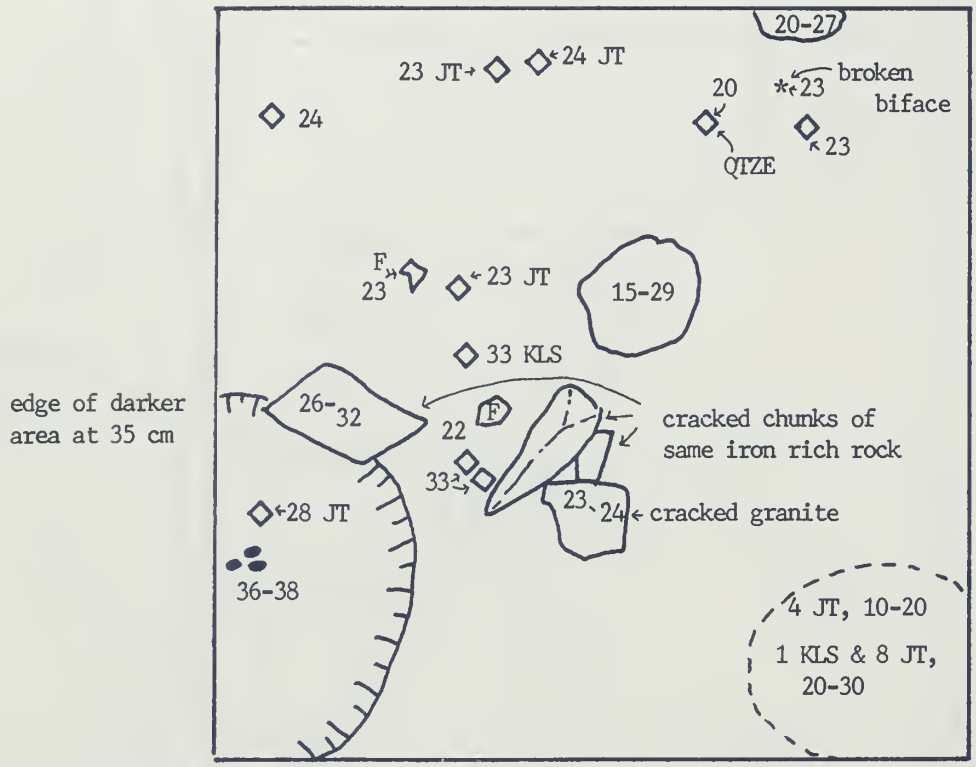
21-SL-165, Area B, FT4 (6/13/84)

Composite Plan View

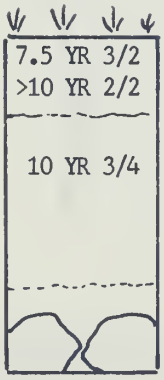


21-SL-165, Area C, FT2 (10/26/83)

Composite Plan View



Boulders emerging at 35-40 cm throughout unit.



dark-very dark brown sandy humus

dark yellowish brown silty sand

10 YR 4/4-6 -- dark yellowish brown sand with gravel and large boulders

Appendix D: Lists of Lithic Evidence

The information about the lithic evidence is arranged in five columns:

1) Type of Lithic

The following abbreviations are used:

SH = shatter
PDF = primary decortication flake
SDF = secondary decortication flake
TF = tertiary flake
R/RF = retouch/rejuvenation flake

2) Type of Raw Material

The following abbreviations are used:

KLS = Knife Lake Siltstone
JT = Jasper Taconite
GFC = Gunflint Silica
HBL = Hudson Bay Lowland Chert
KRF = Knife River Chalcedony (Flint)
QTZ = Quartz (Milky Quartz)
QTZE = Quartzite
BAS = Basalt
IGN = Other Igneous Rock than Basalt

3) Dimensions

Measurements (in millimeters) are arranged in this sequence: maximum length/maximum width/maximum thickness. Fractions of millimeters are generally given only for thickness of smaller flakes. Ap after a measurement means "as preserved", i.e. gives the existing length of a fractured item.

4) Coordinates within Unit, expressed in centimeters, measured from NW corner of unit.

5) Depth within Unit, if more specific than indication for excavation level.

AREA A,
FT1 (NE¼)

(original FT1 unit)	10-20 cm	TF	JT	21/16/2	screen
		TF	KLS	9ap/13/1	"
		Blade	KLS	8ap/7/1	"
		TF	JT	10ap/24/3	" S½
		TF	JT	12/9/1	" N½
	20-30 cm	TF	JT	8ap/12/1	" S½
		2 TF	KLS	10-12/10-12/	" "
		TF	KLS	11ap/20/3	N wall, NW¼
		TF	KLS	17ap/20/3	" " "
		TF	KLS	10x10	screen, S½

AREA A, FT1 (NE¼)	20-30 cm	TF	KLS	10x10	screen, S½	
		5 TF	KLS	max.9/max.17/max.3	water screen	
		TF	JT	7ap/15/2	" "	
		6 R/RF	KLS	max 10/max.10/max 1.5	" "	
AREA A, FT1 (NW,SW,SE¼)						
	10-20 cm	TF	KLS	15ap/20/2	screen, NW¼	15-20 cm
		TF	KLS	43/46/4.3	S.60/E.56	16 cm
		TF	KLS	13ap/20/2.2	screen, SE¼	15-20 cm
		SDF	JT	11/26/6.5	" "	" "
	20-30 cm	TF	KLS	32ap/38/2.2	S.20/E.16	22 cm
		TF	KLS	16ap/9/1.8	S.26/E.25	23 cm
		TF	JT	6/12/1.8	" "	24 cm
		TF	KLS	35/22/3.2	S.84/E.55	24 cm
		TF	KLS	13ap/23/1.6	S.89/E.65	25 cm
		TF	KLS	15ap/22/1.6	S.94/E.80-.83	26 cm
		TF	JT	11/9/1.3	" " "	26 cm
	30-40 cm	TF	KLS	10ap/16/2	S.74-.80/E.78-.80	31 cm
		TF	KLS	8 max./1	" " " " "	31 cm
		TF	JT	8ap/16/1.5	S.85/E.68	36 cm
		R/RF	QTZE	7/6/0.8	S.89/E.95	37 cm
AREA A, FT2	Negative					
FT3,4,5	Not excavated - too disturbed.					
FT6	0-10 cm	TF	QTZE	35/20/4	screen, S½	
		TF	KLS	17ap/18/2	" N½	
	10-20 cm	TF	QTZ	29x29/5	" S½	
	20-30 cm	TF	KLS	23/24/3	NE¼, center	
		TF	KLS	22/22/3	" "	
		TF	KLS	11/11/1	" "	
		TF	QTZE	16ap/15/2	" "	
		TF	QTZ	15/11/4	" "	
		TF	QTZ	12/9/2	" "	
		SH	QTZ	22/18/10	" "	
		R/RF	KLS	9/10/0.8	screen, NW¼	
		TF	QTZ	9ap/7/1	" "	
		TF	QTZ	7ap/8/1	" SW¼	
		Chunk	QTZE		" "	
		TF	QTZE	22/11/6	SE¼, S2/3 of	25-30 cm
		TF	QTZE	11/25/7	" " "	
		TF	QTZ	12ap/15/3	" " "	
		Scraper	JT	19/15/6	S.35/E.20	25 cm
		Core	QTZ	24x19x19	S.49/E.49	
		R/RF	KLS	5x5/1	water screen	
		R/RF	KLS	7x7/1	" "	

AREA A, FT6/W	0-10 cm	TF	KLS	16/13/1.6	screen, NE¼	
		TF	KLS	6ap/16/1	" SE¼	
		SH	KLS	20x12x3	" SW¼	
	10-20 cm	SDF	KLS	37ap/26/2.8	S.24/E.12	17 cm
		TF	QTZ	27/20/4.5	S.50/E.25	" "
		TF	KLS	4ap/6/1.2	screen, NW¼	15-20 cm
		SH	KLS	6x6/1.2	" "	" "
		SDF	KLS	30ap/30/2.4	S.12/E.60	13 cm
		SDF	KLS	9x9/1.4	" "	" "
		SDF	KLS	35ap/40/2.8	S.12/E.88	15 cm
		TF	KLS	12ap/14/2.1	S.42/E.87	17 cm
		TF	KLS	22ap/26/2.9	S.28/E.80	18 cm
		TF	KLS	11apx16/2.3	S.33/E.71	20 cm
		SH	QTZ	16x7x6	S.47/E.70	20 cm
		TF	KLS	12ap/9ap/1.5	screen, NE¼	10-12 cm
		TF	KLS	6ap/9ap/1	" "	" "
		4 flake fragments	KLS	7-10 max./0.5-1	" "	" "
		Flake fragment	JT	7x7/2.8	" "	" "
		R/RF	HBL	4/4/0.7	" "	" "
		SH	HBL	6x6/1.7	" "	" "
		SH	QTZ	28x28x26	S.90/E.76	19 cm
		TF	KLS	10ap/17/2.5	screen, SE¼	
		TF	KLS	8ap x 11/1.4	" "	
		TF	KLS	8/7/1	" "	
		2 flake fragments	KLS	4 and 7 max./1.1	" "	
		R/RF	HBL	3x3/0.3	" "	
		Rejuven. flake	QTZ	3/7/1.1	" "	
		SH	QTZ	7x7x2	" "	
	20-30 cm	TF	KLS	9ap/11/2.1	S.04/E.34	22 cm
		TF	KLS	7ap/10/1.7	S.12/E.09	23 cm
		TF	JT	18/15/4.4	S.08/E.15	23 cm
		TF	JT	16/9ap/3.6	S.23/E.46	24 cm
		TF	KLS	5ap/9/1.5	screen, NW¼	
		R/RF	KLS	6/6/1	" "	
		R/RF	KLS	6/5/0.7	" "	
		R/RF	KLS	5/7/0.8	" "	
		R/RF	KLS	8/5/0.8	" "	
		R/RF	KLS	5/7/0.8	" "	
		R/RF	KLS	7/4/1	" "	
		3 flake fragments	KLS	5-7 max./0.4-1	" "	
		SH	JT	11x7x4.5	" "	
		TF	KLS	48/54/8	S.08-.12/W.62-.66	23 cm
		TF	JT	25/14/4	S.13/E.00	25 cm
		Utilized tertiary flake	GFC	24/23/7.2	S.16/E.87	22 cm
		TF	KLS	7ap/8/0.8	screen, NE¼	20-25 cm
		TF	KLS	6ap/6/1	" "	" "
		TF	KLS	13/5/1.8	" "	" "
		R/RF	KLS	5/6/1	" "	" "
		R/RF	KLS	5/7/0.5	" "	" "
		2 flake fragments	KLS	5-6 max./0.6	" "	" "
		TF	JT	11/8/1.7	" "	" "
		R/RF	JT	4/5/1	" "	" "
		R/RF	GFC	5/4/0.6	" "	" "

A, FT6/W 20-30 cm cont'd

	TF	KLS	15ap/25/3.2	concentrated scatter	20-25 cm
	TF	KLS	13ap/16/2	" "	" "
	TF	KLS	13/22/2.6	" "	" "
	TF	KLS	11ap/14/2.5	" "	" "
	TF	KLS	12ap/12/2.2	" "	" "
	TF	KLS	11ap/15/1.4	" "	" "
	TF	KLS	9ap/15/1.6	" "	" "
	TF	KLS	8/15/1.8	" "	" "
	TF	KLS	10/9/1.2	" "	" "
	TF	KLS	9/11/1.5	" "	" "
	3 flake fragments	KLS	8-14 max./1.1-2.2	" "	" "
	SDF	JT	5/11/2.5	" "	" "
	TF	JT	14/16/3.5	" "	" "
	TF	GFC	10ap/13/1.6	" "	" "
	TF	GFC	11ap/12/3.2	" "	" "
	PDF	HBL	17x14/3.1	" "	" "
	SH	QTZ	22x28x11	" "	" "
	SH	QTZ	15x13x6.3	" "	" "
	SDF	QTZ	15x13x2.9	" "	" "
	TF	KLS	11/14/1.9	S.04/E.81	29 cm
	R/RF	KLS	4ap/5/1.7	S.19/E.90	27 cm
	PDF	JT	14x14/2.9	S.08/E.80	28 cm
	PDF	JT	5ap/10/2.8	S.01/E.79	" "
	TF	HBL	23/18/5	S.04/E.88	" "
	Checked piece?	QTZ	28x18x10	S.04/E.83	29 cm
	TF	KLS	17apx19ap/1.4	S.24/E.76	26 cm
	TF	KLS	12/15/2.2	S.38/E.88	25 cm
	TF	KLS	8apx15ap/2.1	S.30/E.72	26 cm
	TF	KLS	10/7/0.7	screen, NE¼	25-30 cm
	R/RF	KLS	5/7/0.5	" "	" "
	R/RF	KLS	5/7/0.7	" "	" "
	2 flake fragments	KLS	6-8/0.7-1	" "	" "
	TF	GFC	9/11/1.5	" "	" "
	R/RF	GFC	8/6/0.7	" "	" "
	Utilized tertiary flake	KLS	68/43/5.2	S.86/E.61-.67	22 cm
	R/RF	KLS	7/5/1	S.64/E.64	24 cm
	R/RF	GFC	6ap/5/1	" "	" "
	R/RF	QTZ	5/5/1.8	S.88-.96/E.60-.96	21-23 cm
	3 flake fragments	QTZ	6-10/1.2-1.7	" " " "	" "
	SH	QTZ	11x13x5	" " " "	" "
	SH	QTZ	10x14x5	" " " "	" "
	PDF	HBL	13/19/5.8	S.63-.70/E.64-.70	28-30 cm
	TF	GFC	8ap/12ap/1.5	" " " "	" "
	TF	KLS	8ap/7/1	screen, SE¼	25-30 cm
	TF	QTZ	10ap/7/1.1	" "	" "
	TF	KLS	8ap/6/1	S.75/E.85	21 cm
	TF	QTZ	6/12/2.8	SW corner	24 cm
	TF	KLS	5ap/10/1.6	screen, SW¼	20-30 cm
	TF	GFC	9/7/2.6	" "	" "
	R/RF	QTZ	7/6/1.9	" "	" "
30-40 cm	R/RF	GFC	8/5/0.8	S.18/E.06-.12	30-35 cm
	R/RF	QTZ	3ap/4/6	" " "	" "
	R/RF	KLS	7/6/0.9	screen, NE¼	30-35 cm
	2 R/RF	GFC	8/7/0.8; 5/6/0.9	" " "	" "
	SH	HBL	5x5/1.5	" " "	" "
	R/RF	KLS	3/4/0.4	screen, SE¼	" "
	2 flake fragments	JT & QTZ	5-7ap/6-10ap/1-2	" NE¼	35-40 cm

AREA A, FT7	Negative					
AREA A, FT8	0-10 cm	TF	KLS	13ap/25/9	screen, W½ *	
		TF	KLS	29ap/15/3	" "	
		TF	KLS	32/16/2	" "	
		TF	KLS	13ap/15/3	" "	
	10-20cm	TF	KLS	23/33/9	screen *	
		TF	KLS	9ap/15/1	"	
		TF	KLS	7/12/2	"	
		Scraper	GFC	27/22/5.5	S.66-.68/E.48-.50	17 cm
		SH	QTZ	7/10/3	screen	
		R/RF	KLS	4/3/0.6	"	
		Blade	KLS	16ap/18/5	"	20 cm
		TF	KLS	8/16/2	"	20 cm
		R/RF	HBL	2x2	water screen	
		R/RF	KLS	4.5x4.5	" "	
	20-25 cm	TF	KLS	11x11/2	screen	
		TF	QTZ	9ap/10/3	S.15/E.18	22 cm
		TF	KLS	13/8/1	S.98/E.26	23 cm
		SDF	QTZ	17/28/9	S.75/E.18	25 cm
	25-30 cm	TF	KLS	18ap/11/1	screen	
		TF	KLS	12ap/14/1.5	"	
		TF	KLS	19/14/3	"	
		R/RF	KLS	3ap x 5ap/0.5	"	
		TF	KLS	21/36/4	S.2-.4/E.28-.31	26 cm
		TF	KLS	13/20/3	S.32-.36/E.22-.26	26 cm
		TF	KLS	12/20/3	" " " "	28 cm
	30-35 cm	SH	KLS	30x21/7	S.76-.88/E.78-100	
		TF	KLS	15ap/13/1.5	" " " "	
		SDF	QTZ	16/20/6	" " " "	
		R/RF	KLS	6x3/0.5	" " " "	
		TF	KLS	16ap/38/3	SW¼, center	
		TF	KLS	11/11/0.7	" "	
		TF	KLS	9/15/0.6	" "	
		SDF	GFC	8/14/3	" "	
		TF	QTZ	8ap/12/3	screen, NW¼	
	35-40 cm	Core	QTZ	43x34x23	NW¼, center	
		TF	SST	13/18/2	" "	
		TF	KLS	8ap/9/1	screen, SW¼	
		TF	KLS	25ap/50/10	S98/!00/ E.70-73 cm	40 cm
		TF	KLS	15x15/1	water screen	
		TF	KLS	8x8/1	" "	
		TF	QTZ	8x8/1	" "	
		Blade	QTZ	9/3.5/1	" "	
		R/RF	QTZ	5x5/0.8	" "	
		3 R/RF	KLS	2-5 length & width/ 0.5	" "	

* 0-20 cm horizon badly disturbed by roots -- no attempts were made to record itmes in situ

AREA A, FT8/W	0-10 cm	TF	KLS	11ap/20/5	screen	
		TF	KLS	6ap/14/4	"	
		Blade	KLS	21ap/9/1.5	"	
		TF	GFC	18/16/2	"	
	10-20 cm	TF	QTZ	34/38/9	S.58/E.24	11 cm
		SH	QTZ	13/21/5	S.44/E.42	14 cm
		TF	KLS	13/8/3	S.58/E.45	12 cm
		SH	GFC	14/6/6	S.48/E.14	19 cm
		TF	KLS	14/20/2	water screen	
	20-30 cm	TF	KLS	31/45/6	center	30-35 cm
		TF	KRF (?)	8/6/2	"	" "
		PDF	KRF (?)	8/20/9	S.36/E.26	
		Checked piece	QTZ	65/30/28	S.40/E.45	
AREA A, FT8/E	0-10 cm	TF	KLS	22/41/4	screen, SE¼	
		TF	KLS	13ap/28/6	" "	
		Blade	KLS	23/8/2	" "	
		TF	HBL	6ap/13/2	" "	
	10-20 cm	TF	KLS	10/10/2		
		TF	KLS	7/9ap/2.5		
		TF	KLS	7ap/8/1		
		R/RF	KLS	9/9/1.5		
		Blade	KLS	19ap/13/3		
		TF	KLS	20ap/27/4		
		Blade	KLS	14ap/9/2		
		SH	KLS	26x8x7		
		TF	KLS	24/16/3		
		R/RF	HBL	7/6/1		
	20-30 cm	TF	KLS	30/67/11	S.65-.70/E.25-.34	25 cm
		TF	KLS	6ap/7/0.7	same as above	" "
		R/RF	KLS	4/6/1	" " "	" "
		TF	KLS	14/25/3	S.88/E.08	22 cm
		Blade	KLS	15ap/19/4	S.54/E.04	28 cm
		R/RF	KLS	5 by 8 by 1	screen	
	30-35	Blade	GFC	17ap/14/7	S.54/E.04	32 cm
AREA B, FT1	10-20 cm	TF	KLS	8ap/9/1	screen, NE¼	
		TF	KLS	17/13/3	screen, SW¼	
	20-30 cm	TF	KLS	8x8/1.5	screen, NW¼	
		TF	KLS	13 x 6ap/1	" SW¼	
		TF	KLS	14ap/23/3	center, SW¼	
	30-40 cm	Blade	HBL	10ap/11/2	NW¼, S2/3 of	
		TF	QTZE	10x11/2	" " "	
AREA B, FT2	Negative.					

AREA B,						
FT3	10-20 cm	TF	KLS	17/13/3	screen, NW¼	
		TF	KLS	10/10/2.5	" NE¼	
		SH	QTZ	33/24/7	" SW¼	
		TF	KLS	15/12/2	" "	
		TF	KLS	14x8ap/2	" "	
	20-30 cm	TF	QTZ	38ap/17/9	SE¼, S center of	20-25 cm
		TF	JT	7ap/16/4	" " " "	" "
		TF	JT	9ap/10/3	" " " "	" "
		TF	KLS	14/11/2	" " " "	" "
		TF	KLS	12/8/2	" " " "	" "
		TF	KLS	13/8/1.5	" " " "	" "
		TF	JT	12/9/2	screen, SW¼	" "
		SH	QTZ	13x7/2.5	S.61/E.40	21 cm
		TF	KLS	14/10/3	S.75/E.45	22 cm
		SH	QTZ	15x7x7	S.19/E.15	24 cm
		SH	QTZ	22x7x6	S.21/E.83	21 cm
		TF	QTZ	11ap/10/4	S.48/E54	21 cm
		R/RF	JT	3.5x4/0.5	S.56/E.30	28 cm
		TF	HBL	9ap x 8ap/2	S.56/E.16	28 cm
		R/RF	JT	8/6/2	S.76/E.22	28 cm
		SH	QTZ	25/20/9	S.94/E.22	28 cm
		R/RF	HBL	3.5 x 4/0.5	water screen	
	30-40 cm	TF	QTZ	17/13/2	screen, SW¼	30-35 cm
		SH	QTZ	11x13/6	" "	" "
		TF	QTZ	17/13/4	S.30/E.48	33 cm
AREA B,						
FT3/W	10-20 cm	TF	KLS	11ap/16/2	screen, S½	15-20 cm
	20-30 cm	TF	KLS	14x6/2.5	S.53/E.62	28 cm
		SDF	QTZ	10/17/5	S.26/E.88	" "
		SDF	QTZ	47/32/14	S.08/-.16/E.74-.88	28-30 cm
		SDF	QTZ	16/16/5.5	" " " "	" "
		SDF	QTZ	20/10/4.5	" " " "	" "
		SDF	QTZ	13/12/3	" " " "	" "
		TF	QTZ	12x10/2.5	" " " "	" "
	30-40 cm	TF	QTZ	11/10/2	S.14/E.64	35 cm
		TF	QTZ	9x13/2	S.27/E.60	36 cm
		TF	KLS	5x13/1.5	S.34/E.72	32 cm
AREA B,						
FT3/N	0-10 cm	TF	KLS	16ap/13/4.5	screen, SE¼	5-10 cm
	10-20 cm	TF	KLS	58ap/76/14	S.44-.48/E.28-.32	18-22 cm
		TF	KLS	19/19/5	S.44/E.48	18 cm
		TF	KLS	10/12/1.5	S.03/E.36	15 cm
		TF	KLS	6ap/8/1.2	S.30/E.45	" "
		TF	KLS	15ap/15/3.5	S.43/E.38	" "
		TF	KLS	11ap/14/1.7	S.03/E.14	18 cm
		R/RF	KLS	12x5/1	S.09/E.15	" "
		R/RF	KLS	4/12/1	S.14/E.21	" "

AREA B,

FT3/N (cont'd)	10-20 cm	TF	QTZE	18ap/22/3	S.14/E.21	18 cm
		TF	QTZE	12/16/2.8	" "	" "
		R/RF	QTZE	4x2x0.5		
		TF	QTZE	12/15/4.6		
		TF	KLS	14ap/15/2.6		
		TF	KLS	13ap/16/1.8		
		PDF	QTZ	24/29/5		
		SH	QTZ	18x9x5		
		Utilized/modified tertiary flake	JT	40/27/4.5		
		TF	KLS	31x34/7		
		TF	KLS	35/22/5		
		TF	KLS	37/20/5.5		
		TF	KLS	25ap x 15ap/3		
		TF	KLS	12ap/15/1.5		
		SH	KLS	12x19x5.5		
		TF	QTZ	25/34/8		
		R/RF	QTZE	8/7/1.4		
		TF	KLS	11/13/2.5		
		SH	QTZ	8x8x2.8		
		TF	JT	20/23/3		
		TF	QTZE	19ap/29/4.3		
		SH	QTZ	17x14x5		
	20-30 cm	TF	KLS	19ap/19/3	S.15/E.18	22 cm
		TF	KLS	14/13/2.5	S.25/E.22	22 cm
		TF	KLS	13ap x 12 ap/2	S.28/E.28	22cm
		TF	KLS	20ap/9/2.5	" "	22 cm
		2 TF	KLS	11/9/2.5; 9x7/2	S.20-.24/E.21-.26	25 cm
		Blade	KLS	13ap/10/2.5	S.41/E.40	25 cm
		Blade	KLS	7ap/7/1.4	" "	" "
		Blade	KLS	7ap/5/0.9	S.41/E.30	30 cm
		SH	KLS	13x10x4.6	S.12/E.10	" "
		SH	JT	14x13x8	S.36/E.16	24 cm
		TF	QTZE	17ap/14/3	S.26/E.16	22 cm
		TF	QTZE	10ap/15ap/2	S.35/E.25	25 cm
		TF	KLS	9/16/3	screen, NW¼	25-30 cm
		TF	KLS	10ap/12/2	" "	" "
		TF	KLS	7ap/8/3	" "	" "
		R/RF	KLS	8x4x0.7	" "	" "
		R/RF	KLS	4ap x 4ap/1.1	" "	" "
		R/RF	KLS	4/5/1.3	" "	" "
		13 flake fragments	KLS	all less than 10	" "	" "
		R/RF	JT	4/5/1	" "	" "
		R/RF	JT	5/5/0.9	" "	" "
		TF	QTZE	13/15/2	" "	" "
		TF	QTZE	9ap/12/2	" "	" "
		TF	QTZE	6ap/10/1.3	" "	" "
		TF	QTZE	10ap/9/1.2	" "	" "
		TF	QTZE	7ap/9/1	" "	" "
		TF	QTZE	4ap/6/1.6	" "	" "
		R/RF	QTZE	4/8/1	" "	" "
		R/RF	QTZE	4ap x 6/0.9	" "	" "
		2 flake fragments	QTZE	7 and 6 max.	" "	" "

AREA B,

FT3/N (cont'd)	20-30 cm	TF	KLS	41/20/3	S.05/E.58	29 cm
		TF	KLS	11ap/19/2.3	" "	" "
		TF	KLS	16/13/4.2	S.48/E.70	27 cm
		Util. TF	JT	37/32/5	S.04/E.53	22 cm
		TF	JT	15ap/17/3.7	S.25/E.52	25 cm
		TF	QTZ	26/13/5.6	S.25/E.97	25 cm
		TF	QTZE	22ap/15/2.8	S.42/E.58	" "
		R/RF	HBL	3.8/4/1	screen, NE¼	
		TF	KLS	16/9/1.3	S.40/E.66	22 cm
		TF	KLS	10ap/10/2.4	S.94/E.94	25 cm
		TF	KLS	4ap/13/1.7	S.10/E.80	22 cm
		R/RF	KLS	4x11/0.9	S.14/E.58	22 cm
		Flake fragment	KLS	8 max.	S.14/E.96	27 cm
		TF	JT	18ap/40/4.5	" "	" "
		TF	KLS	12ap/13/2.3	screen, SE¼	
		TF	KLS	8ap x 12ap/1.1	" "	
		TF	JT	10ap/25/2.3	" "	
		TF	QTZ	12ap/11/2.3	" "	
		TF	KLS	30/31/9.3	S.15/E.18	30 cm
		R/RF	KLS	7/5/1.5	S.08/E.48	" "
		SDF	QTZ	18/11/4.3	S.40/E.48	28 cm
		SH	QTZ	14x12x4	S.30/E.10	29 cm
		TF	QTZ	15/11/2.6	S.18/E.08	27 cm
		TF	QTZ	11ap/6/4	S.03/E.19	28 cm
		TF	KLS	10ap/14/2.4	screen, SW¼ (N½)	20-30 cm
		2 flake fragments	KLS	5 & 8 max. wdth	" " "	" "
		R/RF	QTZ	4/4/0.9	" " "	" "
		R/RF	QTZ	5x2.8/0.7	" " "	" "
		R/RF	QTZ	4x4/0.8	" " "	" "
		TF	QTZE	8/8/1.7	" " "	" "
		Flake fragment	QTZE	6ap/14ap/2	" " "	" "
		TF	KLS	10/9/2	screen, SW¼ (S½)	" "
		TF	KLS	4ap/9/2	" " "	" "
		5 R/RF	KLS	5-7x5-7/0.5-0.9	" " "	" "
		2 R/RF	QTZ	4-7x4-7/1	" " "	" "
		SH	QTZ	14x7x3	" " "	" "
		Flake fragment	QTZ	6x5/1.4	" " "	" "
	30-40 cm	TF	KLS	10ap/13/2.1	screen, NW¼	30-40 cm
		TF	KLS	6ap/14/2	" "	" " "
		TF	KLS	14/16/3.6	S.14-.19/E.21-.28	35 cm
		TF	KLS	13x10/2.3	" " " "	" "
		TF	KLS	10ap/16/2.3	screen, SE¼ (S½)	30-40 cm
		R/RF	KLS	5ap x 5ap/0.5	" " "	" "
		SH	QTZ	15x5x3	" " "	" "
		TF	KLS	14/11/2.5	S.03-.08/E.29-.39	36-40 cm
		R/RF	KLS	7/9/0.8	" " " "	" "
		2 R/RF fragm	KLS	6ap x 6ap/0.8	" " " "	" "
		PDF	JT	24/14/2.6	" " " "	" "
		TF	KLS	10/12/2	screen, SW¼	" "
		TF	KLS	6ap/13/2	" "	" "
		R/RF	KLS	3x2/0.5	" "	" "
		R/RF	JT	6x3.2/1	" "	" "
		R/RF	HBL	5x3/1	" "	" "
		2 R/RF	QTZ	4/6/1; 2/3/1	" "	" "
		TF	QTZE	11x8/2	" "	" "
		TF	QTZE	5ap/5ap/1.6	" "	" "

AREA B,						
FT3/NE	20-30 cm	Retouched blade	JT	52/22/4	S.43/E.25	22 cm
		TF	KLS	9ap/13ap/2.5	S.14/E.15	21 cm
		SDF	JT	14/19/6	S.36/E.16	23 cm
		SDF	JT	13/13/6	S.26/E.16	" "
		TF	JT	15ap/14ap/3.5	S.34/E.48	25 cm
		TF	JT	9ap/20ap/4.5	S.45/E.46	28 cm
		TF	JT	18/8/2.7	" "	" "
		R/RF	JT	7ap/6/0.9	S.11/E.32	29 cm
		SDF	GFC	8/9/3.2	S.45/E.37	25 cm
		TF	GFC	10/14/2	" "	" "
		TF	GFC	7ap/8/2	S.36/E.46	23 cm
		R/RF	GFC	8/6/1.5	S.33/E.06	" "
		TF	QTZ	29ap/28ap/6	S.18/E.48	25 cm
		SDF	QTZ	24/36/7.5	S.38/E.28	23 cm
		SDF	QTZ	19x26/5.5	S.30/E.26	23 cm
		TF	QTZ	8ap/11/2.3	screen, NW¼	20-30 cm
		2 flake fragments	QTZ	5-10x5-10	" "	" "
		SH	QTZ	9x5x2	" "	" "
		TF	KLS	26ap/20/2.5	S.94/E.46	30 cm
		TF	KLS	7ap/15ap/2.5	S.70/E.90	25-28 cm
		SH	KLS	16x10x4	" "	" "
		PDF	JT	14ap/11ap/2.5	" "	" "
		TF	JT	13ap/11/5	" "	" "
		SH	QTZ	22x12x7	S.70-.90/E.32	25-28 cm
		SH	QTZ	14x11x5	" " "	" "
	30-35 cm	TF	GFC	13/10/2	S.44/e.46	36 cm
AREA B,						
FT4	10-20 cm	Util./modified TF	JT	55/32/5	S.32-.37/E.82-.86	19 cm
		TF	KLS	27ap/36ap/4.3	S.55/E.75	20 cm
		TF	JT	27ap/25ap/3.8	S.76/E.74	17 cm
		R/RF	KLS	6/6/0.8	screen, SE¼	
	20-30 cm	TF	JT	9ap/19/3.1	S.48/E.54	30 cm
		R/RF	KLS	4/4/1.2	screen, NE¼	20-30 cm
		R/RF	GFC	6/4/0.7	" "	" "
		TF	KLS	9x9/1.3	screen, SE¼	" "
		TF	JT	10 max./1.6	" "	" "
		TF	QTZ	12 max./2.5	" "	" "
		TF	KLS	12ap/20/2.5	S.62/E.47	28 cm
		TF	JT	20ap/19ap/3.5	S.71/E.12	30 cm
AREA C, FT1		Negative				
AREA C,						
FT2	10-20 cm	TF	KLS	17ap/8/1	screen, NE¼	
		TF	KLS	12x7/1	" SE ¼	
		TF	KLS	5ap/5/0.8	" SW¼	
		TF	JT	12ap/19/2	SE¼SE¼	
		Blade	JT	11ap/11/2	" "	
		TF	JT	9/7/2	" "	
		R/RF	JT	7/6/1	" "	
		Core	QTZE		s.14/E.65	

AREA C,						
FT2	20-25 cm	TF	JT	12/15/3	S.09/E.38	23-24 cm
		TF	JT	10ap/18/2	" "	" "
		TF	KLS	14/9/1	S.15/E.07	24 cm
		TF	JT	20/17/2.5	S.37/E.30	23 cm
		TF	JT	18/12/4	SE¼SE¼	20-25 cm
		TF	JT	14ap/14/2	" "	" "
		TF	JT	17/10/1.5	" "	" "
		TF	JT	14x6/2	" "	" "
		TF	JT	8/10/2	" "	" "
		TF	JT	10x7/1	" "	" "
		TF	JT	13x9/4	" "	" "
		R/RF	JT	10/9/1.5	" "	" "
		TF	KLS	13/15/2.5	" "	" "
		TF	KLS	9/17/1.5	screen, SW¼	
		Biface	QTZE	36/32/10	S.12-.14/E.75-.76	23 cm
		Chunk	same	32/25/20	S.15-.16/E.78-.79	24 cm
	25-30 cm	TF	JT	11/13/1.5	S.66/E.06	28 cm
		TF	JT	10/12/2	screen, SW¼	
		TF	KLS	7x10/1	" "	
	30-35 cm	TF	KLS	10/13/3	S.46/E.32	33 cm
		TF	KLS	7ap/13/2	S.61/E.33	33 cm
		TF	KLS	9/12/1	" "	" "
		R/RF	KLS	6x4/0.3	water screen	
		R/RF	KLS	4x5/0.3	" "	
AREA C, FT3		Negative				
AREA C,						
FT4	10-20 cm	TF	KLS	7ap/14/1	screen, SE¼	
AREA C,						
FT5	0-10 cm	TF	KLS	10ap/11/2	screen, NE corner SW¼	
	10-20 cm	R/RF	HBL	2x2.5/0.3	NW¼SW¼	
		R/RF	KLS	8/8/1	" "	
		TF	KLS	7ap/9/1	" "	
		TF	KLS	13/15/2.5	" "	
		Core	JT	40x43x25	S.9/E.9	15-20 cm
		Blade	KLS	34ap/17/4	s.56/E.99	20 cm
		TF	KLS	25/23/3	S.66/E.92	18 cm
		TF	HBL	17/13/3	screen, NW¼	
		TF	KLS	8ap/12/1	screen, NE¼	
	20-30 cm	TF	GFC	12ap/13ap/2	S.80-.86/E.55-.63	29 -30 cm
		TF	KLS	13ap/16/2	" " " "	" "
		R/RF	KLS	9/8/0.7	" " " "	" "
		R/RF	KLS	5/5/1	" " " "	" "
		R/RF	HBL	5ap/5ap/1	" " " "	" "
		TF	JT	5ap/10/1.5	screen, NW¼ NE¼ SE¼	

AREA C,						
FT5	30-40	R/RF	KLS	3.5x2.5/0.3	water screen, dark area in SE¼	30-35 cm
		R/RF	KLS	2.5x2/0.3	same as the above	" "
		R/RF	KLS	4x4/0.3	water screen, dark area in NW¼	" "
		TF	GFC	16ap x 14ap/2	S.92/E.47	35 cm
		TF	GFC	10ap/18/2	S.96/E.37	38 cm
		TF	GFC	6ap/18/2	S.53/E.7	40 cm
		TF	KLS	7ap/15/1.5	" "	" "
		TF	KLS	17x9/2	NE¼ SE¼	
	40-45 cm	TF	KLS	11ap/8/0.8	S68/E.84	
AREA C,						
FT5/N	0-10 cm	TF	QTZE	11ap/10/1.5	screen, SE¼	
	10-20 cm	TF	KLS	11ap/10/1.1	S.36/E.42	16 cm
		TF	QTZE	9/12/1.7	screen, NW¼	10-20 cm
		TF	KLS	10ap/12ap/1.6	S.12/E.84	18 cm
		TF	KLS	23/17/1.5	S.64/E.47	16 cm
		TF	KLS	8/7/1.1	S.80-.88/E.39-.46	17-18 cm
		TF	KLS	24ap/19ap/23	" " " "	" "
		TF	KLS	20ap x 8ap/2.1	" " " "	" "
	20-30 cm	TF	JT	13ap/14/2.9	S.25/E.02	26 cm
FT5/W	20-30 cm	TF	KLS	5ap/8/1	screen, NE¼	20-25 cm
		PDF	GFC	9ap/12ap/1.5	" "	" "
		TF	KLS	6ap/13/3	S.68/E.84-.88	20 cm
		SH	GFC	16x12x6	" " "	" "
		TF	KLS	9ap/15/2.1	S.65/E.82	20 cm
		TF	KLS	10ap/15/1.8	S.57/E.78	23 cm
		TF	KLS	9apx6ap/1	S.57/E.85	22 cm
		TF	KLS	13ap/14/2	S.60/E.90	23 cm
		TF	KLS	10ap/13ap/1.3	S.70/E.74	23 cm
		TF	KLS	11ap/17/2.2	S.70-.90/E.65-.80	25 cm
		TF R/RF	KLS	8ap/12/1.4	same as above	
		R/RF	KLS	5ap/8/1.8	" " "	
		R/RF	KLS	5/5/0/9	" " "	
		2 flake fragments	KLS	8-6 max./1/1	" " "	
		SH	GFC	15x3x2	" " "	
		SH	GFC	10x10x3	" " "	
		SH	GFC	9x8x2.5	" " "	
		TF	KLS	5ap/6/0.7	" " "	
		Util. flake	QTZ	48/13x12	S.67/E.70	26 cm
		SH	GFC	14x8x3	S.93/E.55	30 cm
		TF	KLS	6/11/1.5	screen, SE¼	20-25 cm
		TF	KLS	8ap/13ap/1.8	" "	" "
		TF	KLS	8ap/17/2.6	" "	" "
		2 flake fragments	KLS	6&7 max./1	" "	" "
		SH	JT	8x7x2	" "	" "
		PDF	GFC	5/8/2.2	" "	" "
		Flake fragment	QTZ	6 max./1.2	" "	" "

AREA C,

FT5/W	20-30 cm	TF	KLS	6ap/12ap/1.4	screen, SE¼	25-30 cm
		TF	KLS	6ap/7ap/1.6	" "	" "
		TF	KLS	8ap/6ap/1.5	" "	" "
		TF	KLS	9ap/9ap/1.3	" "	" "
		Flake fragment	KLS	7 max. 1.3	" "	" "
		SH	GFC	11x7x2	" "	" "
		SH	GFC	12x7x2	" "	" ..
		SH	GFC	5x5x2	" "	" "
		SH	GFC	10x1306	screen, SE¼	25-30 cm
		TF	KLS	7ap/8/1.3	screen, SW¼	" "
		2 flake fragments	KLS	11 & 9 max/1.2	" "	" "
		R/RF	GFC	4/6/0.7	" "	" "
		R/RF	GFC	6ap/5/0.6	" "	" "
		2 flake fragments	GFC	7&6 max./1	" "	" "
	30-40 cm	Flake fragment	KLS	6ap x 6ap/0.9	S.60/E.98	35 cm
		SH	KLS	10x9x4	S.98/E.57	" "
		TF	KLS	10ap/17/3.2	S.72/E.98	39 cm
		TF	KLS	10/13/1.3	screen, SE¼	30-35 cm
		3 flake fragments	KLS	6-7.max./0.9	" "	" "
		SH	GFC	12x7x2.6	" "	" "
		TF	KLS	18ap x 13ap/1.6	S.64/E.20	31 cm
		TF	KLS	15/12/2	S.97-.99/E.42-.47	32-35 cm
		TF	KLS	6ap/6/0.7	" " " "	" "
		TF	KLS	13ap/8/1.7	" " " "	" "
	40-50 cm	SH	GFC	14x11x4	screen, NW¼	40-45 cm
		TF	KLS	7ap/10/2.4	SE¼ (SW cor.)	40 cm
		SH	GFC	22x22/9	" " "	41 cm
		PDF	HBL	15/19/4.3	" " "	42 cm
FT5/SW	10-20 cm	TF	KLS	10ap/20ap/1.5	S.21/E.12	18 cm
		TF	KLS	12/12/1.8	" "	" "
		TF	KLS	11ap/17/1.3	screen, NW¼	15-20 cm
		TF	KLS	6 max. /0.9	S.50/E.72	17 cm
		R/RF	KLS	7/8/0.9	S.36/E.68	17 cm
		TF	GFC	13/9/2.3	screen, NE¼	15-20 cm
	20-30 cm	TF	KLS	5ap/6/1.2	S.23/E.12	22 cm
		TF	KLS	22/16ap/2.5	S.50/E.79	29 cm
		TF	KLS	14ap/8/1.2	screen, NE¼	20-25 cm
		TF	KLS	9/10/1.4	" "	" "
		TF	KLS	7ap/7/1.2	" "	" "
		TF	KLS	7ap/9ap/1	" "	" "
		TF	QTZ	8/9/1.5	" "	" "
	30-40 cm	Utilized TF	KLS	9/17/1.5	S.15/E.20	40 cm
		TF	KLS	6 max./0.8	" "	" "
		TF	KLS	9/14ap/1.8	S14./E.38	38 cm
		TF	KLS	11/9/1.1	screen, NW¼	30-35 cm
		TF	KLS	6ap/6ap/1.1	" "	" "
		TF	KLS	9ap/8/1.5	" "	" "
		TF	KLS	5ap/8/0.9	" "	35-40 cm
		R/RF	KLS	5/8/0.9	" "	" "
		2 flake fragments	KLS	7&6 max./1 & 0.6	" "	" "

AREA C,

FT5/SW	30-40 cm	TF	KLS	30ap/25/3	S.06-.16/E.57-.68	33 cm
		TF	KLS	9ap/9/1.5	" " " "	" "
		TF	KLS	6ap/7/0.8	" " " "	" "
		TF	KLS	7ap/10/1.3	" " " "	" "
		TF	GFC	15ap/15/4.3	" " " "	" "
		TF	KLS	18ap/18/2.7	S.26/E.78	38 cm
		TF	KLS	7ap/8/1.3	screen, NE¼	30-35 cm
		TF	KLS	5ap/9/0.8	" "	" "
		TF	KLS	6ap/6/1	" "	" "
		R/RF	KLS	6/7/0.9	" "	" "
		2 flake fragments	KLS	5-7 max./1.2	" "	" "
		TF	KLS	10/12/2	" "	35-40 cm
		TF	KLS	7ap/6/0.8	" "	" "
		R/RF	KLS	6/7/1	" "	" "
		SH	GFC	6x7x2	" "	" "
	40-50 cm	TF	KLS	21ap/22/3.1	S.37, E.08	48 cm
		4 TF fragments	KLS	8 max./0.7-1.3	screen, NW¼	40-45 cm
		3 TF fragments	KLS	9 max./1-1.2	" "	45-50 cm
		TF	KLS	7ap/9/1	S.11/E.63	45 cm
		TF	KLS	10/11/1.4	screen, NE¼	40-45 cm
		TF	KLS	6ap/7/0.8	" "	" "
		R/RF	KLS	6/8/1	" "	" "
		R/RF	KLS	5/5/0.7	" "	" "
		TF	KLS	8 max./0.8	" "	" "
		TF	KLS	16x8/1.7	" "	45-50 cm
		TF	KLS	10/10/1.7	" "	" "
		TF	KLS	5ap/5/0.9	" "	" "
		TF	KLS	7ap/9/1.4	" "	" "
		R/RF	KLS	4/6/0.8	" "	" "
	50-60 cm	TF	KLS	21ap/8/1.3	screen, NW¼	50-55 cm
		R/RF	KLS	6/7/1.2	" "	" "
		TF	KLS	3ap/8/1	S.04-.10/E.52	55 cm
		TF	KLS	8ap/7/1.2	" " "	" "
		TF	KLS	17ap x 13ap/1.2	" " "	" "
		R/RF	KLS	6/8/1	S.40/E.71	57 cm
		TF	KLS	11ap/14/1.6	screen, NE¼	50-55 cm
		R/RF	KLS	7/8/0.7	" "	" "
		R/RF	KLS	4/7/0.8	" "	" "
		2 flake fragments	KLS	8 max./1	" "	" "
FT5/S	10-20 cm	Biface (fractured)	KLS	27ap/20ap/4.1	NW¼ NW¼	15-20 cm
		TF	KLS	7ap/8/1.1	screen, NW¼	10-20 cm
		TF	KLS	6ap/6/0.8	" "	" "
		TF	KLS	12ap/8ap/1.2	" "	" "
		7 flake fragments	KLS	9 max./1.2	" "	" "
		SH	GFC	10x10x4	" "	" "
		TF	KLS	8ap/10/0.8	screen, SW¼	10-20 cm
	20-30 cm	TF	GFC	19/12/3.1	S.03-.04/E.47	23 cm
		TF	KLS	7ap/9/1.5	" " "	" "
		Retouched TF	GFC	36ap x 10ap/5.8	S.15/E.00	25 cm

AREA C,

FT5/S	20-30 cm	TF	KLS	8ap/9/1	S.18/E.26	29 cm
		TF	KLS	10/10/1.1	screen, NW¼	20-30 cm
		TF	KLS	10/9/1.4	" "	" "
		TF	KLS	8ap/9/1.7	" "	" "
		TF	KLS	8ap/8/1	" "	" "
		TF	KLS	4ap/8/1	" "	" "
		TF	KLS	8 max./0.8	" "	" "
					" "	" "
	30-40 cm	TF	KLS	20ap/24/1.4	S.14/E.45	31 cm
		TF	KLS	9ap/15/2.7	S.16/E.09	33 cm
		TF	KLS	7ap/14/1	screen, NW¼	30-40 cm
		SH	QTZ	13x12x6	" "	" "
		R/RF	KLS	8/3/0.7	" "	" "
		PDF	GFC	9ap/7/1.5	" "	" "
		SDF	GFC	17ap/14/2.9	S.09/E.54	40 cm
	40-50 cm	TF	KLS	6ap/9/1.4	screen, NW¼	
	50-60 cm	TF	KLS	23ap/34/4.2	S.10/E.10	51 cm
		TF	KLS	8ap/12/1.5	S.20/E.23	54 cm
		PDF	GFC	10x16/5	NE¼ NE¼	52 cm
		TF	KLS	6ap/8/1	screen, NE¼	50-60 cm
		Rejuv. flake	KLS	5/4/0.5	" "	" "

AREA C, FT6 Negative

AREA C,

FT7	10-20 cm	TF	QTZE	65/47/13	NW¼, center of	15-20 cm
		TF	KLS	6ap/15/3	S.06/E.08	20 cm
		TF	KLS	6ap/9/1	SE¼ NE¼ & NE¼ SE¼	15-20 cm
		TF	KLS	22ap/20/3	same as above	
		TF	KLS	18ap/15/3	" " "	
		TF	KLS	21x15/1.5	" " "	
		TF	KLS	16x13/2	" " "	
		TF	KLS	7ap/12/1	" " "	
		TF	KLS	8ap/10/0.8	" " "	
		R/RF	KLS	12/6/0.5	" " "	
		TF	KLS	36ap/30/2	S.70/E.00-.02	20 cm
		SDF	QTZE	15x16ap/3	water screen	
	20-25 cm	Blade	KLS	9ap/7/1	screen, NW¼	
		TF	KLS	25/16/4	S.23/E.36	22 cm
		TF	KLS	19ap/17/2.5	S.25/E.09	21 cm
		TF	KLS	12ap/9/1.5	S.33/E.33	21 cm
		TF	KLS	26 x 15/5	S.57/E.39	22 cm
		TF	GFC	17ap/13/1	S.21/E.55	25 cm
		TF	KLS	14ap/20/2	S.50/E.70	22 cm
		TF	KLS	9ap/11/2	S.59/E.69	21 cm
		TF	KLS	6x4/1	S.81/E.60	23 cm
		TF	KLS	14x12/3	S.86-.94/E.82-.87	21-22 cm
		TF	KLS	6x7/1	" " " "	" "
		TF	GFC	6/10/2	" " " "	" "
		16 TF fragments	KLS	20 max./21 max./ 2 max.	Concentration in SE¼NE¼ and NE¼ SE¼ at 20-25 cm depth	

AREA C,

FT7	20-25 cm	4 R/RF	KLS	7 max./6 max./ 1 max.	same concentration as above	
	25-30 cm	TF	KLS	11ap/15/3	S.03/E.05	27 cm
		TF	KLS	16ap/9/2	S.08/E.92	26 cm
		9 TF fragments	KLS	23 max./23 max./ 4 max.	same concentration as in 20-25 cm level	
FT7/E	0-10 cm	Utilized TF	JT	23ap/19ap/4.8	screen, SW¼	
		TF	KLS	13ap/16/1.5	" "	
	10-20 cm	TF	KLS	6ap/8/1.2	screen, NW¼	
		SH	GFC	18x10x5	S.57/E.80	11 cm
		PDF	QTZ	23x20x7	S.70/E.65	18 cm
		TF	KLS	15/12/3.1	S.60/E.09	14 cm
		TF	GFC	7ap/9/0.9	S.71/E.31	15 cm
		TF	KLS	10ap/9/0.7	S.88/E.12	16 cm
		TF	KLS	5ap/5/1	S.74/E.40	17 cm
		TF	KLS	8/9/1.3	S.56/E.12	" "
		TF	KLS	10ap/11/1.4	S.62/E.19	" "
		SH	KLS	10x9/1.8	S.61/E.49	18 cm
		TF	KLS	11ap/15/2.1	S.71/E.22	" "
		TF	GFC	18/18/3.6	S.88/E.45	19 cm
		R/RF	KLS	9/7/4	S.63/E.37	" "
		Scraper	GFC	24x20x13	S.79/E.38	20 cm
		TF	KLS	13ap/14/1.6	S.63/E.00	" "
		R/RF	KLS	5ap/6/0.7	S.87/E.12	" "
		TF	GFC	20/15/2	S.85/E.35	" "
		SDF	GFC	12x10x5	S.80/E.35	" "
		TF	KLS	7ap/8/1	scree, SW¼	
		TF	KLS	5ap/8/1	" "	
		TF	KLS	5ap/7/1.1	" "	
		TF	KLS	8ap/9/1.7	" "	
		TF	KLS	6/9/1.2	" "	
		R/RF	KLS	4/8/2.5	" "	
		3 flake fragments	KLS	13 max wdth/ 1.9 max. thickness	" "	
	20-30 cm	TF	KLS	8ap/13ap/1.9	S.48/E.32	21 cm
		TF	KLS	12ap/14/2.2	screen, NE¼	
		TF	KLS	23ap/23/3.2	S.50/E.21	21 cm
		TF	KLS	13/6/1.3	S.80/E.15	22 cm
		TF	KLS	14ap/24ap/2.5	S.66/E.00	25 cm
	30-40 cm	SH	QTZ	5x5x8	screen, NE¼	
	40-50 cm	SH	QTZ	13x9x5	screen, NE¼	
		SH	QTZ	8x6x5	" "	
FT7/SE	0-10 cm	TF	KLS	17/12/2.2	screen, NW¼	
		Utilized blade	QTZE	55/19/5.5	S.79/E.10	10 cm

AREA C,						
FT7/SE	10-20 cm	SDF	GFC	13/8/4.5	S.07/E.45	14 cm
		TF	KLS	8ap/13/2	S.10/E.27	" "
		TF	GFC	17ap/17/3.8	S.04/E.01	16 cm
		TF	KLS	5ap x 5ap/0.8	screen, NW¼	
		R/RF	GFC	6/6/1.5	" "	
		Fractured biface	IGN	50ap/67/17	S.15/E.96	12 cm
		TF	KLS	10ap x 11ap/1.1	S.58/E.62	16 cm
		TF	GR	33ap/37/10	NW¼ SW¼	18-20 cm
		TF	KLS	10ap x 8ap/1.2	S.73/E.10	12 cm
	20-30 cm	TF	KLS	28ap/23/3.2	S.14/E.27	22 cm
		Scraper	GFC	22x16/5	S.32/e.25	22 cm
		TF	GFC	12ap/10ap/1.2	screen, NW¼	
		TF	KLS	24ap/25ap/2.7	S.86/E.18	28 cm
FT9	10-20 cm	SDF	HBL	10/24/6	screen	10-15 cm
		TF	BAS	16ap/18/2.2	NW¼ NW¼	15-20 cm
	20-30 cm	Utilized decortic. flake	JT	35x17/12	NW¼, center of	28-30 cm
		TF	JT	7ap/9/1.3	NW¼ SE¼	26-30 cm
	30-40 cm	TF	JT	9ap/9/1.7	NW¼ SE¼	35-40 cm
		TF	KLS	15ap/22ap/2	SW¼, center of	35-36 cm
		TF	JT	11ap/8/1.5	" "	" "
	40-50 cm	Blade fragment	JT	7ap/8/1.7	SW¼ SW¼	40 cm

REPORT ON A PERIMETER SURVEY OF ARCHAEOLOGICAL SITE 21-BE-44, (BLUE EARTH COUNTY, MINNESOTA) AND ON SUBSEQUENT EMERGENCY EXCAVATIONS OF ERODING CULTURAL DEPOSITS. MAY 1982-NOVEMBER 1984.

By

Christina Harrison

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ABSTRACT

Prehistoric site 21-BE-44 occupies most, possibly all, of a 13 acre large island in Lura Lake, Blue Earth County, Minnesota. It was first identified in June 1979 by a Statewide Archaeological Survey team from Minnesota Historical Society. The island comes under the jurisdiction of the Bureau of Land Management (BLM Tract Blue Earth 001). During a 1979 BLM Class I Inventory of existing cultural resources on public domain lands in Minnesota, the newly discovered site was formally added to the BLM Cultural Resource Inventory as site number MN-013-012. In 1982, Blue Earth County filed an application with the BLM for title transfer of the island under the Recreation and Public Purposes Act in order that the island could be included within the boundaries of the adjacent Daly County Park. In connection with this application, BLM contracted with Archaeological Research Services of Minneapolis, MN, to perform a perimeter survey of the site. The objectives of the investigation would be to a) study the nature and condition of the cultural deposit and assess the amount of damage that had been and could continue to be caused by severe wave and wind erosion along the northwest shore of the island; b) establish a permanent datum and coordinate grid on the site and record the present site/island boundaries as well as any other information that would facilitate future monitoring of the site and its condition; c) recommend mitigation measures that would protect the site from any further damage or allow further data collection if the threat of future damage could not be eliminated, and, d) interpret the findings of this and past investigations in such a manner that they would provide a tentative reconstruction of the site itself as well as its place within the regional culture history.

The results of the perimeter survey (performed during May-June 1983) indicated that at least two concentrations of cultural evidence were in the process of being eroded along the northwest shore of the island. The contract was then modified in order to provide for more intensive testing of these deposits -- a task which was accomplished during the Fall of 1983. By the end of the 1983 season, a total of 19 formal test units had yielded enough evidence (lithics, faunal remains and features interpreted as fire basins) to indicate the presence of one or more aceramic components in the west/northwestern part of the island, within a context that had remained fairly undisturbed until the onset of erosion (the island has never been cultivated). Finally, the 1983 results were supplemented by a third, more limited investigation during the Fall of 1984, when formal testing at five locations in the southwestern part of the island identified ceramic evidence located above an aceramic level corresponding to that excavated in the 1983 units. This third visit also served to monitor the amount of erosion that had taken place since the perimeter survey.

This report details the results of all three of these investigations. In addition, it provides a brief description of the site area and its environmental setting, as well as a review of the results of previous cultural resource investigations in the area and an attempt to interpret the data from 21-BE-44 within a regional context. On the basis of a rather limited sample of the total deposit, the site is tentatively interpreted as the location of repeated warm season occupations by late Archaic to late prehistoric groups adapted to a life within the so-called praire-lakes region and an economy heavily dependent on bison, smaller furbearing animals and waterfowl. The report concludes with recommendations for the future management of this cultural resource.

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I. INTRODUCTION

21-BE-44 is a prehistoric archaeological site which occupies most or, possibly, all of an approximately thirteen acre large island in Lura Lake, southern Blue Earth County, Minnesota (SWSENE, SESWNE, NWNESE and NENWSE Section 25, T105N, R27W; see Figures 1, 2 and 3). It was first identified in June 1979 during a cultural resource reconnaissance survey of Blue Earth and adjacent Faribault counties, conducted by a Statewide Archaeological Survey team from the Minnesota Historical Society (Appendix A). At that time, surface reconnaissance and shovel testing revealed a fairly continuous scatter of lithic, ceramic and faunal evidence on much of the island as well as on the mainland northeast of the narrow natural causeway that connects the two (the mainland evidence was given a separate site number, 21-BE-45). The cultural material on 21-BE-44 suggested that the island had been occupied one or more times during the Woodland period (ca. 200 B.C.-A.D. 900). It was also noted that part of the cultural deposit on 21-BE-44 was threatened by quite severe shoreline erosion on the northwest side of the island.

The island comes under the jurisdiction of the Bureau of Land Management (BLM Tract Blue Earth 001). During a BLM Class I Inventory of existing cultural resources on public domain lands in Minnesota, conducted during the later part of 1979, the newly discovered 21-BE-44 site was formally added to the BLM Cultural Resource Inventory as site number MN-013-012 (Karamansky, McNerney and Nixon 1980).

In 1982, Blue Earth County filed an application with the BLM for title transfer of the island under the Recreation and Public Purposes Act (43 USC 869). By then, the island had been used for some time as part of the Daly County Park which is located mainly on the shore and mainland to the northeast of the island. When the county bought the parkland, they inadvertently assumed that the island was included in that acquisition and proceeded to develop it along with the rest of the park. By comparison with the rest of the park however, the development on and the public use of the island has been fairly minimal. Maintained as a wildlife habitat, it has remained largely intact and manmade disturbance seems limited to the clearing and use of a nature-recreation trail around the perimeter of the island and to the erection of wooden posts for interpretative signs along the trail.

In order to examine the site and evaluate the extent of natural and manmade disturbance of the cultural deposit, archaeologists revisited the island in August 1982, this time BLM archaeologist Richard Brook and University of Minnesota archaeologist Clark Dobbs. This visit confirmed that the shoreline erosion observed by the Minnesota

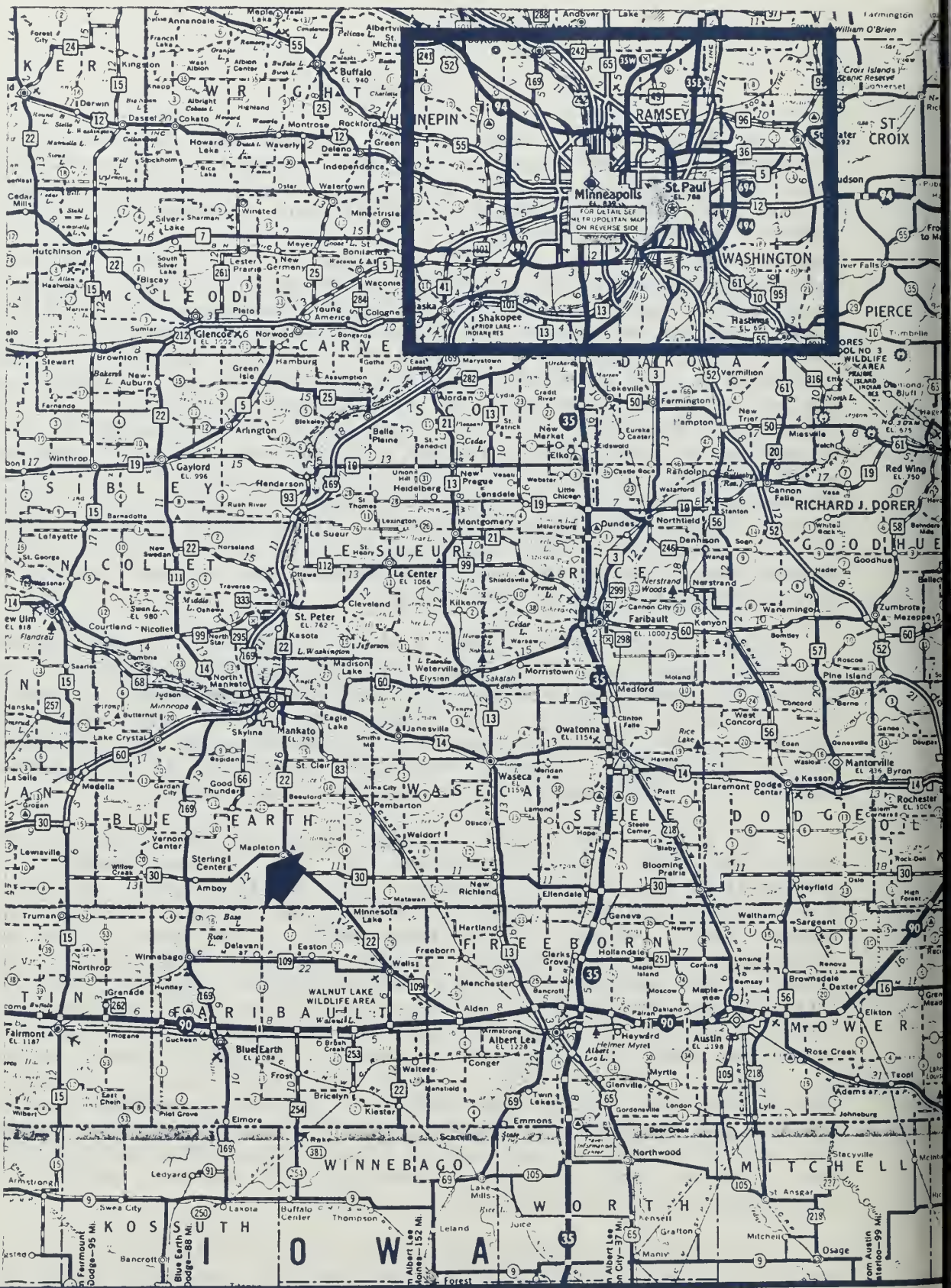

Figure 1. General Location of Project Area

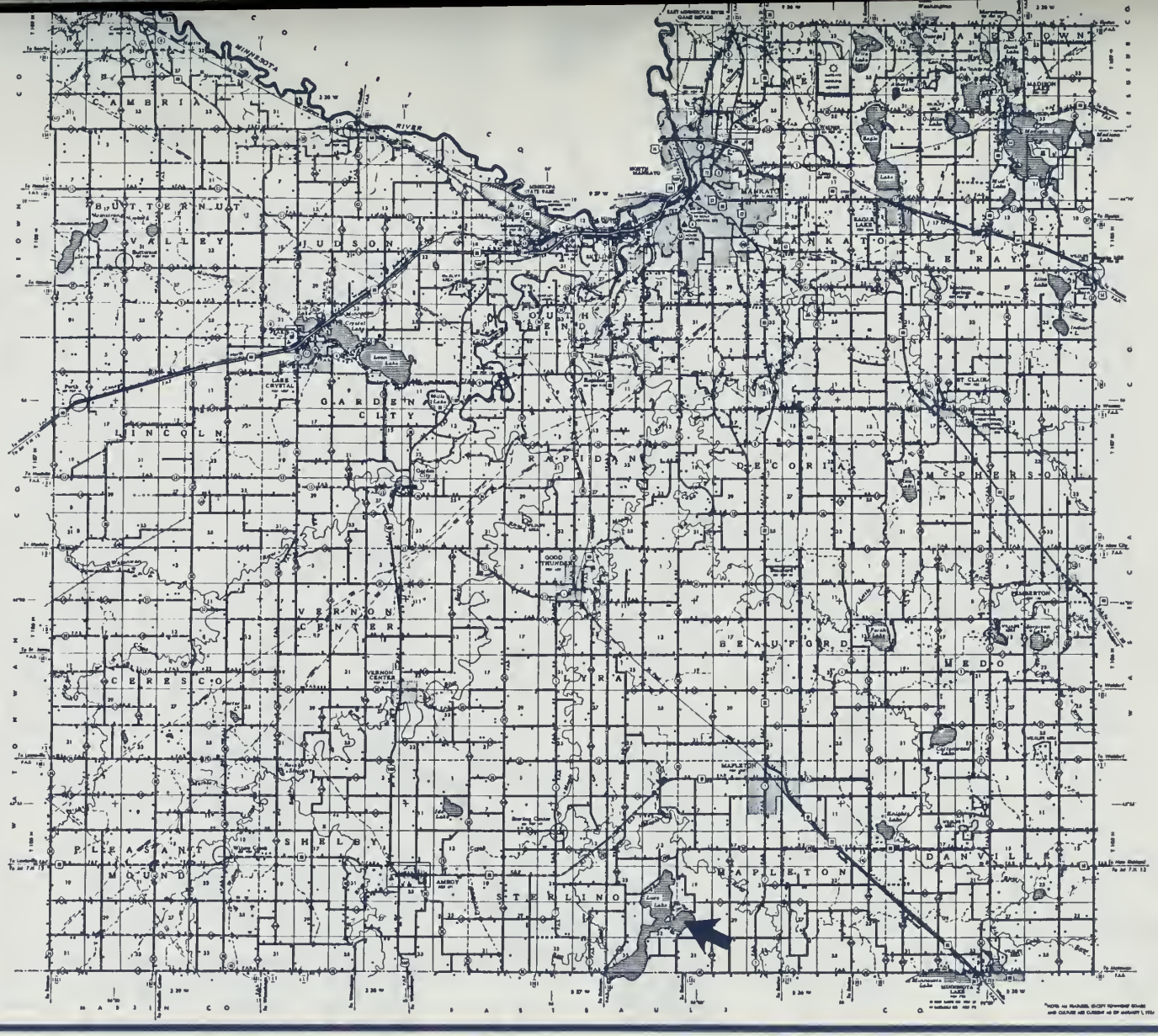

Figure 2. Blue Earth County

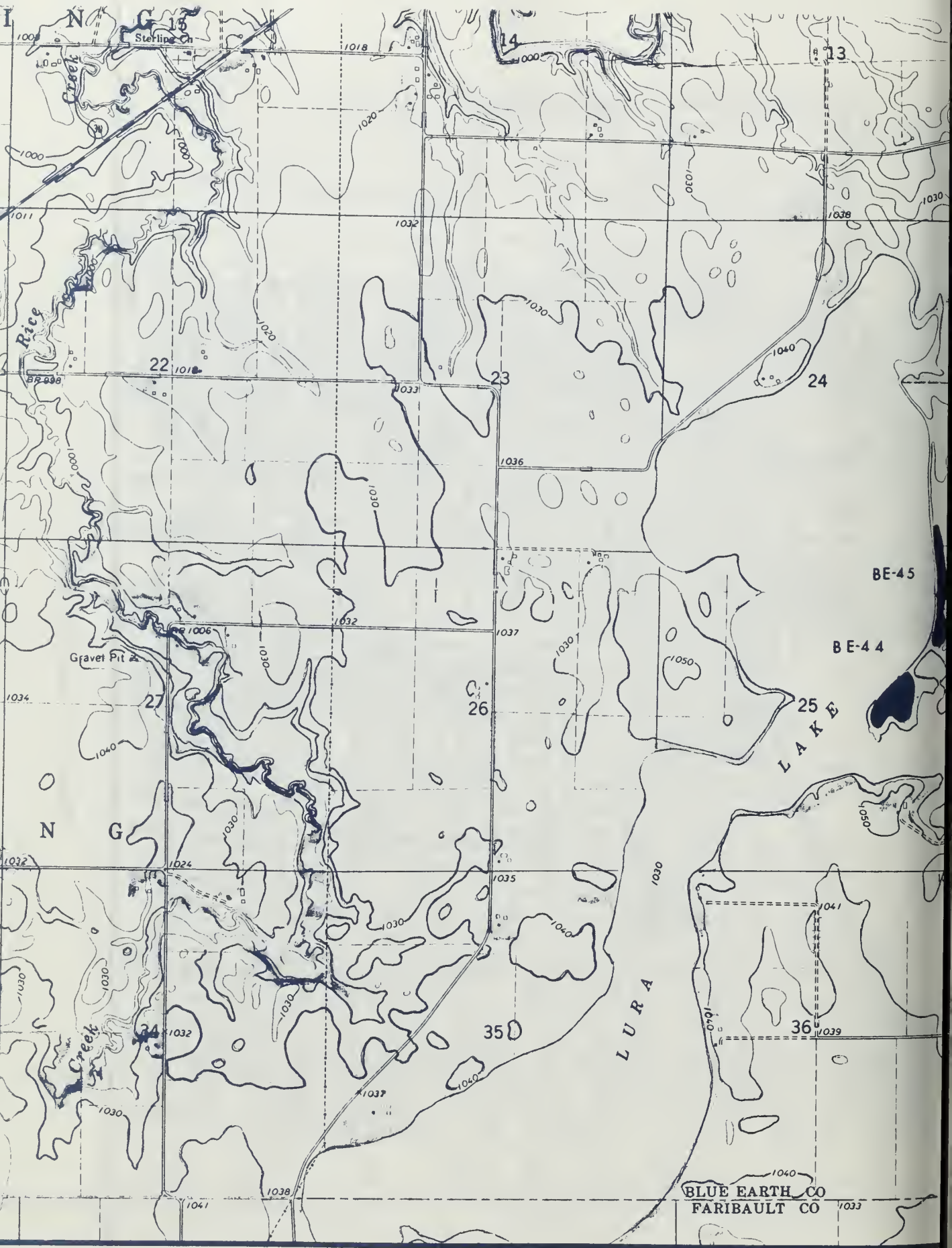

Figure 3. Topography of Project Area and Its Vicinity

Historical Society team in 1979 was progressing at a fairly rapid pace and that parts of the cultural deposit were being destroyed in the process (Dobbs 1982).

The following spring, BLM procured a more intensive archaeological survey which would accomplish limited and controlled data collection on site 21 BE 44 in order to evaluate the impact of the erosion and recover a sample of the information that is currently being destroyed. More specifically, the objectives of this procurement would be:

- to study the present physical condition of the archaeological deposit and its natural setting;

- to assess a) the amount of damage that had been done to the cultural deposit; b) the extent to and the manner in which man-produced and natural factors had contributed to this disturbance and c) the speed and intensity with which this disturbance was continuing to affect the cultural deposit;

- to retrieve with minimal impact on remaining cultural deposits and in a tightly controlled manner, cultural and paleo-environmental data from those parts of the site that were faced with immediate or fairly imminent destruction;

- to recommend mitigation measures that would protect the site from any further damage and/or allow further data collection if the threat of future damage could not be eliminated;

- to establish a permanent datum point and, with standard surveying equipment, draft a map of the site that would show a) the present boundaries of the site and the island; b) the relationship of disturbed areas to these boundaries; c) the location of all areas tested or surface examined during this undertaking and d) any other information deemed useful for the future monitoring of the site as well as the interpretation of existing data and, possibly, additional data recovery in the future;

- to attempt to interpret the findings of this and past investigations in such a manner that they would provide a reconstruction not only of the site itself but also of its place within the regional culture history.

The contract for this project was awarded to Archaeological Research Services, Minneapolis, MN. The field work was carried out during May and June, 1983. Christina Harrison acted as principal investigator, aided by Randall Withrow as field assistant and Suzanne Dickerson, Matthew Masotti and Susan McCanna as crew members (see above under Acknowledgements).

The results of the perimeter survey indicated that at least two concentrations of cultural evidence were located along the eroding shoreline and were in the process of being washed into the lake. This fact, in combination with abundant evidence of severe recent erosion all along the northwest side of the island, led to a modification of the original contract in order to provide for more intensive testing of the two eroding cultural deposits. This second phase was accomplished during September-October, 1983, again with Christina Harrison as the principal investigator but with an otherwise new team: Blythe Williams Carlson, Laila Haglund, Leigh Mazion and James Myster. BLM archaeologist Richard Brook visited for a few days in order to evaluate the progress of the project.

By the end of the 1983 season, a total of nineteen formal test units had been excavated (an initial series of four exploratory 50 by 50 cm units followed by fifteen square meter units). Together, they yielded a considerable amount of cultural evidence (lithics, faunal remains, undisturbed features interpreted as fire basins), all of which indicated the presence of one or more aceramic components in the west/northwestern part of the site, i.e. the part threatened by severe and rapid bank erosion.

During the initial 1979 survey as well as the May 1983 investigation, ceramic evidence had been retrieved from a shovel test and surface collected gopher mounds elsewhere on the island, including an area due south of the tested aceramic deposit(s). In order to a) get a more complete picture of the cultural sequence on the site, and, b) establish whether the ceramic component(s) also extended far enough west/northwest to be threatened by future erosion, BLM arranged for a third, more limited, investigation to be carried out during the Fall of 1984. Another objective of this return visit was to determine how much erosion had taken place during the fifteen months which had lapsed since the perimeter survey.

This third BLM investigation took place during early November, 1984 and was carried out by Christina Harrison, assisted by two graduate students, Marcia Regan and Sue Thurston. A total of five units were excavated. In addition, the west/northwestward extent of the eroding bank was compared to that which had been mapped in May of 1983. The results of the excavations and the bank inspection indicated a) that several ceramic components overlie an aceramic level comparable to that found in Area A, b) that the ceramic evidence appears to peter out well inland from the eroding shore, and c) that the erosion had continued during the past year but at a somewhat slower pace than that evidenced during 1982-1983.

II. ENVIRONMENTAL BACKGROUND

Site and Immediate Surroundings

The island that 21-BE-44 is located on is connected with the mainland by a natural, approximately 150 meter long, causeway. The topography and present contours of both the island and the nearby shore suggest that this may have been a peninsula in the past (Figure 3). Both feature generally level to gently undulating terrain. The west/northwestern part of the island is the highest and most level, with an elevation of 4-5 meters above normal lake level (Figure 4). From this part, the land slopes gently to the 1-2 meter lower, again quite level, southeastern part (Figure 11). Most of the island is wooded, with only a few clearings near the shores. It has never been completely cleared; none of it has been cultivated. The vegetation cover consists of mature hard woods, predominantly white and bur oak, elm, Eastern Hophorn beam, box elder, green ash and Kentucky coffee tree.

Lura Lake (Figures 3, 5 and 6) is a fairly large and irregularly shaped body of water which covers approximately 1224 acres (495 hectares). Like most lakes in the region, it is quite shallow, with a mean depth of 4.3 feet (1.3 meters) and a maximum depth of 9 feet (2.7 meters). It is completely spring fed; located on fairly high and level terrain, it receives a fairly moderate amount of runoff from the surrounding land. Highway construction on the westside of the lake appears to have interfered with the original outlet which, judging by the topographic map, would have connected the southwestern part of the lake with the Rice Creek-Maple River-Le Sueur River-Minnesota River drainage less than a mile to the west. Because of its shallow basin, the lake seems very prone to sharp drops in water level during dry years. Local old-time residents still remember the dry years of the 1930's when it was possible to drive vehicles or let cattle graze on parts of what is now lake bottom.

Geological Setting

The level or gently undulating landscape that surrounds Lura Lake and is typical of much of Blue Earth County owes its character to the last of the Pleistocene stages, the Wisconsin glaciation (USDA 1979:128-209; Wright 1972:574). Climatic fluctuations during this last stage appear to have caused four glacial advances and recessions across south central Minnesota; the evidence for the first three, however, has been obscured by later deposits and can be seen only in deep road cuts and very eroded river valleys. The last glacier to spread across southern Minnesota was the Des Moines lobe which advanced south-southeast from the Winnipeg lowland following the Red River and Minnesota River

Figure 4. View of West/Northwest Shore of Island, as Seen from Lura Lake.

Figure 5. View of South Shore of Lura Lake.

Figure 6. View of West Shore of Lura Lake.

lowlands; it completely covered what is now Blue Earth County and continued as far south as Des Moines, Iowa, where it climaxed around 14,000 B.P. During the next few millennia, this glacier receded again, quite rapidly, leaving behind a thick mantle of distinctive, greyish, shale-rich calcareous till. On top of this ground moraine, melt waters from the receding glacier laid down waterborne sediments in the form of outwash plains and deltaic or lacustrine deposits. The latter were formed at times when the melt waters ponded temporarily into glacial lakes. In parts of central and southeastern Blue Earth County (including the Lura Lake area) the undulating ground moraine is now covered by four or more feet of silty clay and silty clay loam deposited by Glacial Lake Minnesota (Figure 7). As pent up melt water found its outlet through forceful glacial rivers, it carved distinct river valleys with abrupt bluffs and gorges as well as series of terraces along their lower reaches; within the county, present-day Minnesota, Blue Earth and Le Sueur Rivers flow through such oversized, deeply cut valleys. By about 12,000 B.P., Blue Earth County would have been largely free of ice except for scattered large buried iceblocks which melted much more slowly, leaving behind depressions that later filled with water and now remain as lakes and bogs.

What remains is a youthful landscape characterized by fairly level to undulating terrain with little differentiation in elevations; most of it falls in the range between 1000 and 1060 feet above sea level (the vicinity of Lura Lake is contained between the 1030 and 1050 contours). The land also features a scatter of water filled, fairly shallow depressions and a generally poorly developed network of immature streams in shallow, marshy valleys; only a few of the rivers, like those mentioned above, flow through larger, more deeply cut glacial river valleys.

Because of the thickness of the glacial drift deposited by the Des Moines lobe, underlying bedrock strata have little or no effect on the surface relief and are exposed only along well developed river valleys such as the Minnesota River or the lower parts of the Blue Earth River and its tributaries, particularly the Le Sueur and Maple Rivers.

The soils on the 21-BE-44 island and much of the land surrounding the southern part of Lura Lake are silty clay loams and silty clays of the Shorewood Series (USDA 1979:68-70). Poor to moderately well drained, they formed on nearly level to gently sloping ground, under tall grass prairie and in a mantle of fine or fairly fine textured glacial lacustrine sediments over friable, calcareous, loamy glacial till. Baroda silty clay loam, formed in a similar manner and environment but on more level ground, predominates on the mainland northeast of the island (USDA 1979:17).

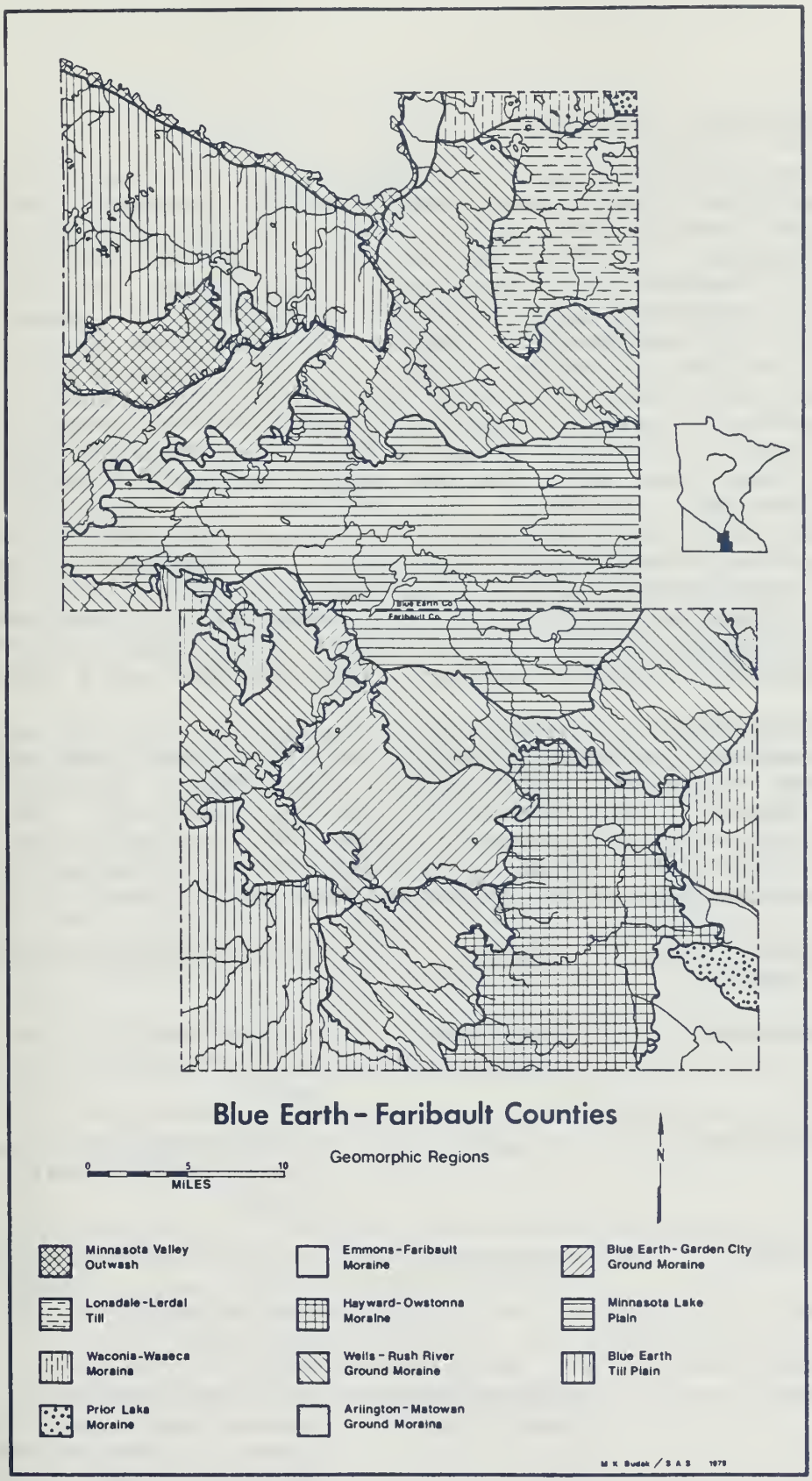

Figure 7. Geomorphic Regions in Project Area (Courtesy Minnesota Historical Society)

Climate, Flora and Fauna

The modern climate is continental, with great contrast between summer and winter temperatures. Summers tend to be warm and humid, with average daily temperatures of maximum 80-85 degrees F (27-29 degrees C) and minimum 58-63 degrees F (15-17 degrees C); approximately 70 percent of the total annual amount of precipitation falls in the summer (an average of twenty-nine inches). Tornadoes and violent thunderstorms are quite frequent. Grass fires were also common before the arrival of Euro-American settlers and the destruction of the tall grass prairie. The average length of the growing season is 156 days (all statistics have been taken from the Soil Survey of Blue Earth County--USDA 1979:199-205). Winters tend to be cold and dry, with average daily temperatures of maximum 29 degrees F (-13 degrees C) and minimum 9 degrees F (-2 degrees C) and with temperatures below zero on as much as thirty-three days a year. During years of normal snow cover, the soil is usually frozen to a depth of two to three feet for four to five months. Strong winds and blizzards are quite common.

According to various pollen spectra as well as mollusk, micro-mammal and macrofossil studies from western and southern Minnesota and northern Iowa (Baker and Van Zant 1980; Brush 1967; Durkee 1971; Jelgersmaa 1962; Van Zant 1979; Watts and Winter 1966; Wright 1964; Wright, Winter and Patten 1963), the climatic and vegetational changes of the post-glacial period can be summarized as follows:

Approximate date (B.P.)	Pollen	Vegetation/Environment
13,500-12,500	Compositae-Cyperaceae	Tundra (last glacier recedes from S. Minnesota)
12,500-11,100	Picea-Larix	Southern Boreal Forest (cool, moist conditions)
11,100-9000	Picea-Betula-Abies-Fraxinus	Mixed Conifer-Hardwood (still cooler, with more ground moisture than now)
9000-3500	Quercus-Gramineae-Artemisia	Oak-Savanna/Prairie (warmer and drier than present, less ground moisture, lower lake levels)
3500-A.D. 1800	See below	Tall Grass Prairie: return to lower tempera-

tures and increasing precipitation--comparable to modern conditions although the Neo-Atlantic interlude brought warmer conditions and increased precipitation to the eastern plains between approximately A.D. 900 and 1150.

As suggested by the above, most of central southern Minnesota has been characterized by a fairly stable prairie environment throughout much of the post-glacial period. Blue Earth County, however, is located along the north-northeast margin of an ecological "tension zone" between prairie and forest and this margin has shifted back and forth considerably with changes in temperature, relative humidity, wind velocity and precipitation (USDA 1979:199) as well as with the intermittent impact of fires, probably mostly started by lightning (Heinselman 1974).

On the basis of data from the original land survey, it has been possible to identify, probably with considerable accuracy, at least four different vegetation types in the area around Lura Lake (Figure 8). In spite of the fluctuations of the prairie-forest border mentioned above, these vegetation zones would probably have been located near or at least within easy reach of the Lura Lake area for most of the last nine millenia. The reconstruction, based on original land survey data, has been taken from Heinselman 1974; Marschner 1974 and USDA 1979:199. The four zones are:

1) Tall Grass Prairie on the well drained uplands to the north, east/southeast, south and west of Lura Lake;

2) Oak Openings and Barrens on well drained uplands to the northeast and, at some distance, also to the south and southwest;

3) Wet Prairie, Marshes and Sloughs on poorly drained lowlands and in shallow depressions;

4) Solid-Canopy Deciduous Trees such as oak, elm, basswood, ash, maple and aspen along sheltered river valleys and lakeshores, i.e. also around Lura Lake and along the Rice Creek-Maple River-Le Sueur River drainage.

In short, 21-BE-44 seems to have been located in quite a rich and varied environment. By comparison, only ten miles or so further west, the Blue Earth River seems to have marked the south and westernmost extent of even intermittent

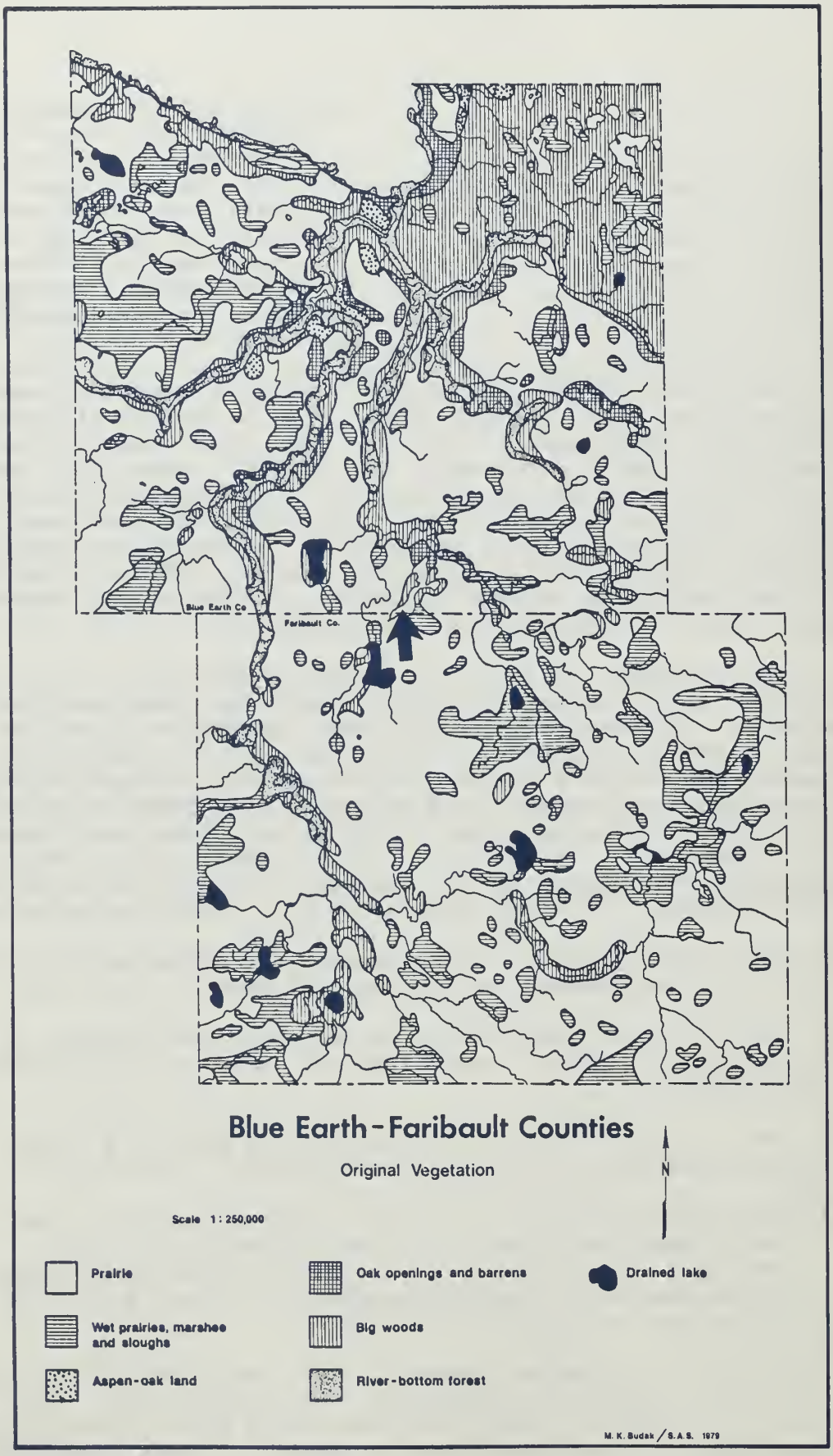

Figure 8. Native Vegetation at Time of Initial Euro-American Settlement (Courtesy Minnesota Historical Society)

oak-savanna; beyond that, the tall grass prairie became the predominant vegetation type.

This varied environment housed quite a range of plant species. The following list is based on two studies of native vegetation types, one of them a study of the environment around the Jeffers Petroglyph Site approximately sixty miles west/northwest of Lura Lake (Roefer, English and Lothson 1973), the other a more general discussion of the original vegetation in Minnesota (Heinselman 1974). Plants indicated with an asterisk are known to have been used by the Indians for food, medicine, fiber, construction material, etc. (Densmore 1974).

Tall Grass Prairie--grasses and forbs

Big Bluestem (Andropogon gerardii)*
Little Bluestem (A. scoparicus)*
Blue Grama (Boutelons gracilis)
Sideoats Grama (B. curtipendula)
Indian Grass (Sorgastrum nutans)*
Switch Grass (Panicum virgatum)
Prairie Violet (Viola pedatifida)
Star Grass (Hyproxis hirsuta)
Prairie Rose (Rosa blanda)*
Goldenrod (Solidago memoralis)*
Sawtooth Sunflower (Helianthus grosseseratus)*
Aster (Aster sp.)*
Purple Cone Flower (Echinacea angustifolia)
Pasque Flower (Anemone patens)
Purple Prairie Clover (Petalostemum purpureum)*
Downy Gentian (Gentiana puberula)
Blazing Star (Liatris psychnostachya)*

Oak Openings and Barrens

Oak, mostly bur oak (Quercus macrocarpa)*--growing singly or in stands.

Matrix of tall grass prairie as described above.

Solid-Canopy Woods (river valleys, dry ravines/coulees northfacing slopes of protected bluffs/hills, sheltered lakeshores):

American Elm (Ulmus americana)*
Slippery Elm (U. fulva)*
Cork Elm (U. racemosa)
Green Ash (Fraxinus lanceolata or pennsylvanica)*
Bur Oak (Quercus macrocarpa)*
Box Elder (Acer gegundo)*

Cottonwood (Populus deltoides)
Basswood (Tili americana)*
Silver Maple (Acer sachainum)
Hackberry (Celtis occidentalis)*
Ironwood (Ostrya virginiana)*
Willow (Salix amygdaloides)*
Red Cedar (Juniperus virginiana)*
Wild Plum (Prunus americana)*
Wild Red Cherry (P. pennsylvanica)
Choke Cherry (P. virginiana)*
Sheepberry (Viburnum lentage)
Downy Arrow Wood (V. pubescence)
Burning Bush (Euonymus atropurpureus)
Red Osier Dogwood (Cornus stolonifera)*
June Berry (Amelanchier oblongifolia)
Prairie Rose (Rosa blanda)*
Hawthorne (Crataegus sp.)
Shining Willow (Salix lucida)*
Heart Leaved Willow (S. cordata)*
Sandbar Willow (S. longifolia)*
Buffalo Berry (Shepherdia argentea)
Wolf Berry (Symphoricampos occidentalis)

Other species known to occur in the prairie region (upland prairie, sheltered bluffs, lakeshores, river-bottoms, wet prairie and marsh) and known to have been used by the Indians are:

White Waterlily (Castalia odorata)
Sedges (Carex sp.)
Bulrushes (Scirpus validus)
Cattails (Typha latifolia)
Arrowhead (Sagittaria latifolia)
Nettle (Urtica sp.)
Jerusalem Artichoke (Helianthus tuberosis)
Dandelion (Taraxacum officinale)
Wild Onion (Allium stellatum)
Thistle (Cirsum sp.)
Milkweed (Asclepias syriaca)
Prairie Sage (Artemisia frigida)

Part of the Illinoian biotic province, this region was also characterized by a varied fauna, summarized here from Burt 1957, Cleland 1966 and Shane 1982. Species marked with an asterisk have been identified in a prehistoric context within the prairie-lakes region of southwestern Minnesota, e.g. at the Pedersen Site (21-LN-2), the Big Slough Site (21-MU-1) and the Mountain Lake Site (21-CO-1) (Anfinson 1982; Shane 1982). Within the prairie zone, the faunal resources included bison (Bison bison),* elk (Cervus canadensis)*, wolf (Canis lupus),* coyote (Canis sp.),* badger (Taxidea taxus),* striped skunk (Mephitis mephitis),* jackrabbit (Lepus sp.),* Franklin and thirteen-

lined ground squirrel (Citellus franklini and C. tridecemlineatus),* plains pocket gopher (Geomys bursarius),* prairie vole (Microtus ochrogaster),* Swainson's hawk (Buteo swainsoni),* rough legged hawk (B. regalis),* prairie chicken (Tympanuchus cupido), sandhill crane (Grus canadensis).* Deciduous woodlands in stream valleys or along lakeshores harbored whitetail deer (Odocoileus virginianus),* elk, wolf, coyote, raccoon (Procyon lotor),* striped skunk, red fox (Vulpes fulva), gray fox (Urocyon cinereoargenteus),* grey and red squirrel (Sciurus carolinensis, Sc. niger, Tamiasciurus hudsonicus), woodchuck (Marmota monax), cottontail (Sylvilagus floridanus),* weasel (Mustela sp.), small rodents (Rodentia),* snakes,* sharp-tailed grouse (Pediaecetes phasianellus), bob-white quail (Colinus virginianus), owl (Otus and Bubo sp.),* bald eagle (Haliaeetus leucocephalus).* Marshlands in prairie sloughs and along the margins of the deeper lakes provided a habitat for beaver (Castor canadensis),* muskrat (Ondatra zibethica),* raccoon, otter (Lutra canadensis),* marten (Martes americana),* mink (Mustela vison),* merganser (Mergus sp.), mallard (Anas platyrhyncos),* other duck (Anas and Aythya sp.), snow goose (Chen sp.),* swans (Cygnus sp.), herons (Ardea herodias and Butorides virescens), cranes, frogs (Rana sp.),* toads (Bufo sp.), and various turtles (Chelydra serpentina, Chrysemys picta and Trionyx sp.).* The fish population of lakes and streams included bullheads (Ictalurus sp.),* yellow perch (Perca flavescens),* pike (Esox sp.),* common sucker (Catostomidae),* crappie (Pomoxis sp.),* as well as turtles and various mussels.

Lithic Resources

Efforts are presently underway to identify lithic resources in Blue Earth County and other parts of southern Minnesota. Sources of oolitic cherts are particularly common in the southeastern part of the state where deeply cut river valleys have exposed chert-bearing formations. Similar deposits have been identified along the lower reaches of the Blue Earth River near its junction with the Minnesota River (Dobbs and Shane 1982:56). It is possible that such deposits occur also along the lower, more deeply eroded parts of the Maple and Le Sueur Rivers; oolitic cherts are very predominant in the assemblage found at 21-BE-44 which suggests access to fairly local sources.

According to Dobbs and Shane (1982:56), there are also localized occurrences of non-oolitic cherts east of the Blue Earth River valley, i.e. not far from the Lura Lake area. As indicated above (and as far as we can tell from the sample at hand), such cherts were much less frequently used at 21-BE-44.

Other lithic raw materials used at this site, particularly granites, sandstones, quartzites and basalts, were probably found as cobbles eroding out of the glacial till along streambeds and lakeshores.

III. CULTURAL CONTEXT; HISTORY OF INVESTIGATIONS

Previous Research

Until 1979, archaeological research in Blue Earth County had been rather limited and focused mostly on the main valley of the Blue Earth River drainage. Winchell's monograph of 1911 mentions several mounds that had been recorded during early land surveys in the county (Winchell 1911:98-100). During the 1940's and 1950's, Lloyd A. Wilford made a number of visits to the area (reported on in brief memos kept in the Blue Earth County file at the University of Minnesota). Amongst other things, he located some major habitation sites which he interpreted as representative of the Mississippian Tradition (Wilford 1941, 1945a and 1955). Excavations were carried out on two of these locations, the Humphrey and Vosburg sites (Wilford 1945b and 1952 respectively). Some of these early findings were later reevaluated (Henning 1970 and Gibbon 1980).

The first attempt to a more comprehensive and systematic inventory survey was undertaken in 1979 when a team of Minnesota Historical Society archaeologists performed a random, stratified sampling survey of the watersheds of the Blue Earth and Maple Rivers within Blue Earth and Faribault Counties (Lofstrom 1980). A total of 74 sites were identified (included 21-BE-44) and the results seemed to indicate that the highest rate of site occurrence could be expected along streamshores (particularly at stream-stream junctions), followed by lakeshores (particularly islands), while the likely number of sites in areas away from water seemed quite low. Recently, these results have come under criticism which maintains that the stratified sampling was disproportional and that the results therefore should have been weighted before conclusions were drawn; as this was not done, the statistical inferences should be considered misleading (E. Henning in Hudak 1983). When the corrected results are presented in this critical review, however, they contradict much of what is known so far about site distribution in the upper Midwest, suggesting that a majority of prehistoric sites in the Blue Earth and Faribault County area are more likely to be found away from water. Clearly, more work of this nature will have to be carried out in the region before we can be reasonably confident about making probabilistic statements about site distribution.

More recent reconnaissance surveys along the Blue Earth River valley should, in fact, serve to supplement some of the results of the Minnesota Historical Society investigation (which was carried out as one phase of the general Statewide Archaeological Survey). In 1980 and 1981, Clark A. Dobbs of the University of Minnesota conducted systematic surface reconnaissance and surface collecting of known sites both in the vicinity of the Humphrey and Vosburg sites and along the upper Blue Earth River valley in Faribault County; as the result of intensive survey around the confluence of Center Creek and the Blue Earth River, controlled surface collections were obtained from sixteen sites within what has been designated as the Center Creek Locality (Dobbs 1984:60). During the same field seasons, Orrin C. Shane III of the Science Museum of Minnesota carried out similar survey work along the lower Blue Earth River valley in Blue Earth County, particularly around the archaeologically rich Willow Creek-Blue Earth River junction; a cluster of Oneota sites were identified, now designated as the Willow Creek Locality (Dobbs 1984; Dobbs and Shane 1982). Although these projects were initiated in order to identify late prehistoric Oneota settlement patterns, a number of earlier prehistoric Archaic and Woodland sites were found in the process. The sampling methods used were also quite compatible with those of the Statewide Archaeological Survey:

- sampling was done within environmentally defined strata;

- the forty acre quarter-quarter section served as the basic sampling unit;

- the sampling universe encompassed areas located both near and away from water.

The results of the work in the Center Creek Locality have now been presented in a detailed study (Dobbs 1984). Analysis of the Willow Creek Locality is still in progress but certain preliminary interpretations have already been drawn (Dobbs and Shane 1982).

In addition to 21-BE-44 and -45, eighteen prehistoric sites have been recorded within a ten mile radius of Lura Lake (Fig. 9). Located adjacent to lakes and streams like Minnesota Lake, drained Lake Jackson and the Maple River, most of them are artifact scatters on higher areas which have been severely disturbed by cultivation. Thirteen are aceramic, in three cases identified as Archaic, otherwise of an undetermined but probably early cultural affiliation. Three have been identified as habitation and mound sites of the Woodland period. Two appear to be multi-component with materials spanning much of the post-glacial period. Several

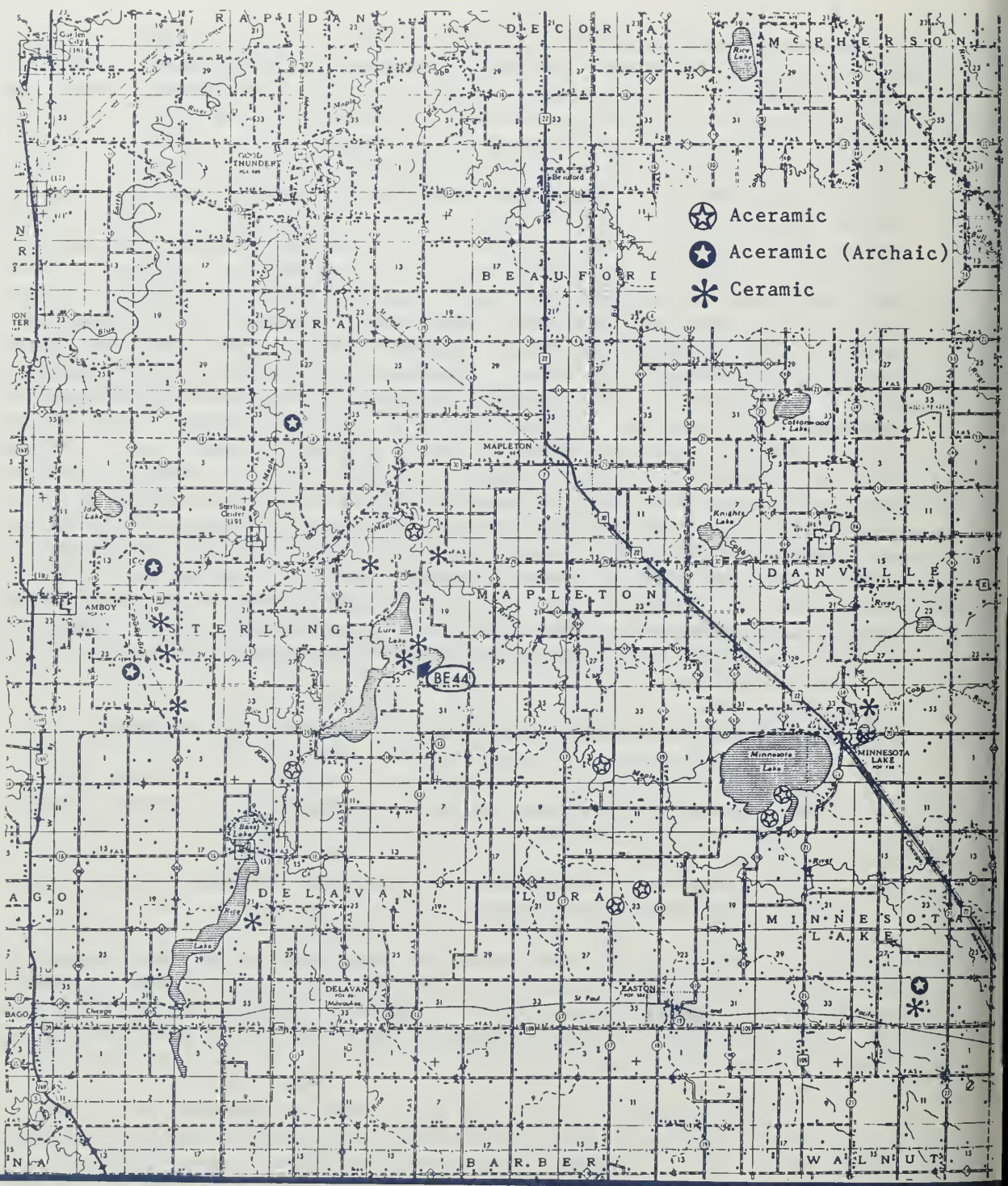

Figure 9. Distribution of Archaeological Sites in Southeastern Blue Earth and Northeastern Faribault Counties

share a number of locational and cultural characteristics with 21-BE-44.

The Prehistoric Record

Archaeological evidence accumulated so far gives a clear indication that human groups have taken advantage of the rich natural resources of this region for many thousand years. Isolated surface finds of paleo-Indian and Archaic projectile points as well as "lithic scatters" of points, knives, scrapers and other hunting-gathering tools (along with waste flakes and fire-cracked rock) are representative of the first seven or eight millennia of the post-glacial period. The lithic scatters sometimes occur in association with faunal evidence, particularly bison bones.

No paleo-Indian sites have been excavated in south-central Minnesota. As no cultural material from this period has been found *in situ*, we know very little about the cultural context. There are, however, a few sites in adjacent regions that we may extrapolate from, for example the Simonson and Cherokee Sewer sites in northwestern Iowa and the Browns Valley site in western Minnesota (Agogino nad Frankforter 1960, Anderson and Shutler 1978, Anderson and Semken 1980). At these sites, the cultural and paleoenvironmental evidence suggests a lifestyle similar to that of the better known Archaic period.

Archaic sites tend to be scattered across the landscape (along major as well as minor waterways and occasionally also at some distance from water); they also tend to be small and thin. Within Blue Earth County and adjacent counties, Archaic sites have been found on the shores of many of the shallow lakes that are typical of this region (which is part of what archaeologists now call the Prairie Lakes subarea--see Anfinson 1982). Archaic sites have also been recorded along the bluffs of larger streams like the Blue Earth River and probably occurred with some frequency also on the bottomlands, as suggested by the discovery of some fairly deeply buried sites (Dobbs and Shane 1982:67; E. Henning 1983:4.18). Several important sites of this period are located on the bed of Lake Ozatonka (extinct for at least seven millennia) at some distance south of Lura Lake (Dobbs 1982; Dobbs and Shane 1982:67). Few of these sites have been more than surface collected but, again, there are Archaic sites in adjacent parts of the Prairie Lakes subarea which have yielded enough paleoenvironmental and cultural evidence to give us some general idea of settlement and subsistence patterns during that period (Dobbs 1979; Hudak 1974; Shane 1978 and 1982; Shay 1971).

Existing evidence suggests the presence of a number of Archaic complexes which represent regional populations--

regional but not isolated. The preference for certain types of lithic raw materials from non-local sources suggest cooperative relations with other groups. In addition, Archaic groups of this region seem to share technological attributes such as projectile point styles with both the Plains and the Eastern Archaic traditions (E. Henning 1983:4.19).

During the Archaic, local populations seem to have achieved a balanced and broad-based adaptation to the prairie-lake environment of this region, successfully utilizing both the grassland resources (such as bison) and shallow lake/wetland resources (fish, muskrat, water fowl, aquatic plants etc.). Bison seems to have been a preferred source of meat, bones and hides, judging by the fact that it is the predominant faunal element in all excavated Archaic sites of the prairie-lakes area (Shane 1982). At well excavated Archaic sites, however, there is also ample evidence that a number of other animals were hunted and trapped--according to Shay (1971), practically all mammals available except for small rodents. In the same study (of the Itasca Bison Kill site in northwest-central Minnesota), Shay lists over fifty species of plants which were represented in the Archaic cultural deposits and/or are known to have been used by later prehistoric or early historic groups.

So far, three main types of sites have been identified for the Paleo-Indian and Archaic periods: bison kill/ processing sites, upland resource-specific gathering loci and lakeshore or valley floor habitation and/or resource-specific sites (E. Henning 1983:4.20).

As on the central plains, the Late Archaic in the Prairie Lakes subarea seems to have survived longer than it did further east, where ceramic-using Early Woodland groups became predominant during the middle part of the first millennium B.C. When a ceramic tradition, the so-called Fox Lake Phase, finally did emerge within the Prairie Lakes subarea around 200 B.C., the Early Woodland pre-Havana ceramic traditions in the more eastern, riverine, forested zone had already given way to Middle Woodland Havana. Contemporary as the Fox Lake Phase and the Havana manifestations may have been, there was little or no contact between them. The ceramics were different as were the subsistence and social patterns. While more easterly Havana-Hopewell and related groups developed a mode of life based on specialized and far-flung trade, incipient agriculture and an elaborate burial ceremonialism which involved mound building and indicated differentiation of wealth and social status, Fox Lake people continued to rely on an economy and a mode of life which essentially was a continuation of the successful pattern established during the Archaic (Shane 1978 and 1982).

The number of sites increased during this phase. Most of them occur on islands, peninsulas and island causeways in the smaller or medium sized shallow lakes of the Prairie Lakes subarea. Settlements do not seem to have been very large--probably only a few households. While some of them may have been fairly permanent habitation sites (a possible oval shaped house foundation at the Mountain Lake site in Cottonwood County, Minnesota, may date from this period or be somewhat later), most were probably more seasonal in character. It has been suggested that most of the sites on the smaller lakes are spring-summer-fall locations while more sheltered sites, e.g. in the Minnesota River valley or in wooded areas around larger lakes, may have been winter camps (Anfinson 1979 and 1982).

The faunal evidence as well as the lithic tools are essentially the same as during the Archaic, although style changes are evident in projectile points. The lithics now tend to be made of cherts, chalcedony and quartzites from local rather than distant sources. Bison, fish, small mammals, water fowl and aquatic or upland plants continued to be the staples of the subsistence. There is no evidence, at least so far, of any experiments with horticulture. Nor is there any evidence linking Fox Lake ceramics with mounds or even any kind of burials. A few mounds have been recorded within the Fox Lake distribution area but only one has been dated by a C-14 date falling somewhere around the fifth century A.D. The overall impression is one of a conservative lifestyle involving hunting and gathering, transhumance and low population densities (Dobbs and Shane 1982:67).

The ceramics, however, do represent a new cultural element. The vessels were wide-mouths, thick-walled and grit-tempered with conoidal bases and a cord-marked exterior surface. The latter had usually been further decorated with trailed or incised lines, bosses or punctates and cord-wrapped stick impressions on the upper part of the vessel. A long-lasting ceramic tradition (200 B.C.-A.D. 900), it passed through several developmental stages (Anfinson 1979; Hudak 1976). The tradition was probably developed by indigenous groups in southern Minnesota but under influences from the east--there seems to be a definite similarity between Fox Lake and such early Woodland ceramic styles as Black Sand Incised (Illinois), Spring Hollow Incised (E. Iowa) and Dane Incised (Wisconsin). The very close similarity between Fox Lake and the Early Woodland Marion Thick Ware in southeastern Minnesota suggests that the latter may have been the link in this development.

The stable and successful economy and the overall conservative character of the Fox Lake manifestation and its very similar successor, the Lake Benton Phase (A.D. 900-1500?), may explain their long lifespan and the unusually

late and rather incomplete transition to late prehistoric characteristics in the Prairie Lakes subarea. This applies to the slow stylistic changes in ceramics as much as to the apparent resistence to horticulture during the west-northwest spread of the Mississippian Tradition (Blue Earth Oneota Phase) or the north-northeast spread of the Missouri or Plains Village Tradition (Great Oasis and Cambria Phases) around A.D. 1000. Sites representing these late prehistoric traditions in Minnesota tend to be found along the major river valleys or larger lakes of the southern part of the state and range in date between approximately A.D. 1000 to 1300 for Cambria-Great Oasis and A.D. 1000 to 1600 for Blue Earth Oneota. Although there are distinct differences between these phases, there are also some common characteristics that set them apart from earlier Woodland traditions: semi-sedentary or sedentary villages with distinct rectangular semi-subterranean house floors (Plains Village) or less distinct, ovoid, wigwam-like ones (Oneota); maize horticulture (in addition to traditional hunting and gathering); features associated with this new economy such as large storage pits (later used as garbage pits and filled with large amounts of maize, bone and shell refuse) and bison or deer scapula hoes; distinctive ceramics which tend to be globular in shape, large, thin-walled and smooth surfaced with elaborate trailed/incised decoration; a fairly limited range of lithic artifacts (small triangular projectile points, small thumbnail scrapers and side scrapers, knives, drills, gravers, sandstone abraders, ground adzes, rough bifaces, choppers, utilized flakes, manos, metates and hammerstones) but a wide variety of bone and antler artifacts (awls, needles, punches, fish hooks, projectile points, flaking tools, beaver incisor chisels, scapula and antler hoes and picks, squash knives, bone beads and pendants, a variety of incised ornaments and games pieces); game pieces of other materials; shell spoons and ornaments; pipes--in short a wide range of utilitarian items as well as items reflecting a fairly elaborate ceremonial and recreational technology.

The Cambria Phase has been named after a large village site (21-BE-2) located on a terrace of the Minnesota River valley in the northwestern corner of Blue Earth County. Three other, smaller Cambria sites are located in the same general area. Cambria like ceramics have also been reported from sites along the lower Minnesota River valley as far downstream as its junction with the Mississippi. Most Cambria sites, however, are smaller campsites scattered around southwestern Minnesota and upstream on the Minnesota River. The Great Oasis Phase is less well represented in Blue Earth and adjacent counties but some of its ceramics have been found at the Cambria site. Probably the oldest of the initial variants of the Missouri tradition (ca. A.D. 900-1250) and apparently developed mostly from a Late Woodland base (D. Henning 1983:4.49), it seems to have had

its core area in northwestern Iowa but extended also into southwestern Minnesota, eastern South Dakota and northeastern Nebraska. Its early development coincided with a period of somewhat cooler and moister climate (the Neo-Atlantic) which allowed the spread of agriculture west into the previously much drier plains regions. A typical Great Oasis village was located on the edge of a first terrace immediately above a floodplain or lakebed. In southwestern Minnesota, however, great Oasis sites are more frequently found on islands and peninsulas. In addition to horticulture, hunting and gathering continued. Deer and elk were important game in the early stages but were forced east by the drought that followed the Neo-Atlantic; instead, bison moved back in large numbers to the open grasslands of the Prairie Lakes area. Migratory birds, small mammals, fish and fresh water molluscs eked out this aspect of the economy. Great Oasis people were involved in extensive trade, probably acting as middlemen between Mississippian centers like Cahokia and peripheral groups (D. Henning 1983:4.61).

Missouri tradition groups seem to have disappeared from the eastern plains region during the fourteenth century A.D., in part, perhaps, because of the climatic change and increasing drought conditions, in part, almost certainly, because of pressure from neighboring eastern Blue Earth Oneota groups who seem to have adjusted more successfully to the changing climate and continued to combine horticulture with hunting and gathering in south central and southeastern Minnesota until the historic period.

The Blue Earth Oneota manifestation, along with one represented by almost identical ceramics (Correctionville Trailed) in northwestern Iowa and southeastern Nebraska, is considered to be just one "phase" of the widespread Oneota tradition (Peterson 1979). This phase has also been identified as one of several "group continuities" within the Oneota, the so-called Northwest Iowa Group Continuity (D. Henning 1983:4.74). The two type sites in Minnesota, both extensive village sites (Humphrey and Vosburg, see above) have been known for years and are located in the Blue Earth River drainage in Faribault County. As mentioned earlier, recent survey work has recorded two large clusters of Oneota habitation sites in the same river drainage: the Center Creek locality at the confluence of that creek and the Blue Earth River in Faribault County and the Willow Creek Locality at a similar confluence in Blue Earth County (Dobbs 1984; Dobbs and Shane 1982). For the full distance of approximately seven miles between these clusters, no Oneota material has been found, nor have any Oneota sites been recognized during survey work east of the Blue Earth River (Lofstrom 1980). A number of sites found around the lakes east of this river (including Lura Lake) all date from the earlier Archaic and Woodland periods. This discrepancy is

particularly striking considering the very rich Oneota evidence within the two localities, thirty-one sites in the Willow Creek locality alone. Most of the latter are concentrated on an upland area which protrudes north towards the Willow Creek-Blue Earth River confluence and is flanked by the north (later east) trending Willow Creek on the west side and the Blue Earth River on the east side, a location which provides natural protection from the prevailing west/northwest winds and the danger of prairie fires (Dobbs and Shane 1982:67). Such a clustering may also in part be the result of social structure and tradition: the historic Oto Indians, for example, by many considered to be Oneota descendants, "usually lived in several neighboring villages which were voluntary groupings of families" (ibid.:68). The location of these Oneota sites would also have meant easy access to a variety of resource zones: the forested bottomlands and riverine environment of the valleys, the oak-savanna along the bluffs and adjacent uplands and the tall grass prairie. Both clusters are located at points where the valley widens abruptly to provide extensive alluvial bottomlands suitable for horticulture.

The Early Historic Period

No historic Indian evidence has been found on any Blue Earth/Correctionville Phase sites which means that these Oneota groups cannot be definitely linked with the historic Ioway, Oto and Omaha groups that lived in southern Minnesota during the seventeenth century. It has been suggested, however, that the late Oneota Orr phase in southeastern Minnesota (part of the Upper Mississippi Group Continuity according to D. Henning 1983) was ancestral to the historic Ioway, a fact which would suggest a similar relationship between the late Blue Earth/Correctionville Phase (Northwest Iowa Group Continuity) and another one of these historically known groups.

European goods have been found on some late Oneota sites in both northwestern Iowa and southeastern Minnesota: glass and ceramic beads, copper and brass ornaments (bracelets, rings, pendants), iron knives and kettle fragments, gun parts and gun flints. These objects tend to be few in number and are probably indicative of fairly restricted trade contact with Europeans, either directly or through intermediaries.

The earliest written documentation of European contact with the Blue Earth River region dates from year 1700, when the French trader Le Sueur ascended this river for a short distance in order to establish a French trading post, Fort Vert (L'Huillier), probably fairly near the mouth of what is now called the Le Sueur River. Le Sueur`s records also give valuable information about Sioux Indian groups and movements

at that time (Wedel 1974 and 1981). The Ioway, for example, who had originally lived in southeastern Minnesota, had by that stage moved southwest across the Blue Earth River and the Des Moines River valleys to Spirit Lake in northwestern Iowa--from there, they traded with Le Sueur. Similarly, the Oto and Omaha Indians from even further west/southwest came to trade at Fort Vert, as did Dakota groups from south central and southeastern Minnesota. Although there was some competition and conflict between different Siouan groups for trade with the Europeans, they seem to have been resolved through the moving away/out of the way by one of the parties rather than through open conflict.

By the early historic period, Eastern Dakota bands inhabited much of southern Minnesota, having been driven out of northern and central Minnesota by the Ojibway during the seventeenth and eighteenth centuries. The Dakota were keen participants in the French fur trade, providing Le Sueur and others with beaver pelts, other small animal furs, deer and bison hides. The Red and Minnesota Rivers became major waterways for this trade. After the British had won the French/Indian War, the trade passed into their hands. Jonathan Carver in 1767 reports meeting numerous Sioux while exploring the Minnesota River, as did later, American, explorers and traders after the War of 1812. The trade along the Minnesota River and its tributaries continued well past the mid-nineteenth century and during the first half of that century, Dakota villages, trading posts and missions were found at a number of places along the Minnesota River, including the Mankato area less than twenty miles north of Lura Lake.

By the mid-nineteenth century, there were also a number of white settlements in what is now Blue Earth County. Mankato was founded in 1852; other early settlements like South Bend, Garden City and Vernon Center were established soon after along the Blue Earth River. The surrounding countryside was settled at a rapid pace--by 1873, the county had nearly 2000 farms (originally, over 50% of the land in the county was quite wet but much of it was drained during the latter part of the nineteenth century, USDA 1979:204). By the 1870's, the Indians were largely gone from the county. After the Upper and Lower Sioux bands had ceded their tribal lands to the U.S. government through the Traverse de Sioux and Mendota Treaties in 1851, there followed a decade of tension between the displaced Dakotas and the new settlers and their government, tension which culminated with the Sioux Uprising of 1862. Afterwards, most Dakota Indians were driven out of the state. Although some of them later returned, southern Minnesota was basically in the hands of white settlers from the 1860's on.

IV. FIELD INVESTIGATIONS

Sequence of Investigations

A prework conference and inspection of the site took place on May 2, 1983. BLM Archaeologist Richard A. Brook, Blue Earth County Parks Supervisor Steve Michel, Randall A. Withrow, Field Assistant and Christina Harrison, Principal Investigator and Field Director, were all present. During this visit, it was established that wind and wave action had caused considerable damage to the site since the August 1982 visit paid by Richard Brook and Clark Dobbs (above, page 1). Severe storms later that year had caused much damage to the west/northwest shore of the island as well as the shore of the mainland to the immediate north. According to Steve Michel, as much as 2.5 meters of shoreline had been washed away from the mainland during just one storm in November, 1982; judging by the amount of recent stumping and the number of trees that were either leaning over or already halfway down the bank, the damage to the island must have been at least as severe.

Field work began on May 12, 1983, with a five day period during which the mapping and the shoreline inspection were completed. Very wet and windy conditions, along with unusually high water levels in Lura Lake (more than 1 meter above normal), made for more difficult access to the island and created unexpected complications during the inspection of the shoreline. The following tasks were accomplished:

a) From a datum point located near the northern tip of the island, a baseline and a metric coordinate grid were extended across the rest of the island and site area. With the aid of these reference points, the survey team then mapped:

- elevation contours;
- the present shoreline, with particular emphasis on detail along the eroding part;
- man-made disturbances (trails and nature signs);
- reference trees along/near the west/northwest shore (with species identified--see Appendix C); these were mapped in order to facilitate the monitoring of future erosion and provide additional key points for the matching of the map with photographic sequences taken from the lake.

The results are shown on two maps included here as Figures 10 and 11.

b) The entire west/northwest shore (more than 300 meters long, with more than 250 meters subject to severe erosion) was photographed from a canoe out on Lura Lake, in both black and white and color and in 20 meter

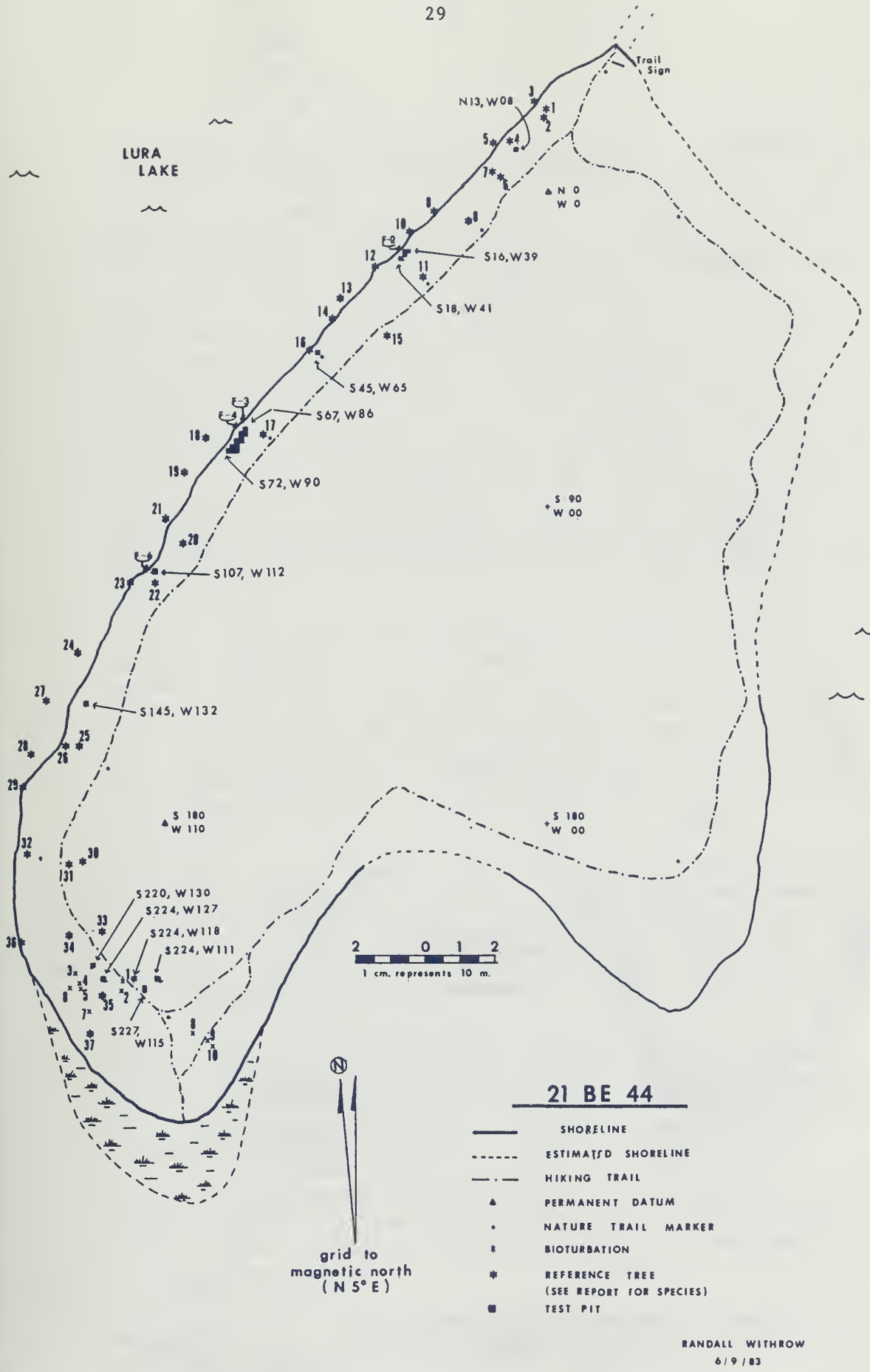

Figure 10. Daly Park Island and 21-BE-44, with Excavation Units and Marker Trees Indicated

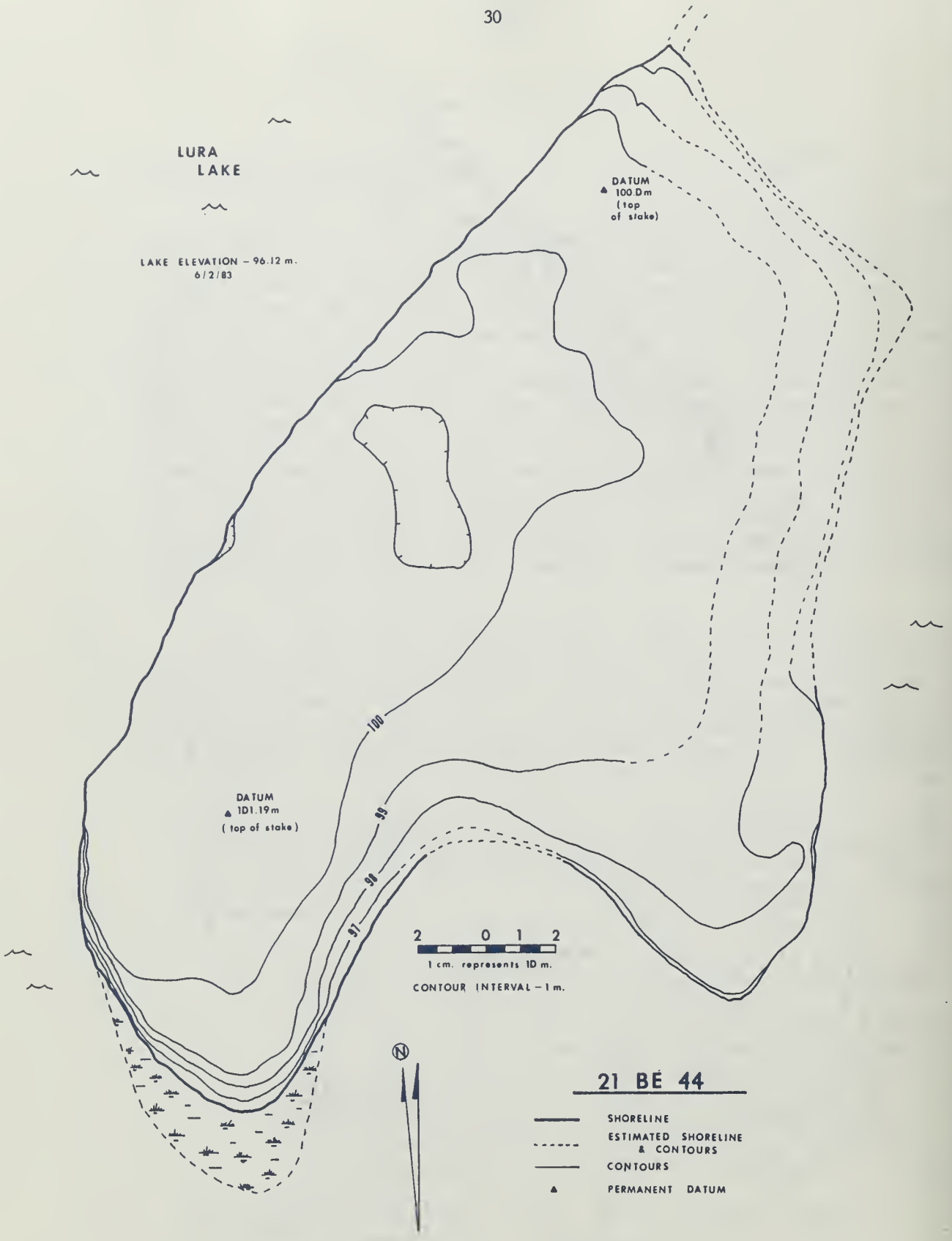

Figure 11. Daly Park Island and 21-BE-44, with Elevations Indicated

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segments keyed to the metric coordinates. Selected views are shown here as Figures 12-17.

c) The eroded banks along the same shore were inspected for any signs of disturbed cultural evidence. A combination of high water levels, strong west/northwest winds and high, steep banks made access by canoe impossible. In order to check the up to four meters high, near vertical, sometimes even undercut banks, crew members usually had to suspend themselves on knotted ropes from the top. Inspection focused on the entire bank--the presently eroding A and B horizons (generally the uppermost 90-100 centimeters) as well as the accumulations of already eroded top soil resting on the lower bank, along the otherwise culturally sterile C horizon. Cultural material and/or faunal evidence was found to be eroding out of the 40-60 centimeter zone in three different areas, all of which were identified by their coordinates and flagged for further testing.

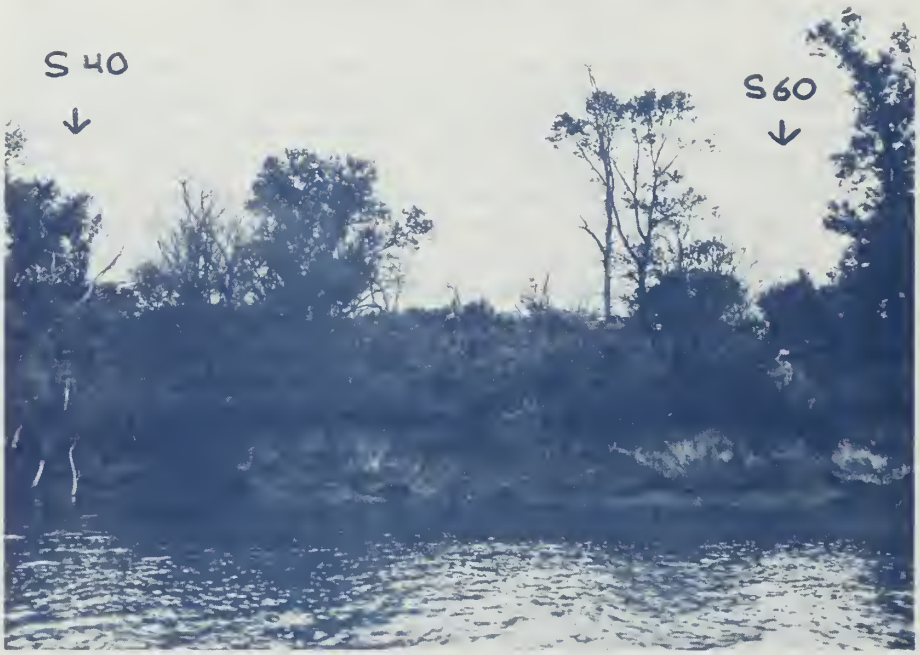
d) Surface reconnaissance was conducted across the west/northwestern half of the island along transects walked north-south at fifteen meter intervals. A scatter of cultural materials (lithics and ceramics) were noted on top of gopher mounds in the southwestern part of the island (an area where 1979 shovel testing had proved negative). Cultural evidence (lithics) was also found along the heavily eroded northernmost part of the nature trail.

The results of this first part of the investigation suggested that the cultural deposit in the west/northwestern part of the island was more extensive than had been indicated by previous investigations, and also that the current impact of erosion was much greater than expected. The latter was demonstrated by the fact that

- still green, recently slumped trees and chunks of sodded topsoil could be seen intermittently at the bottom of the eroding bank all along the shore--many of them probably victims of the November 1982 storms that also washed away several meters of shore along the mainland;

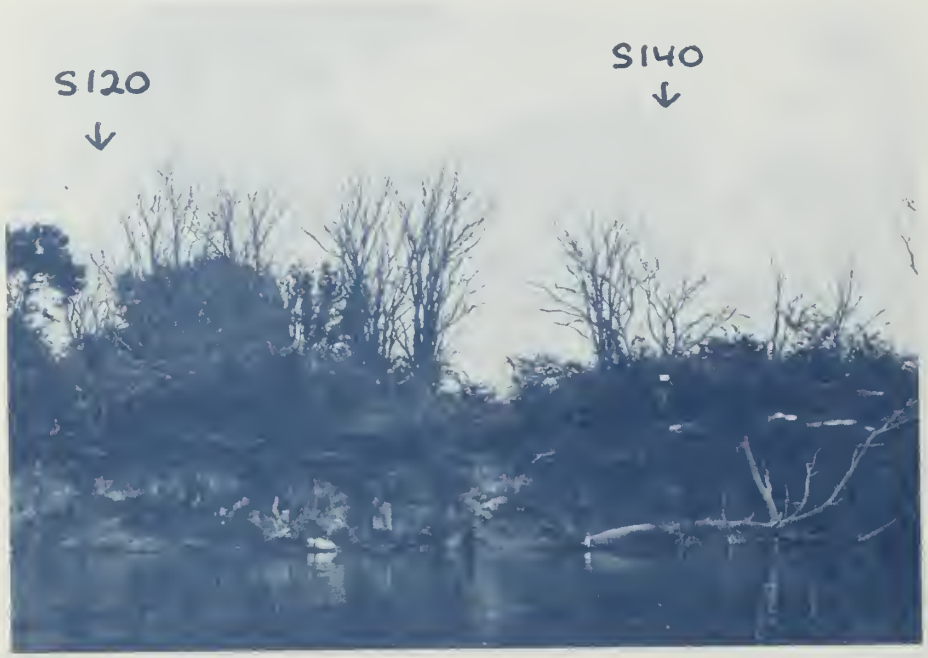
- the size of some of these slumped areas (as well as of others that still were hanging down all along the top of the bank) suggested that as much as 1.5 meters of land surface could collapse at any one brief period of inclement weather;

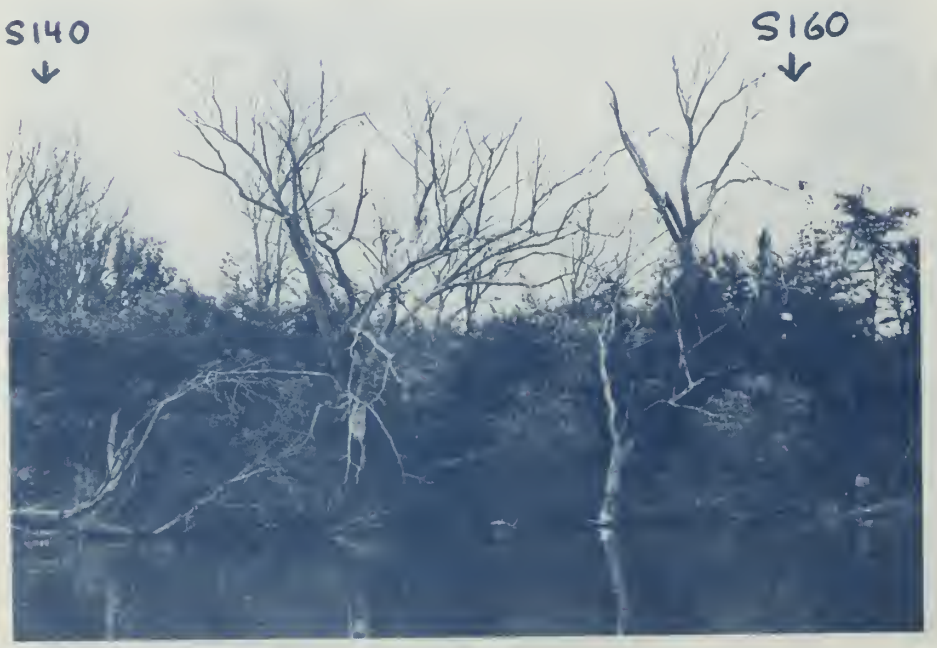
- examples of this process actually were observed during the bank inspection on 5/14/83, when strong west/northwest winds and intense wave activity caused



Figures 12 and 13. Selected Views of the Eroding West/Northwest Shore.

Figures 14 and 15. Selected Views of the Eroding West/Northwest Shore.





Figures 16 and 17. Selected Views of the Eroding West/Northwest Shore.

slumping and undercutting to take place at a visible pace;

- several stretches of upper bank had been visibly affected just in the few weeks that passed between the two visits of May 1983.

Frequent rainstorms during late May-early June 1983 delayed the next step of the perimeter survey, i.e. the excavation of a series of formal test units along the endangered west/northwest shore. Soil conditions were still very wet when work resumed on June 22. Seven formal test units were placed within 1-1.5 meters of the bank, three of them in two locations where cultural material and/or faunal evidence had been found to be eroding out of the bank, four of them inside apparently sterile parts of the same. While the latter four yielded nothing or just a thin scatter of lithics, the first three proved to be quite productive, indicating that the cultural evidence that was eroding out of the bank formed part of two distinct, quite dense and fairly extensive cultural deposits with faunal evidence (burnt and unburnt animal bone), debitage of various lithic raw materials and fire-cracked rock in concentrations suggesting the presence of fire pits. Both deposits (or concentrations within one general cultural deposit) appeared to have high potential for yielding undisturbed features such as habitation floors and specific activity areas. Almost all the evidence was concentrated within the 40-50 centimeter level, in the lower part of the top soil. No ceramics were found. Both of these factors suggested that the evidence derived from an early, aceramic or preceramic, possibly Archaic occupation level.

On the basis of these test results as well as the observations regarding the possible severity of future erosion, the contract was amended to provide for additional, more intensive excavation within the two areas of apparent find concentration. Bank inspection and subsurface tests all indicated that the two areas extended southwest-northeast along the bank for approximately 3 meters and 8 meters respectively. Judging by the observed rate of erosion, it seemed quite possible that it could remove as much as another 4 meters of bank during the next couple of years, i.e. before the time that more definite decisions had been made regarding the protection or mitigation of the endangered cultural deposit. Estimating that emergency investigation should focus on an area of twelve square meters for the smaller and thirty-two square meters for the larger of the two concentrations, and that at least a 30 percent sample needed to be excavated within each, the number of formal square meter units was set at four and eleven respectively, i.e. twelve units in addition to the three already excavated.

The excavation of these additional units was accomplished during late September and early to mid-October, 1983. By this time, after a fairly dry summer, the silty clay loam that constitutes the B-horizon on the island had dried somewhat and taken on a lighter grayish brown shade than that encountered in the adjacent units during the wet month of June. The texture of the soil had also changed to a drier, more crumbly one. As the additional nine units were excavated within the larger of the two areas under investigation, a scatter of darker, more clayey, circular or ovoid features emerged very distinctly within the grayish brown crumbly matrix of the B horizon, all within the 40-50 centimeter and upper 50-60 centimeter levels that also produced the bulk of the artifactual evidence. Basin-shaped, stained darker by fire, with charcoal, ash lenses, burnt bone fragments and scattered fire-cracked rocks, they were clearly the remains of fire pits. On the floor around them was a scatter of lithics (mostly different types of debitage), some faunal evidence and a number of grind and hammer stones.

The units in the second, smaller area appeared to lack fire pits as such but contained enough burnt bone and fire-cracked rock to suggest the presence of fire hearths in the near vicinity. Otherwise, the cultural evidence was comparable to that of the larger area.

The emergency excavations of 1983 had thus yielded a limited but probably fairly representative sample of a preceramic component which seemed to extend along much of the eroding west/northwest shore. The nature of the ceramic evidence in the south/southeastern part of the island was still only poorly understood. In order to a) arrive at a more complete picture of the total cultural sequence on the site, and b) determine whether any of the ceramics producing occupation level(s) extended close enough to the west/northwest shore to be endangered by further erosion, the decision was made to return for a final series of tests during the 1984 season. Such a visit would also provide an opportunity to determine at what rate erosion had progressed during the year that had passed since the perimeter survey.

Formal testing at five locations in the southwestern part of the island identified ceramic evidence representing several distinct traditions, all of it found at levels distinctly above a lower, aceramic component comparable to the one found in the 1983 units (see further below on page). A brief inspection of the shoreline indicated that the rate of erosion had been comparably slow (apparently largely due to lower water levels during the preceding months) but that some new slumping had occurred, particularly along wooded parts of the west/northwest side of the island.

Excavation Procedures

All excavation units were laid out according to the established grid and each was designated by the metric coordinate of the northeastern corner of the unit. As earlier tests, both in 1979 and June 1983, had proven the uppermost 20 centimeters of topsoil to be culturally sterile, this over burden was removed by skim-shoveling. Subsequent levels were troweled. Although the units were taken down by 10 centimeter levels, they were mapped and photographed by 5 centimeter increments in all areas where cultural features and/or significant patterns of artifact distribution were encountered. Soil contents were water-screened through 1/8" hardware cloth. In addition, a 4% soil sample was taken from each 10 centimeter level (or, in the case of soil differentiation within a level, from each significant area). These samples were later water screened through 2.8 millimeter and 1.8 millimeter mesh. Neither of these screening procedures produced much evidence beyond what had already been identified in situ during hand troweling. To the greatest extent possible, all evidence was piece plotted on composite plan view maps drawn for each production level, with all locational information based on the general coordinate grid. Plan views of each level, as well as any significant wall profile, were drawn as well as photographed in colour, standard black and white and infrared black and white.

V. CULTURAL EVIDENCE

Excavation units which produced evidence of fire basins and/or distinctive patterns of artifact distribution have been illustrated by plan views and selected wall profiles included as figures within the text. Lists presenting the description of and locational references for all other evidence have been included within Appendix D. The location of all units are shown on Figure 10.

Test Units and Cultural Features

The northernmost of the units, N12/W08 (6/22/83) produced a thin scatter of lithics (debitage, a fractured grindstone) and some fragments of burnt bone between the 30 centimeter and 60 centimeter levels (Tables 3 and 4). No features were apparent, but fragments of fire-cracked rock suggested the presence of a fire pit nearby. The eroding bank approximately six meters west of the unit had proved negative during the May 1983 inspection but shovel-testing and bank examination by the Minnesota Historical Society (MHS) team in 1979 had yielded a thin scatter of lithics and faunal evidence in the near vicinity (Appendix A).

Approximately 40 meters further southwest, S17/W40 (6/22/83), was excavated a few meters inland from a spot where a dense scatter of burnt bone and burnt antler fragments had been found eroding out of the bank (F2 on Figure 10). Another four fragments were retrieved from the 20-30 centimeter and 30-40 centimeter levels of the unit, along with some fire-cracked rock. The 40-50 centimeter level produced some debitage, a cobble used as a polisher, and several small cobbles with exteriors that appeared discolored, cracked and/or made friable by exposure to heat. As the smaller one of the two areas selected for more intensive investigation during the later part of 1983, this location was further explored through the excavation of another three units. S16/W39 (10/23/83) featured some fire/heat modified cobbles and some charcoal in the 30-40 centimeter level and a hammer stone of basalt as well as more charcoal in the 40-50 centimeter level. S16/W40 (11/11/83) produced a flake, six fire/heat modified cobbles and some charcoal specks from the 20-30 centimeter level and another flake, six fragments of burnt bone and a disintegrating, possibly fire-cracked cobble from the 30-40 centimeter level. S18/W41 (11/12/83) proved positive only in the 30-40 centimeter level which contained two cobbles used for grinding and polishing as well as a distinctive granite boulder shaped like a round loaf, with indications that the flat part had been used as a grinding surface; in addition, there were several heat affected cobble fragments and some charcoal.

Approximately 40 meters southwest of the cluster of units just described, S45/W65 (6/30/83) proved completely negative as did a test put in by the MHS team in 1979 circa 20 meters south/southwest of the same.

During the 1983 bank inspection, a few pieces of debitage had been found eroding out of the uppermost 50 centimeter horizon at approximately S65-66/W87-88 (F3 and F4 on Figure 10). Two formal test units excavated 1.5-2 meters inland from these find spots proved positive. The yield from S67/W86 (6/23/83) was sparse--three pieces of debitage between 30 and 50 centimeters. S68/W87, on the other hand, produced a fairly concentrated scatter of eleven flakes (one with use wear), a grind stone and four fragments of fire-cracked rock as well as part of an animal tooth, all between the 38 centimeter and 45 centimeter levels. Once it had been decided that this second, apparently somewhat larger area of find concentration also warranted further investigation, another nine units were excavated immediately adjacent to the first two: S68/W86, S69/W87, S70/W87, S70/W88, S71/W88, S71/W89, S72/W88, S72/W89, and S72/W90 (9/20-23/83 and 10/4-5, 20-23/83).

All but one of these nine units featured the rounded to slightly ovoid, basin-shaped lenses of darker soil that were

described above. Seven of them were found in the northeastern part of the excavation area, mostly in unit S69/W87 (Figures 18 and 20), while another ten were clustered in the southwestern part, mostly within S71/W89 and adjacent units (Figures 18 and 21). While almost all of them were found in the lighter grayish brown, more dry and friable B horizon (Figure 22), they emerged at somewhat different levels (Table 1): two at 38-39 centimeters, four at 40-41 centimeters, one at 42-43 centimeters, seven at 44-45 centimeters, two at 46-47 centimeters and two at 50 centimeters. One was found well above the others, at 30 centimeters, in the darker A-horizon where it showed up more by differentiation in soil texture than color. Seven measured between 5 and 8 in central depth while the rest clustered in the 9 centimeter to 16 centimeter depth range. Most of the features were fairly circular, with a diameter of 20-30 centimeters (see features), 30-40 centimeters (seven) or 40-46 centimeters (four). A larger one, however, ovoid in outline, had a maximum width of 72 centimeters. As mentioned earlier, all had the distinct characteristics of fire basins: heat discoloration of the soil as well as scattered fire-cracked rock fragments, charcoal, ash lenses and burnt bone fragments (Figures 18, 20, 21 and 25-28).

Most of the lithic evidence in these units came out of the same levels as the features, with approximately 6% from the 30-40 centimeter level, 58% from the 40-50 centimeter level and 31% from the 50-60 centimeter level, while just a few items were located above and below 30 centimeters and 60 centimeters respectively. (Table 4). The density of lithics varies considerably from unit to unit--while five yielded about a dozen or less items each and two contained about twice that number, there were two units that proved quite prolific: S68/W86 with 113 items and S69/W87 with 67 items (Figure 19 and Table 3). With the exception of a projectile point, a possible knife or preform, a couple of scrapers and a few modified flakes as well as three grind stone fragments, all the lithics represent some form of debitage (see further below).

In addition to fragments of burnt bone in several of these units, five also produced unburnt faunal evidence. In most cases, the latter was too fragmentary to allow species identification but a couple of long bone segments, as well as some fragmentary teeth, appear to derive from bison and deer (see further below).

Another 40 meters to the southwest, S107/W112 (6/23-30/83) was placed approximately one meter inland from a point where an apparent polisher and a piece of chert shatter had been found eroding out of the uppermost 40-50 centimeters of the bank (F6 on Figure 10). The yield was quite meager: two pieces of debitage from the 45 centimeter level.

FEATURE	UNIT(S)	DIAMETER/MAXIMUM WIDTH	DEPTH	OTHER
A	S68/W86	32 cm	47-58 cm	very circular tapered basin
B	S69/W87	32 cm	40-55 cm	very circular tapered basin
C	" "	28 cm	42-51 cm	circular, tapering
D	" "	36 cm	44-52 cm	ovoid, tapering
E	S69/W87 & S70/W87	50 cm (+)	45-60 cm	irregularly ovoid, not as distinct
F	S69/W87	32 cm	50-58 cm	somewhat irregular, pie-shaped cross section
G	S70/W87	50 cm (+)	45-53 cm	ovoid, tapering
H	S71/W88 & S71/W89	42 cm	38-55 cm	ovoid, very dark, tapering
I	S71/W88 & 89 S72/W88 & 89	72 cm	40-52 cm	very distinct, tapering
J	S71/W89	?	45-? cm	very flat top; mostly outside unit
K	" "	?	42-47 cm	partly outside unit
L	" "	22 cm	39-44 cm	small, flat pie-shaped cross section
M	" "	26 cm	45-56 cm	same as above
N	" "	30 cm	50-57	similar to the above
O	S72/W89	24 cm	45-52 cm	similar to the above
P	" "	34 cm (+)	45-53 cm	circular, tapering, partly outside unit
Q	S72/W90	41 cm	47-55 cm	ovoid, tapering
R	S70/W89	36 cm	30-39 cm	not very distinct

Table 1. Locational and Morphological Characteristics of Circular/Ovoid Features

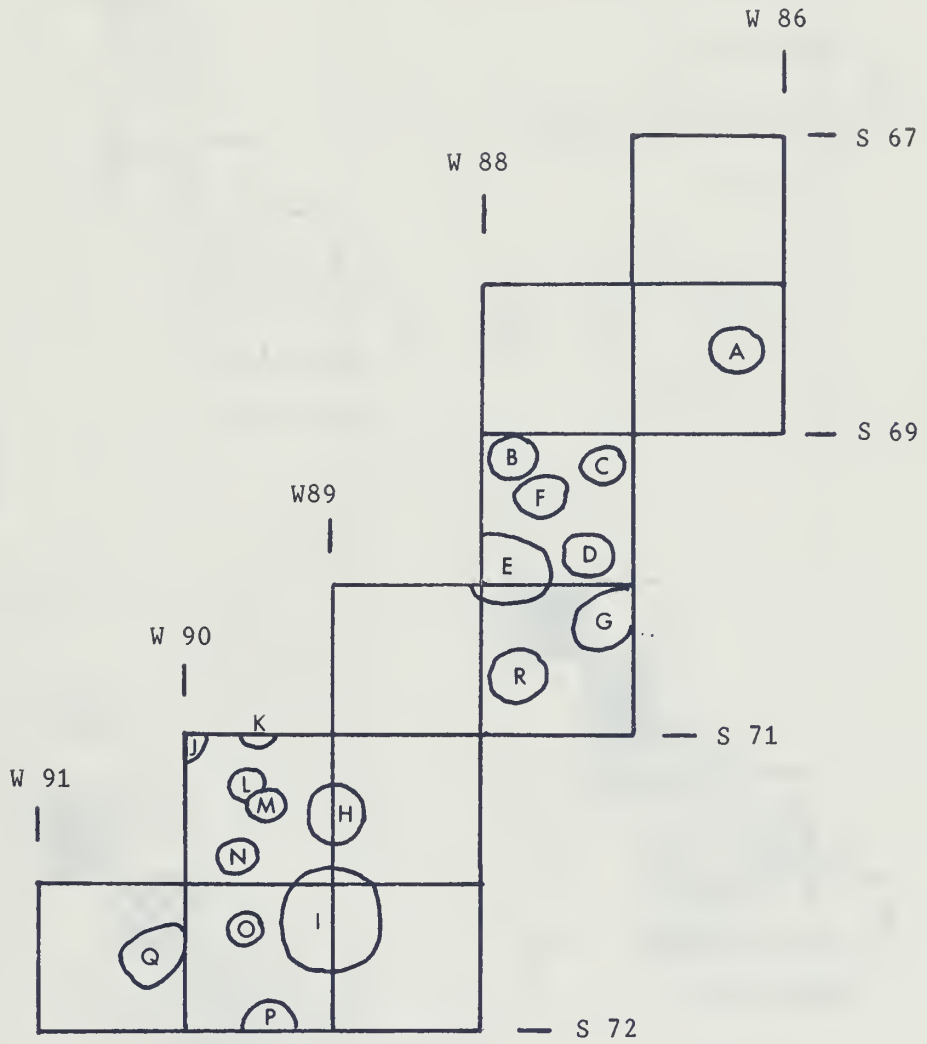


Figure 18. Composite View of Units S67/W86 to S72/W90: Features

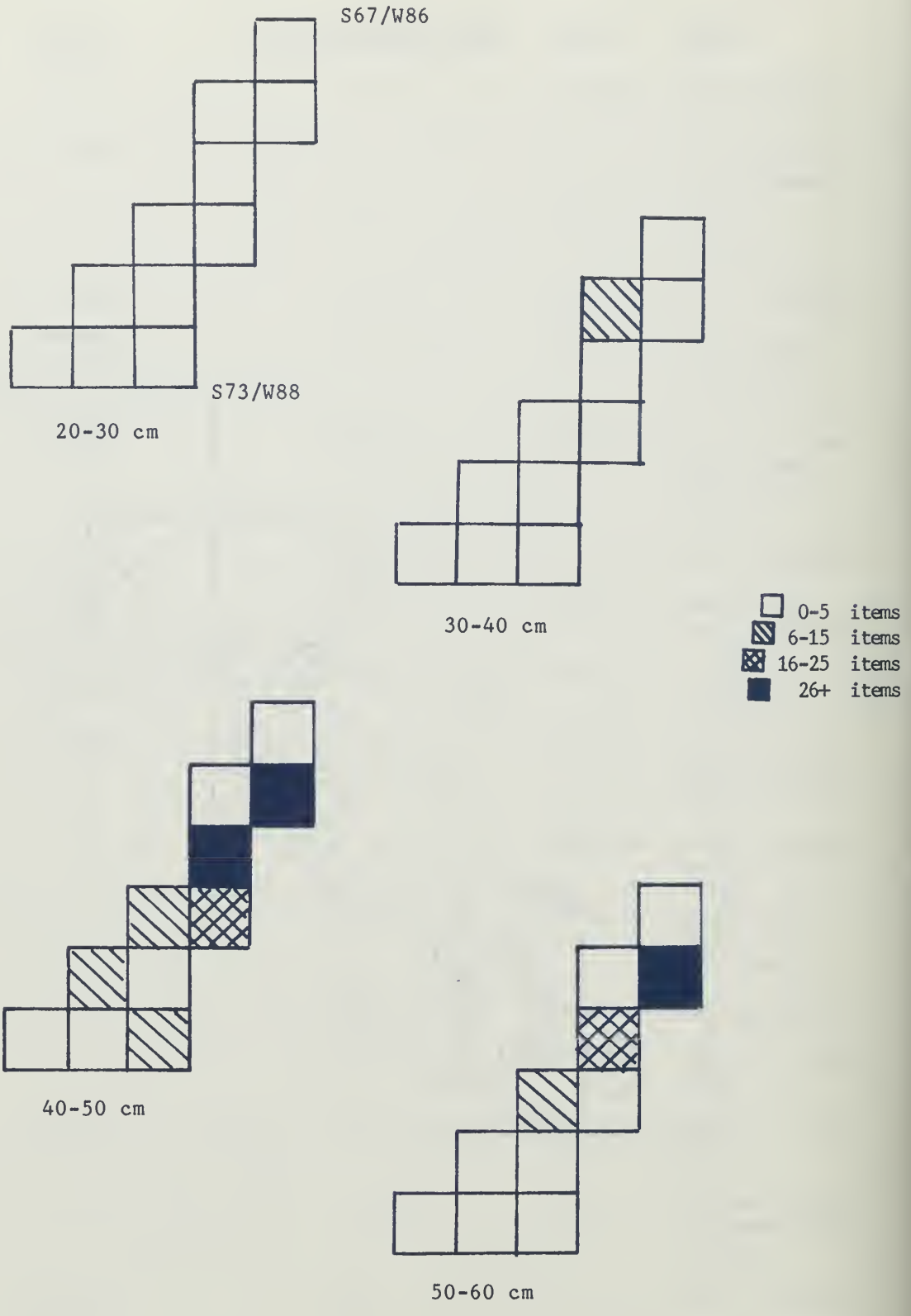


Figure 19. Composite View of Units S67/W86 to S72/W90: Frequency and Distribution of Lithics by Level.

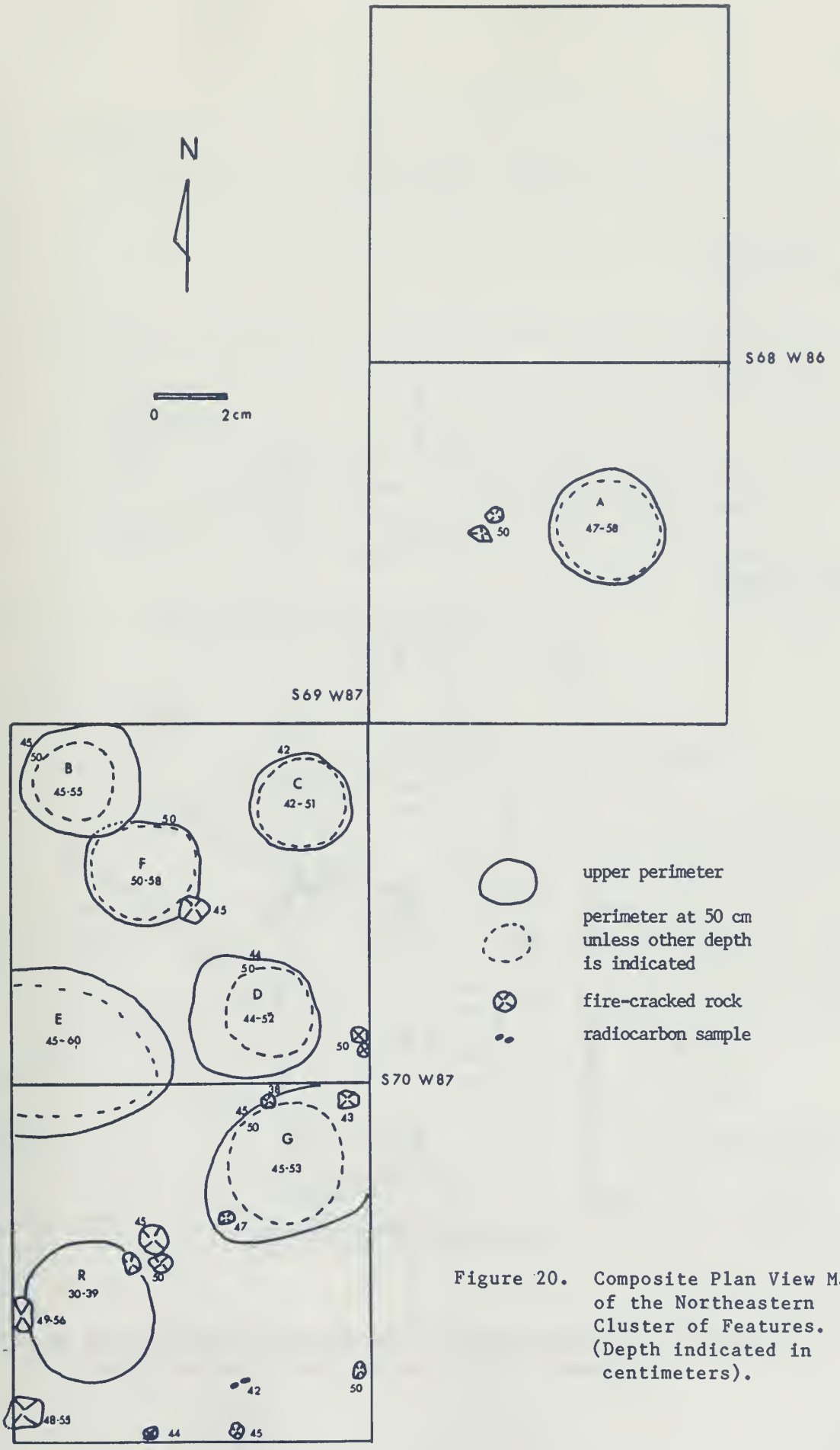


Figure 20. Composite Plan View Map of the Northeastern Cluster of Features. (Depth indicated in centimeters).

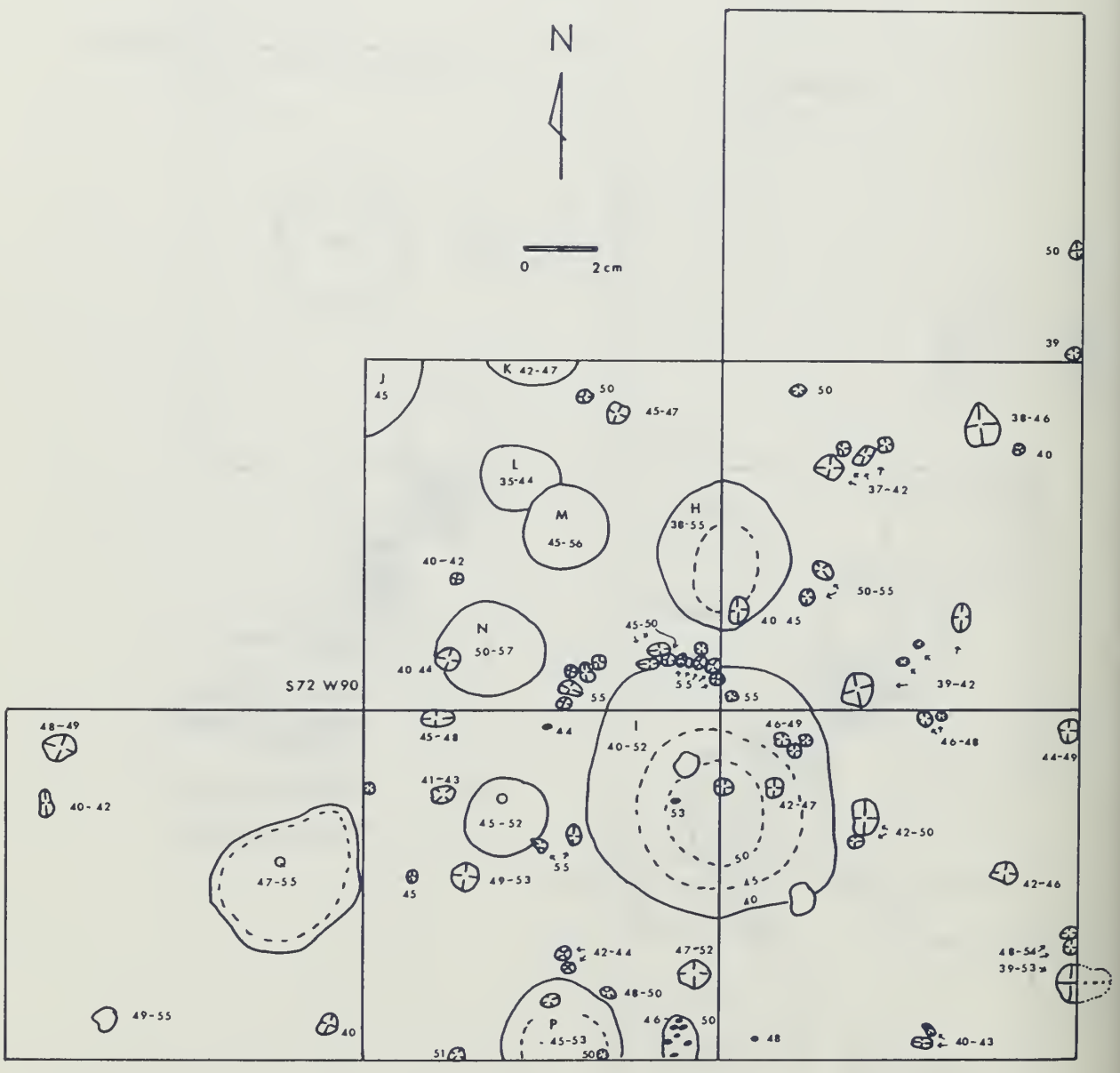
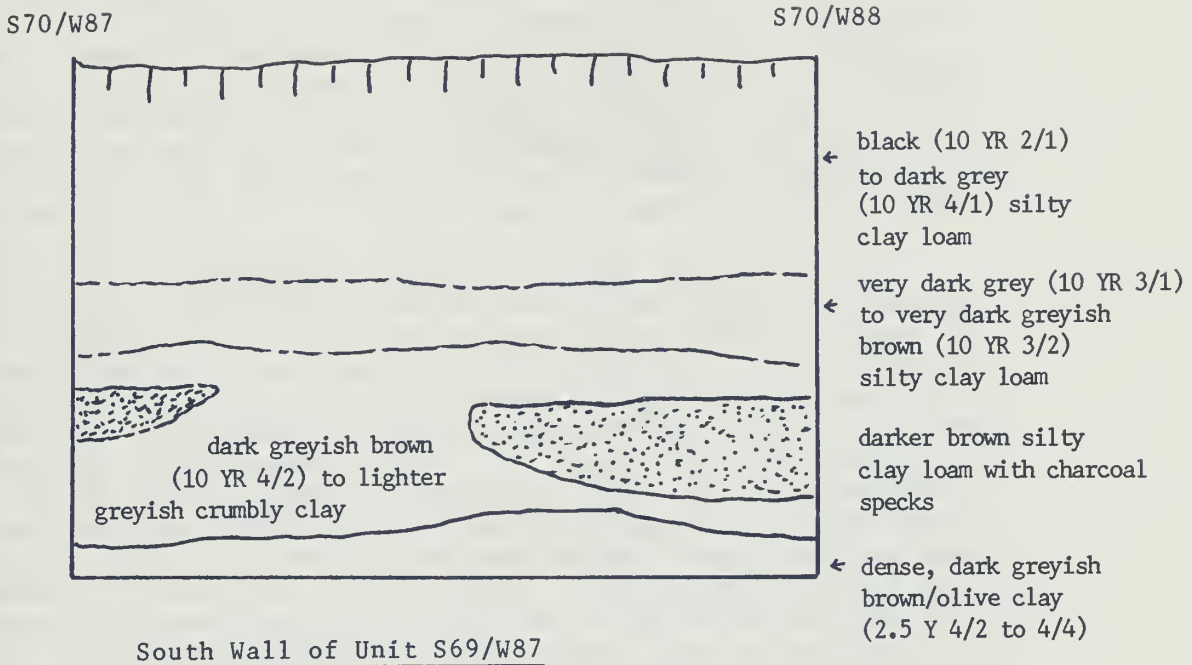
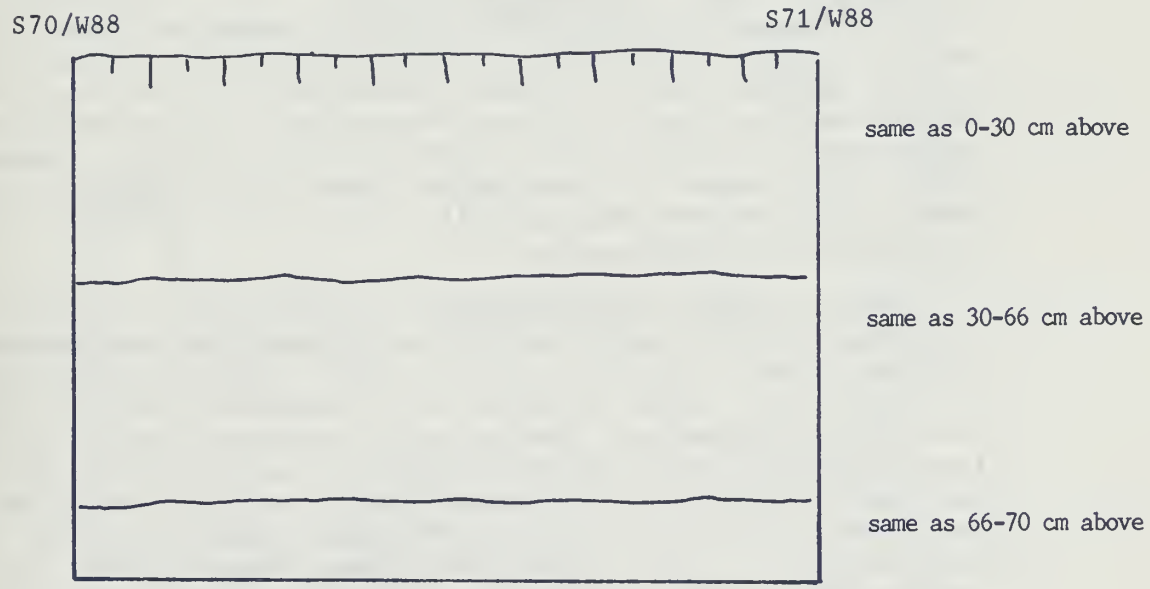


Figure 21. Composite Plan View Map of Southwestern Cluster of Features. (For explanations refer to Figure 20)



South Wall of Unit S69/W87



East Wall of Unit S70/W88

Figure 22. Selected Wall Profiles of 1983 Units.

Finally, the southernmost unit of the 1983 season, S145/W132 (6/30/83) proved completely negative. Tests put in during the 1979 survey somewhat inland from both S107/W112 and S145/W132 had also proven negative. All these results would indicate that an area of cultural sterility or at least low find density lies between the southern end of the S86/W67-S72/W90 find area and the area tested during 1984, i.e. the southwestern, ceramics producing deposit.

The first of the 1984 units, S224/W118 (11/7-10/84) was placed close to the gopher mound which had produced a number of sherds during the perimeter survey (Bioturbation Spot 1 on Figure 10). This unit yielded both ceramic and lithic evidence as well as fragments of fire-cracked rock but the cultural material was rather thinly scattered and there were no features similar to those described above. The distribution of the evidence within S224/W118, with a roughly circular pattern of fire-cracked rock in the central and southern part and a concentration of lithic artifacts in the northeastern part (Figure 23), may still represent an activity area as most of this evidence emerged from the 30-40 centimeter and upper 40-50 centimeter levels within an area where the variations in vertical distribution may have been caused largely by extensive bioturbation.

Two exploratory 50x50 centimeter units, S220/W130 and S224/W127 were excavated nine and thirteen meters west/northwest of S224/W118, with negative results. The latter, along with the similarly negative nature of five gopher mounds located west/southwest of the sterile tests (Bioturbation Spots 3-7 on Figure 10) and several negative tests put in by the 1979 team in this vicinity (Appendix A) would all seem to indicate that the ceramic producing deposit thins out very rapidly towards the west/southwestern part of the island.

As earlier investigations already had recorded ceramic evidence on the southeastern side and the southwestern tip of the island (1979, Test 12; 1983, Bioturbation Spot 10), it did not seem urgent to continue testing for the horizontal extent of the ceramic component(s). The rest of the 1984 units were therefore placed near S224/W118 in order to explore the vertical distribution of the ceramics as well as the possible overlap of the aceramic and ceramic components. The first of these exploratory 50 by 50 centimeter units, S224/W111 (11/8-9/84), yielded nothing but a few flakes and fire-cracked rock fragments, all between 30 and 40 centimeters and it was not expanded. A second unit of the same size, S227/W115 (11/8-9/84), was more productive: several sherds, a number of flakes and some fire-cracked rocks. As this unit was extended southward into a 50x150 centimeter trench (Figure 24), it continued to yield a thin but consistent scatter of sherds, pieces of debitage and fire-cracked rock (including a couple of fire-

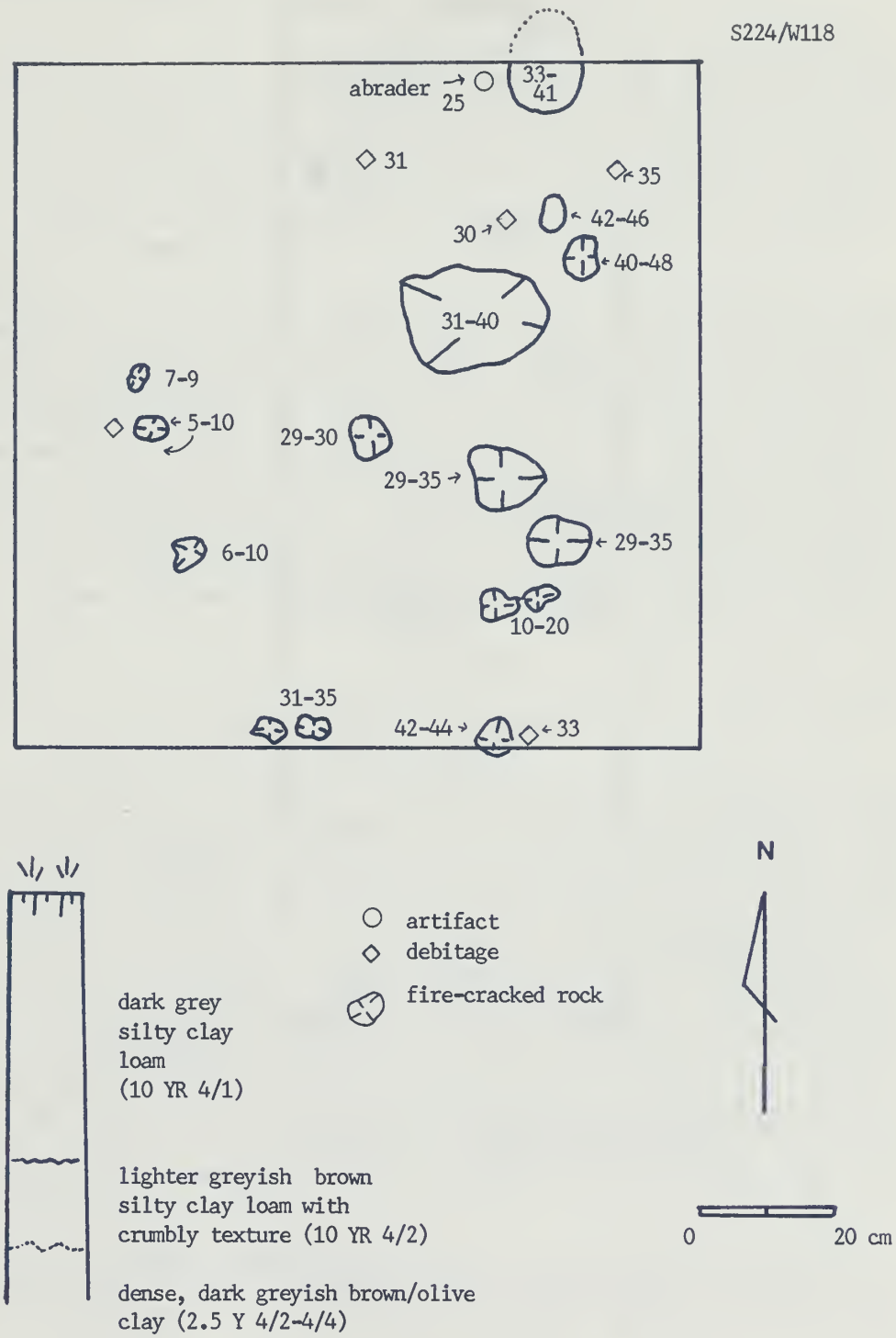
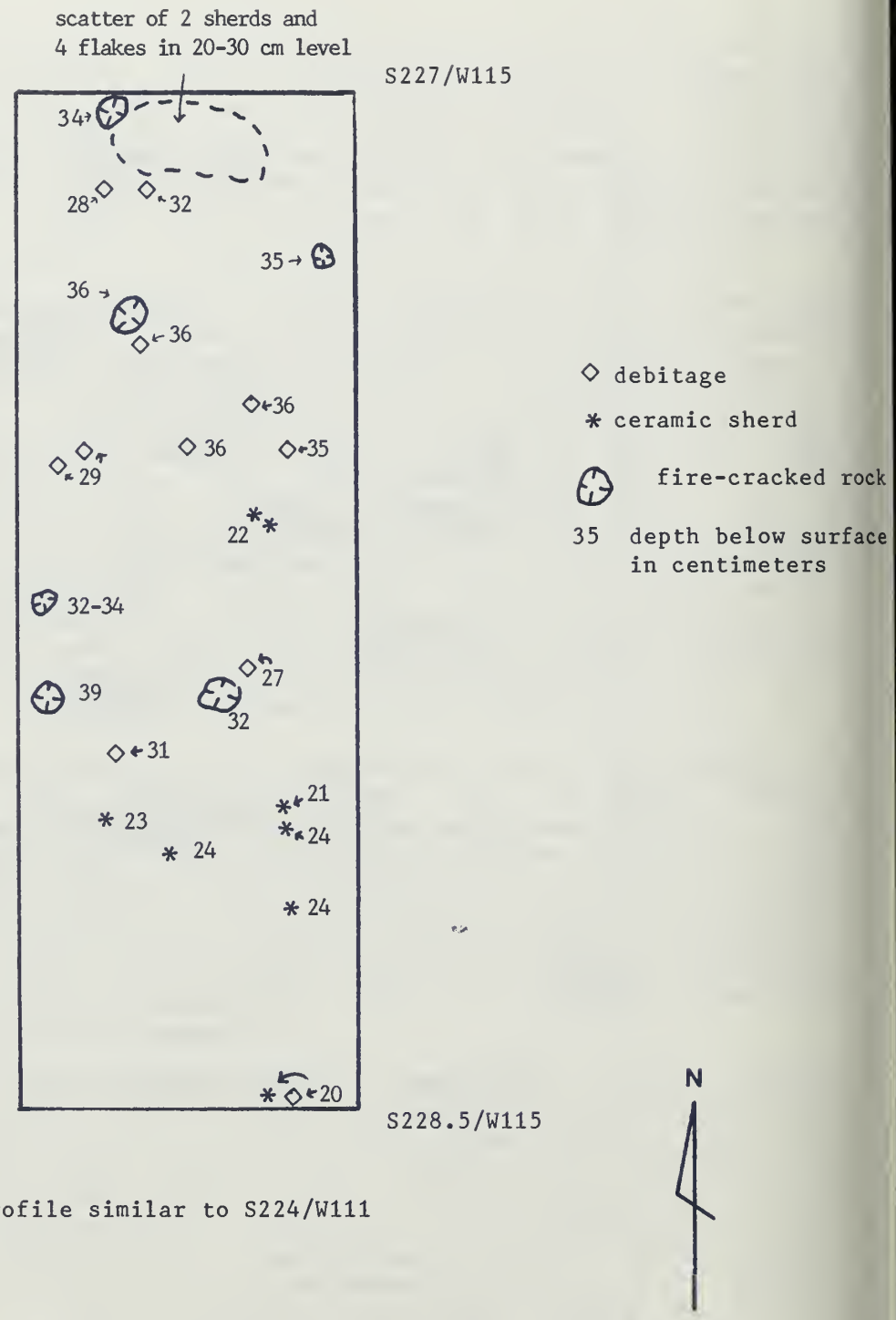


Figure 23. Composite Plan View Map of S224/W118



Soil profile similar to S224/W111

Figure 24. Composite Plan View Map of S227/W115 with Extension

cracked grind stones). There were no apparent anomalies in either soil texture or color.

None of the 1984 units contained any definite evidence of prehistoric fire. Occasional specks of charcoal were found, but mostly in the upper levels and generally well above the horizons that produced most of the fire-cracked artifacts and cobbles. As they seemed mroe likely to be the result of later, natural brush and forest fires and as they were all small and fragmented, they were not recorded or sampled for radiocarbon dating.

Tables 5 and 6 present a general summary of the type and distribution of the lithic and ceramic evidence in the 1984 units (including the surface collected bioturbation areas). All but one of the positive test units produced ceramics; all but two of these sherds were found in the 20-30 centimeter level. Approximately half of the lithic debitage was also found in the upper levels, again mostly in the 20-30 centimeter level although some appeared to have been displaced upwards by gopher activity. The rest of the debitage, as well as most of the other lithic evidence (grind stones, hammer stones, heat-altered cobbles, fire-cracked rock) were found between 30 centimeters and 50 centimeters, i.e. below the ceramics. This suggests the presence of one or more aceramic components (presumably contemporary with much of the evidence in the 1983 units) also on this part of the site.

Comparing the aceramic evidence found so far at this site, it appears to cluster in three areas which are separated by stretches with little or no evidence. The concentration around the S15/W39-S18/W41 units and that overlain by ceramic evidence in the vicinity of S224/W118 seem to share a number of characteristics: neither has, so far, produced any evidence of hearths; in both, the aceramic evidence clusters between the 30-50 centimeter levels; both feature a considerable number of grinding/polishing/hammer stones. The central of the three areas is characterized by some considerably larger concentrations of debitage, by the presence of fire basins, by more unburnt faunal evidence, by a larger number of diagnostic artifacts--most of this concentrated at somewhat lower levels than those of the other two areas.

More extensive testing would be necessary before any firm conclusions can be drawn regarding the patterns of temporal and locational variability; the results so far do indicate, however, that such patterns may have been unusually well preserved at this site.

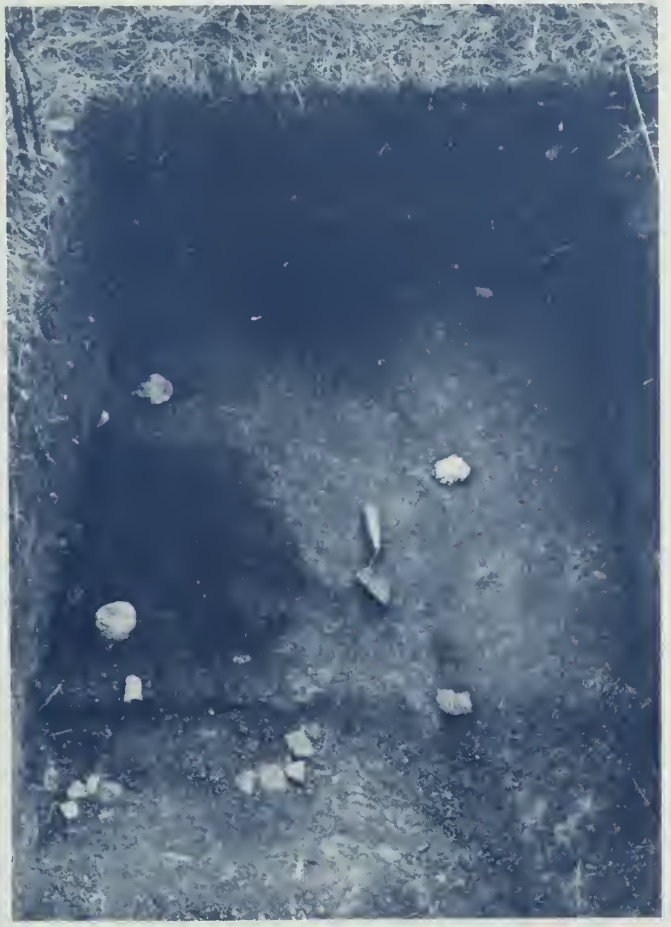


Figure 25. S71/W89 (foreground): South Edge at 55 cm; S72/W89 (background): Emerging Fire Pits at 45 cm and Surrounding Floor at 50 cm.

Figure 26. Same as Figure 25, with Entire Floor in S72/W89 at 50 cm.

Figure 27. S69/W87, at 55 cm, with Features B, C and D Completely Excavated.

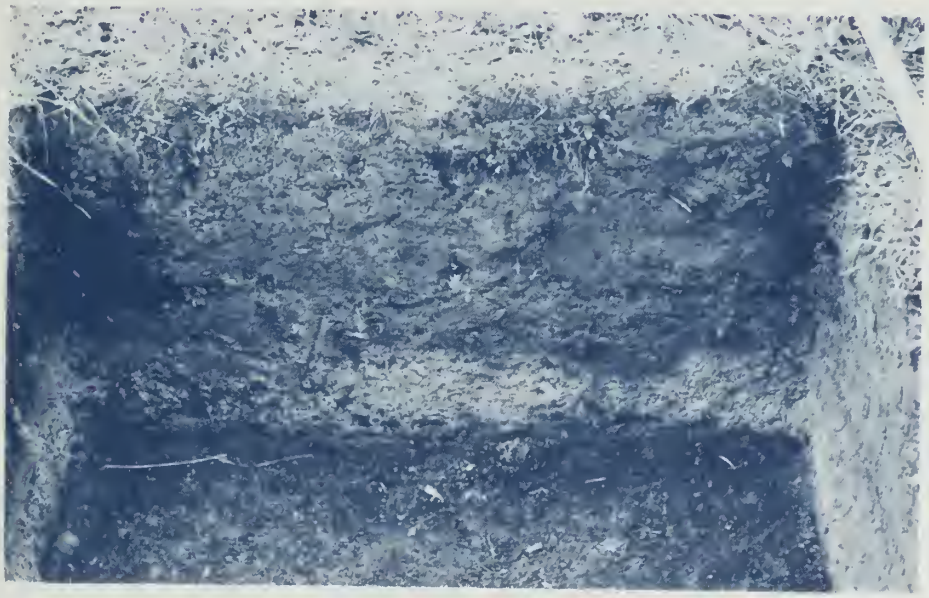


Figure 28. S72-73/W91, at 60 cm, Showing Typical Wall Profile

Lithics

A total of 353 lithics were recovered during the 1983 and 1984 investigations at 21-BE-44. Nine of them are either finished/nearly finished implements or flakes with a modified/utilized work edge. Most (327) represent some type of debitage. Seventeen constitute all or parts of implements used for grinding/abrading/polishing or percussion (Table 2). Most of the units also produced fractured natural rocks, frequently fragments of spherical cobbles, mostly of granite (Tables 3 and 5). Because of the type of fracturing, the frequent discoloration by heat and the common association with firepits and charcoal, they have been interpreted as fire-cracked rock.

Most of the flaked items that show evidence of deliberate shaping and/or use appear to have been associated with cutting and scraping activities. There is also one projectile point--the only item found so far that is at all diagnostic as to dating and cultural affiliation.

The following terms are used in the description of the 21-BE-44 lithics:

CHECKED PIECE: A chunk of raw material with one or more randomly placed negative flake scars that probably result from a preliminary evaluation of the flaking quality of the material--may be a potential core or a reject.

SHATTER: Irregularly shaped pieces of raw material which generally were the by-product of heavy percussion flaking with a hard hammer--lack such flake characteristics as a bulb of percussion, etc.

PRIMARY DECORTICATION FLAKE: A flake with a dorsal surface which still is completely covered with the original cortex of the raw material (although small scars from the preparation of a striking platform may be present).

SECONDARY DECORTICATION FLAKE: A flake with a dorsal surface that still is partially covered with cortex but which also features scars from the primary decortication.

TERTIARY FLAKE: A flake produced during the modification of the overall shape of an implement, i.e. the reduction stage between decortication and edge modification. Included in this category are flakes with parallel or almost parallel lateral edges,

		Finished Implement	Retouched/Utilized Flake	Retouch/Rejuvenation Flake	Tertiary Flake	Flake Fragment	Secondary Decortication Flake	Primary Decortication Flake	Shatter	Checked Piece	Abrader/Polisher	Grindstone	Hammer Stone	Composite Hammer and Grindstone	Total
Oolitic Chert	A*				5										5
	B	4	5		180	20	21	3	6						239
	C				7		4								11
Grand Meadow Chert	A														
	B				1			1	1						3
	C														
Agate	C						1								1
Jasper	B				1						1				2
	C						1								1
Non-diagnostic Chert	A						1								1
	B			1	19	1	3	4	5	1					34
	C			1	11		1	1	1						15
Brown Chalcedony	A				1										1
	B				1										1
	C								1						1
Other Chalcedony	A				1										1
	C				1				2						3
Siltstone	C				1										1
Silicified Sandstone	B				4				1						5
	C							1							1
Quartz	A				2										2
	B				5				4						9
Basalt	A										1	1		2	4
	B										1	1			2
Granite	A											2			2
	B											1	1		2
	C											2			2
Sandstone	B											1			1
	C											1			1
Shale	B										1				1
Limestone	C												1		1
Total:		4	5	2	240	21	32	10	21	1	4	9	2	2	353

Table 2. Lithic Artifact and Raw Material Categories at 21-BE-44: Summary of Types and Frequencies

* A: N13/W08>S18/W41; B: S67/W86>S107/W112; C: S224/W118>S228/W115 (and areas disturbed by rodent burrows).

the length of which is equal to or more than twice the width. Commonly referred to as blades, they are here included as a subcategory of tertiary flakes, mainly because they seem too erratic in occurrence and variable in appearance to indicate the use of a systematic blade technology.

RETOUCH/REJUVENATION FLAKE: A small, usually thin flake which is the product of either the initial edge modification or subsequent edge rejuvenation rather than the overall shaping of an implement.

The assemblage does not, as yet, feature any cores but the presence of 21 pieces of shatter, as well as 10 primary and 32 secondary decortification flakes, indicates that the initial steps of the lithic reduction process frequently were performed on the island, and on most of the raw materials used. The vast majority of the flakes, however, are tertiary ones--240, i.e. more than 70 percent of all the flaked lithics. Small flakes representing the final shaping or resharpening stages are conspicuously absent. Only two items can be described as retouch/rejuvenation flakes; it is possible, however, that quite a few of the smaller flake fragments derive from such flakes.

With the exception of three pebbles/cobbles used for abrading/polishing, probably during wood and bone working, the rest of the lithics seem to have been associated with grinding and percussion, presumably during the processing of plant foods.

Fifteen types of lithic raw material are represented in the 21-BE-44 assemblage (Table 2):

PRAIRIE DU CHIEN GROUP CHERTS. An extensive and, in its central part, up to 350 feet thick Early Ordovician stratum, the Prairie du Chien Group is divided into two major formations: the Oneota dolomite and, above that, the Shakopee dolomite and sandstone. Both contain chert-bearing members in which the chert, mostly oolitic, occurs in layers, as lenses or as spherical nodules. These cherts tend to range from dark grey to very light grey, with either oolitic inclusions in ligher and darker shades of the same basic colors, or with, in non-oolitic varieties, diffuse streaking and mottling of white, light grey, olive-grey, yellowish-grey, light brown. Heat-treatment will change these colors to a lighter, more greyish pink or pale orange in oolitic cherts and more pink to reddish orange in non-oolitic ones. Deliberate heat-treatment of the otherwise rather

unworkable Prairie du Chien cherts appears to have been common, at least for the more advanced stages of the lithic reduction process, before final modification. (Summarized from Withrow 1983:45-50).

While many of these cherts may have been extracted from bedrock exposures, others were probably collected from secondary deposits, as boulders and cobbles in dry streambeds. Most of the oolitic cherts which occur in such abundance at 21-BE-44 probably derived from the Shakopee formation which is exposed in a number of places along the Minnesota River and its tributaries. Shakopee cherts tend to be more densely oolitic than those from the Oneota dolomite, a characteristic found on a majority of the oolitic cherts on the island.

In all, more than 75 percent of the flaked lithics at the site (255 items) were made from this oolitic chert (Table 2). Within the category classified as non-diagnostic cherts (50 items, i.e. nearly 15 percent) there are a number of greyish to off-white, somewhat mottled cherts that may represent the non-oolitic forms of Prairie du Chien chert.

GRAND MEADOW CHERT/CEDAR VALLEY FORMATION CHERT This light grey, micro crystalline, occasionally somewhat translucent chert is characterized by a homogeneous texture with few, if any, fossil inclusions and a dull to satin luster as well as, generally, a heavily weathered cortex. Prehistoric groups would have procured this material from outcrops along the eastern edge of the Cedar Valley formation, along a 20 to 75 mile wide stretch from Mower County, Minnesota, to Rock Island County, Illinois. In Minnesota, the Grand Meadow quarry in Mower County (21-MW-8) was intensively exploited for this chert (Trow 1981:102, Withrow 1983:58-59).

Three items at 21-BE-44 appear to be Grand Meadow chert (Table 2). The distance between the Grand Meadow quarry and Lura Lake is approximately 75 miles. Whether the 21-BE-44 specimens came from this quarry or some other part of the Cedar Valley formation, they must have travelled a considerable distance and were presumably procured through either direct quarrying expeditions or some form of exchange network.

JASPER. An opaque, micro crystalline, homogeneous chert, which ranges in color from yellow to orange

and red. Sources of jasper are reported from southeastern Minnesota. Two jasper flakes and one jasper pebble used as a pebble were found at 21-BE-44.

AGATE. Glacially transported agate pebbles are common across many parts of the state. A single secondary decortication flake at 21-BE-44 seems to derive from such a pebble or nodule.

CHALCEDONY. The assemblage includes seven items of this highly homogeneous, cryptocrystalline and translucent silica. Of these, three are medium to fairly dark brown, which suggests that they may have been struck off cores of Knife River Flint. The latter, dark brown, very translucent, with intermittent but parallel striations and lens-shaped inclusions of darker material, was quarried from deposits in Dunn and Mercer Counties, North Dakota, but could also have been found in a secondary context along alluvial terraces of the Missouri River and in glacial gravels in southeastern South Dakota and further east (Ahler 1977). The other forms of chalcedony at the site, off-white and grey, are of a more general type, almost certainly from glacially transported cobbles.

SILTSTONE. One flake of grey, highly siliceous argillite looks very similar to forms of siltstone that are common throughout eastern and northeastern Minnesota--in bedrock formations of the north, as glacially transported cobbles further south.

ORTHOQUARTZITE/SILICIFIED SANDSTONE. Fine-grained, highly silicified varieties which will fracture right through, rather than around the individual grains, possess good to excellent flaking properties and were widely used prehistorically. Coloring tends to be highly variable, particularly after heat-treatment. Orthoquartzites are found in outcrops of Cambrian sandstone in western Wisconsin (Hixton and Alma "quartzite"), in southeastern Minnesota and along the Minnesota River and its tributaries; a whitish/silver-colored, less well cemented variety, has been found along the Maple River (Withrow 1983:37-45 and personal communication). Six items of silicified sandstone, ranging from poorly to quite well cemented varieties, may also have a fairly local origin.

QUARTZ (MILKY QUARTZ). Milky white to fairly colorless and translucent, with poor to quite distinct conchoidal fracture depending on the grade, quartz is represented by 11 pieces of debitage, either shatter or tertiary flakes. Found in veins in the bedrocks of northeastern Minnesota and Ontario, it is common as glacially transported cobbles further south.

BASALT (used broadly to include fine-grained igneous rocks with a high content of ferromagnesian minerals). Occurs quite widely as glacially transported cobbles and boulders in the tills of Wisconsin, Minnesota and Iowa. At 21-BE-44, basalt was one of the preferred materials for grindstones and abraders.

GRANITE. Medium to coarse-grained igneous cobbles, with a high content of quartz and feldspar crystals are common throughout the glacial tills. At 21-BE-44, the majority of the grindstones, and most of the fire-cracked cobbles, are of this material.

SANDSTONE, LIMESTONE and SHALE, represented by a few items at the site, are all integral to the bedrock structure of southeastern Minnesota and Iowa and also widely scattered throughout the glacial till.

In short, most of the lithic raw materials used at this site could have been obtained fairly locally, probably, in most cases, from dry streambeds and the talus slopes of the bluffs along the lower reaches of the larger rivers. Only the Grand Meadow chert and, possibly, the brown chalcedony, would suggest at least intermittent involvement with more complex procurement/exchange systems.

All the cherts are represented by shatter, primary and secondary decortication flakes as well as tertiary ones (Table 2), an indication, as suggested earlier, that cobbles/chunks of raw material were brought to the island basically as they were found, with most of the reduction taking place on the site.

With oolitic chert in abundance throughout the assemblage and the other raw materials being either rather nondescript or very sparsely represented, it is not yet possible to discern any horizontal or vertical clustering in the use and distribution of the lithic raw materials. The only exception to this would be the occurrence of the Grand Meadow Chert from between 45 centimeters and 52 centimeters in S69/W87, S70/W87 and S70/W88, i.e. three adjacent units--a fact which suggests that they all were struck off the same core.

Figure 19, as well as Tables 3 and 5, which describe the horizontal distribution of cultural evidence across the 1983 and 1984 excavation areas, indicate a distinct variability in find density within the larger cluster of the 1983 units, with less than 13 items in 4 units, with between 18 and 29 items in 4 units and with 35 items in 1 unit. By comparison, one unit yielded 69 items and another unit as many as 114 (S69/W87 and S68/W86 respectively). Although all three of the most productive units also featured one or two firepits, the units surrounding the densest cluster of firepits did not produce even half as many lithics. The three most productive units, all adjacent to each other, yielded enough lithic debitage to suggest that they form part of a fairly extensive lithic workfloor (Figures 18 and 19).

Tables 4 and 6 describe the vertical distribution of the cultural evidence within the 1983 and 1984 excavation areas. While the numbers for the northern, smaller of the 1983 areas (Area A) are too meager to be very informative, they do indicate that 30-40 centimeters and 40-50 centimeters were the main cultural levels. In the southern, larger area (Area B), the clustering is, again, striking: with 169 lithic items and the emergence of most of the fire circles in the 40-50 centimeter level, this appears to have been the actual habitation level, while the 50-60 centimeter level at that time may have constituted the level immediately below the sod horizon. The still relatively high incidence of lithics in that level may be explained by disturbance through the digging and use of the fire pits and by the accidental trampling of particularly sharp-edged items into the ground. As mentioned above on page 49, there seems to be a clear stratification between an upper, ceramics-bearing and a lower aceramic horizon within the 1984 units, with the lower level corresponding closely in terms of depth and content to the other areas, particularly the northernmost one.

The nine lithics that have been classified as finished implements or retouched/utilized flakes are shown in Figure 29, along with one of the three items interpreted as a possible polishing tool.

Figure 29:C, a side-notched projectile point found in S71/W88 at 48 centimeters, is made of grey/light grey oolitic chert (5Y 7-6/1) with olive grey/pale olive and white inclusions (5Y 6/2-3 and 5Y 8/1). Its maximum length is 32.5 millimeters, with a maximum width of 19.5 millimeters across the blade and 20 millimeters across the base. Its maximum thickness is 5.7 millimeters. With a roughly triangular general shape, slightly convex lateral body edges, a fairly straight basal edge and rather shallow side-notches close to the base, it appears very similar to the "Madison Side-Notched" type and similar points reported

	Finished Implement	Retouched/Utilized Flake	Retouch/Rejuvenation Flake	Tertiary Flake	Flake Fragment	Secondary Decortication Flake	Primary Decortication Flake	Shatter	Checked Piece	Abrader/Polisher	Grindstone	Hammerstone	Composite Grindstone/ Hammerstone	Fire-cracked Cobbles	TOTAL	Other Fire-cracked Rock	Burnt Bone	Unburnt Bone	Charcoal	
N13/W08				5			1				1			3	10		x			
S16/W39													1	1	2	x			x	
S15-16/W42*																	X			
S16/W40				1		1								7	9		x			
S17/W40				2										6	8	x	x	x		
S18/W41											2		1	5	8					
TOTAL:				8		1	1				3		2	22	37					
S65-66/W87*				1											1					
S67/W86				2			1								3					
S68/W86		2		79	14	10	3	5						1	114	x	x		x	
S68/W87		1		8		2		1			1				13	x		X		
S69/W87		1		52	5	4	1	3						3	69	x	x	x	x	
S70/W87		1		25		1	1							7	35	x	x		x	
S70/W88			1	21		2		1			1			3	29	x	x	X	x**	
S71/W88	1			8				3	1					8	21	x	x			
S71/W89	2			7	2	2		1		1				9	24	x	x	X	x	
S72/W88	1			3		3						1		10	18				x***	
S72/W89				2				1		1				6	10	x			x***	
S72/W90				3				1			1			3	8	x	x	x	x	
S89/W103															0					
S108-109/W114*								1		1					2					
S107/W112				1			1								2		x			
TOTAL:	4	5	1	212	21	24	7	17	1	3	3	1		50	349					

Table 3. Lithic and Organic Evidence in 1983 Units -- Horizontal Distribution

X identifiable x other
* findspot ** charred seed fragment *** radiocarbon sample

	Finished Implement	Retouched/Utilized Flake	Retouch/Rejuvenation Flake	Tertiary Flake	Flake Fragment	Secondary Decortication Flake	Primary Decortication Flake	Shatter	Checked Piece	Abrader/Polisher	Grindstone	Hammerstone	Composite Grindstone/Hammerstone	Fire-cracked Cobble	TOTAL	Other Fire-cracked Rock	Burnt Bone	Unburnt Bone	Charcoal
AREA A*																			
0-10 cm															0				
10-20 cm															0				
20-30 cm				1										6	7		x		
30-40 cm				1		1					3		1	9	15	x	x**		x
50-60 cm				3			1			1			1	5	11		x		
TOTAL:	0	0	0	5		1	1	0	0	1	3	0	2	20	33				
Area B*																			
0-10 cm															0				
10-20 cm															0				
20-30 cm				2		1		1							4				x
30-40 cm		2		20		3	1	2			1			5	34	x	x	Xx	x
40-50 cm	4	3		123	13	12	4	6	1	2		1		34	203	x	x**	Xx**	x***
50-60 cm			1	57	8	8	2	7			2			10	95	x	x	X	x***
60-70 cm				10											10		x		x
TOTAL:	4	5	1	212	21	24	7	16	1	2	3	1		49	346				

* Area A: N13/W08>S18/W41; Area B: S67/W86>S107/W112
** Concentration
*** Radiocarbon sample
X = Identifiable; x = Too fragmentary to be identifiable

Table 4. Lithic and Organic Evidence in 1983 Units -- Vertical Distribution

	Ceramic Sherd	Retouch/Rejuvenation Flake	Tertiary Flake	Secondary Decortication Flake	Primary Decortication Flake	Shatter	Abrader	Grindstone	Hammerstone	Fire-cracked Cobbles	TOTAL ITEMS	Other Fire-cracked Rock
GM 1-2 *	8		1	1							10	x
GM 3-7	1			1						1	3	x
GM 8-10	5		1								6	x
S224/W118**	2		1			4	1	2	1	2	13	x
S224/W111		1	2	1						3	7	x
S227/W115	2		8	2	2					3	17	x
S227.5/W115	6		5	2				1		1	15	
S228/W115	7		2								9	
TOTAL:	31	1	20	7	2	4	1	3	1	10	80	

* = rodent (gopher) burrow

** = $1m^2$, rest of units only 50x50 cm

Table 5. Lithic and Ceramic Evidence in 1984 Units and Adjacent, Surface Collected Disturbances -- Horizontal Distribution

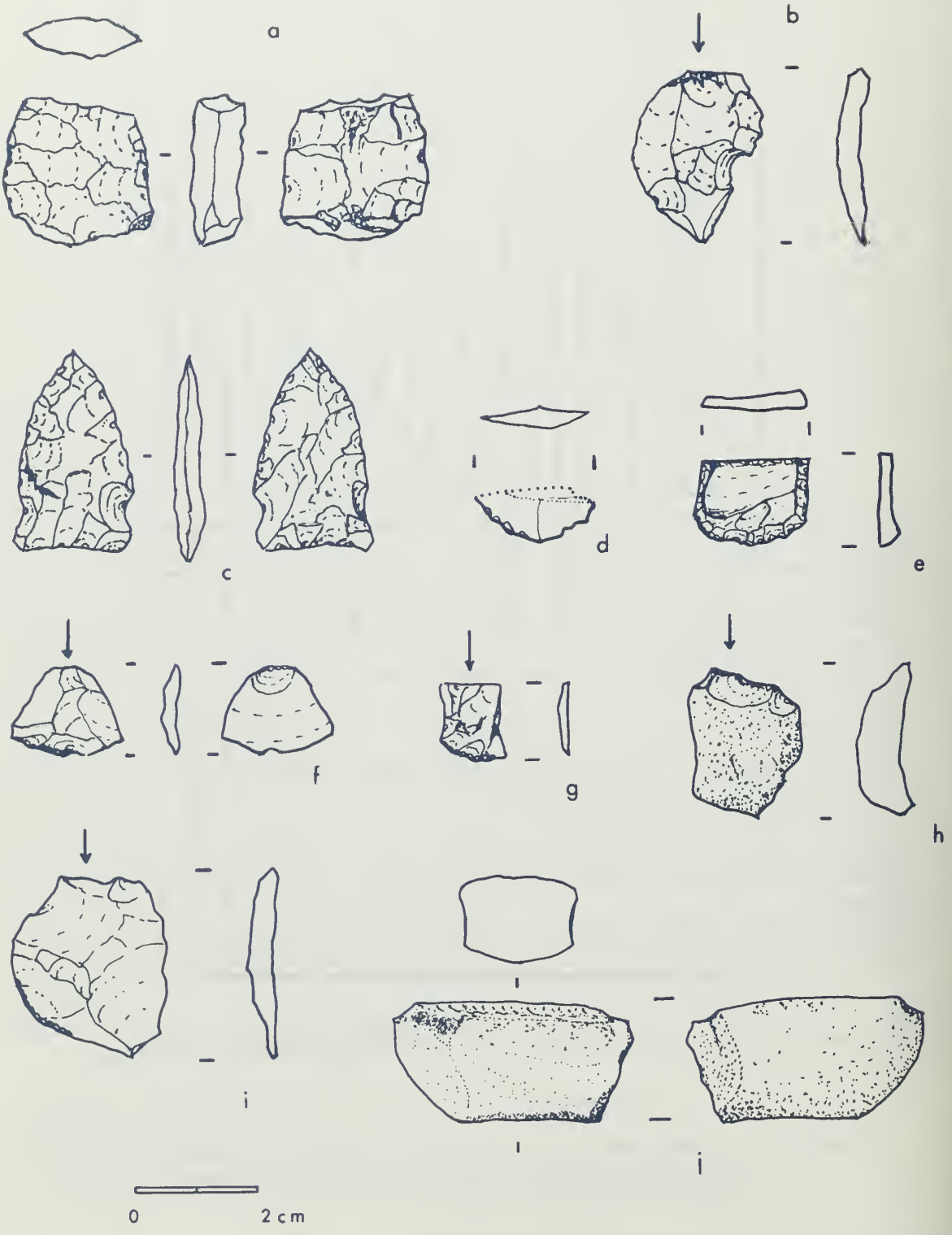


Figure 29. Selected Lithics (described on pages 58-64)

from southern and east-central Minnesota as well as Iowa and Wisconsin (Caine 1974; Hurley 1975 and Ritzenthaler 1967). Points like these appear to have been in use throughout much of the first millennia B.C. and A.D.

Figure 29:a represents a fractured biface interpreted as a knife/cutting tool or, possibly, a preform. Found in the 40-50 centimeter level of S71/W89, it is made of variegated, lightly oolitic light grey chert (10YR 7-6/1) with light grey/light brownish grey inclusions (10YR 7-6/2). The preserved length is 24 millimeters, the maximum width 25 millimeters and thickness 8.4 millimeters.

Figure 29:b shows a notched flake found in the 45-50 centimeter level of S69/W87, in one of the fire basins (Pit B). 28 millimeters long, 21 millimeters wide, and 3.2 millimeters thick, the flake is of variegated oolitic chert; the dark red (10R 3/6), pale to weak red (10R 5-6/4) and pinkish grey (5YR 7/1-2 and 6/2) coloring suggests heat-treatment.

Figure 29:d, a fractured flake with minute unifacial retouch or usewear, was found in S68/W87 at 38-39 centimeters, with a cluster of three other flakes. Of oolitic chert in the light grey to greyish brown range (10YR 5-7/1-2), it measures 6 millimeters in preserved length, 19 millimeters in width and 3 millimeters in thickness.

Figure 29:e, a fractured end (and side?) scraper from S71/W89, at 45-47 centimeters, measures 15 millimeters in preserved length, 18.7 millimeters in maximum width and 4 millimeters in thickness. It is made from a faintly mottled chert of a pinkish white to pinkish grey (5YR 8-7/2-3) and pale red (10R 6/3) shade that suggests heat treatment.

Figure 29:f, a flake with minute unifacial retouch or usewear, from S68/W86, at 45-50 centimeters. Maximum length/width/thickness are 15 millimeters/19 millimeters/3.7 millimeters. The pinkish grey (2.5YR 6-7/2) to somewhat brown (7.5YR 5/2) oolitic chert appears to have been heat treated.

Figure 29:g, another flake with minute unifacial retouch, this time from S68/W86 at 40 centimeter depth, may have been used as a small endscraper or scaler. Badly fractured, it measures 12 millimeters and 10 millimeters in maximum preserved length and width, and 2 millimeters in maximum thickness. The reddish tint of the oolitic chert (10R 4/4 and 5-6/3) indicates heat-treatment.

Figure 29:h. A primary decortication which has been modified into a crude scraper, was found in S72/W88, at 45 centimeters. Its length/width/thickness measurements are

21.5/21.5/9 millimeters. The oolitic chert is the same as that used for 29:c.

Figure 29:i, a flake with minute unifacial retouch/usewear. Found in S70/W87 at 45 centimeters. Measurements are 29/27/5.2 millimeters. The oolitic chert is light grey/greyish brown/pale brown/brown (10YR 5-7/1-3).

Figure 29:j, finally, was found in S71/W89 at 48-50 cm. Dimensions: 41 millimeters/21 millimeters/15 millimeters; color: grey/olive grey (5Y 5/1-2). Made of shale, it features a very symmetrical and distinctly polished shallow groove along one side. So far, the use of this item defies a convincing explanation but the distinctness and smooth sheen of the groove suggests that it was used, in some way, for polishing.

	Ceramic Sherd	Retouch/Rejuvenation Flake	Tertiary Flake	Secondary Decortication Flake	Primary Decortication Flake	Shatter	Abrader	Grindstone	Hammerstone	Fire-cracked Cobble	TOTAL ITEMS	Other Fire-cracked Rock
0-10 cm			2					1			3	x
10-20 cm	2		2								4	x
20-30 cm	15	1	9	1		1	1			1	29	x
30-40 cm			4	3	2	3		2		6	20	x
40-50 cm			1	1					1	2	5	
TOTAL:	17	1	18	5	2	4	1	3	1	9	61	

Table 6. Lithic and Ceramic Evidence in 1984 Units -- Vertical Distribution

Ceramics

A total of 31 sherds were retrieved from the southwestern part of the site (Table 7). With the exception of one plain necksherd, all the ceramic evidence derives from the bodies of various vessels. Without any examples of lips, rims, or decorated necksherds, there are few diagnostic traits to help us determine the date or cultural affiliation. All the sherds are grit or sand tempered, all have, at some point at least, had a cord impressed exterior, all but one are fairly thin, quite well fired and made of fairly fine textured clay. There is, however, enough variation in the traits mentioned above, as well as in the coloring of the ware, to suggest the presence of at least five different types of body sherds:

Type A (represented by one sherd only) is characterized by:

- rather coarse texture;
- coarse grit temper (crushed granite) ranging from 1 to 4 millimeters in grain size;
- a hardness of approximately 2.5 on the Moh scale;
- rather variegated coloring: brown (7.5 YR 5-4/4) with more greyish specks on the exterior; strong brown (7.5 YR 5-4/6) to very dark grey (5 YR 3/1) on the interior; with a similarly dark grey core;
- thick walls (8.3 millimeters);
- smoothed over or partly worn off obliquely crossing lines--impressions only faintly visible, approximately three impressions per centimeter.

Type B-1 (represented by the necksherd in gophermound #1):

- fairly fine texture;
- fine grit/sand temper with occasional larger quartz grains of up to 2 millimeter width;
- a hardness of 3.5-4 on the Moh scale;
- rather variable coloring: dark brown (7.5 YR 4-3/2) on the exterior, brown (7.5 YR 5-4/4) on the interior; reddish yellow to strong brown (7.5 YR 6-5/6) core;
- ca. 5 millimeter thick walls;
- vertical cord impressions on the exterior (ca. 3 per centimeter), cut obliquely by more widely spaced, very narrow cord impressions (barely 3 per centimeter); little or no smoothing of cord impressed

	A	B1	B2	C	D	E	TOTAL
GM 1 and 2		1	3	2	2		8
GM 7			1				1
GM 10				4		1	5
S224/W118	1			1			2
S224/W111							0
S227/W115				2			2
S227.5/W115				4	2		6
S228/W115			5		2		7
TOTAL:	1	1	9	13	6	1	31

Table 7. Distribution of Ceramic Sherd Catgories Within 1984 Excavation Units and Adjacent, Surface Collected Disturbances

surface, direction of twist indistinct.

Type B-2 (represented by nine sherds):

- texture, temper, hardness, color all like B-1;
- thickness varies from 3 to 5.5 millimeters, with 3.5-4 as the predominant range;
- cord-marked exterior, with deep and distinct impressions (ca. 3 per centimeter), created by S-twisted cord (3-4 twists per cord), running fairly parallel in one direction, apparently mostly vertically.

Type C (represented by thirteen sherds):

- fairly fine texture;
- fine grit/sand temper with occasional larger quartz grains of up to fifteen millimeter width;
- a hardness of 3.5-4;
- uniformly dark brown (7.5 YR 4/2 coloring on the exterior); variably reddish yellow to strong brown (7.5 YR 6-5/4) coloring on the interior; and throughout the core;
- thickness varying from 3.8-5.5 millimeter, with 4 to 5.2 millimeter as the predominant range;
- faintly visible, smoothed over cord impressions (barely 3 per centimeter), predominantly in one direction, with fine cord (less than 1.5 millimeters thick) direction of twist indistinct.

Type D (represented by six sherds):

- fine texture, very well fired;
- fine grit/sand temper;
- a hardness of about 4 on the Moh scale;
- quite variable coloring: reddish yellow-strong brown (7.5 YR 6-5/4-6) on the exterior; brown (7.5 YR 5-4/2-Y) on the interior; consistent brown (7.5 YR 4/2) through core;
- thin walls in the 3-3.5 millimeter range;
- somewhat smoothed but still quite distinct cord markings, mostly in one direction (apparently vertically), 3 to 4 impressions per centimeter apparently made with rather thin, double-twisted cord (3-4 twists per centimeter).

Type E (one sherd):

- very fine textured, well fired;
- fine sand temper
- hardness of 4 on the Moh scale;
- uniform coloring of 7.5 YR 4/2 (dark brown), throughout;
- very thin walls--sample sherd only 2.5 millimeters thick;
- obliquely crossing, very thin cord impressions (4 per centimeter), partly smoothed over, twist indistinct.

In spite of the absence of diagnostic sherds, it seems possible to identify at least four of these types, albeit in a very tentative manner, with some of the ceramic and cultural traditions described above on pages

Type A could possibly be an example of Middle Woodland Fox Lake Ware, specifically the vertical cordmarked variety, which is characterized by grit temper, a thickness range of 6-12 millimeters, dark grey to reddish brown color and vertical cordmarking (Anfinson 1979:80-85).

Types B-1 and B-2, as well as, possibly, Type D, appear quite similar to Late Woodland Lake Benton ceramics, specifically the Vertical Cordmarked variety. Generally regarded as a continuation of the Middle Woodland Fox Lake Phase, Lake Benton ceramics occur throughout southwestern Minnesota as far east as eastern Blue Earth County. They are characterized by grit temper, a hardness of around 3.5, a thickness range of 4-8 millimeters, reddish brown to dark greyish brown coloring and, in the case of the mentioned type, vertical and, occasionally, also oblique cord marking on the exterior (Anfinson 1979:110).

Type C finally, could either be an atypical version of Lake Benton or, possibly, an example of the contemporary Great Oasis Ware which also occurs on islands or peninsulas in shallow lakes of southwest/central Minnesota. In terms of temper, thickness and coloring, all three seem fairly identical; the smoothed over cord markings characteristic of Type C, however, are also one of the common features of Great Oasis ceramics.

The small and very thin sherd classified as Type E defies even tentative identification. Its general character suggests a very late prehistoric date.

The apparent presence of two, possibly three distinct ceramic traditions, even within such a small sample from a very limited part of the site, suggests considerable temporal and/or cultural diversity for the later prehistoric

sequence at Lura Lake. This diversity, as well as the thin and scattered distribution of cultural materials and the lack of habitation features, may well indicate that different but contemporaneous groups may have used the island as a seasonal short term base for such activities as fishing or the hunting of waterfowl.

Blue Earth Oneota is the only regional late prehistoric ceramic tradition which seems clearly absent on the site. This corroborates the observation made by Dobbs and Shane that the Oneota manifestation was confined largely to the major river valleys while other, less sedentary late prehistoric groups inhabited the hinterlands (Dobbs and Shane 1982).

Organic Evidence

Most of the faunal evidence found so far at this site (Tables 3 and 4) is too poorly preserved to be identifiable. With the exception of the rather disintegrated remains of a) some large ungulate teeth that seem to have the morphological characteristics and fall in the size range of bison molars, and b) a few pieces of incinerated deer antler, both burnt and unburnt bone occurs as rather small fragments without any diagnostic characteristics. Many appear to be the remains of long bones in sizes ranging from those typical of large ungulates to small mammals or, in a few cases, water fowl. There were no fish bones.

Several chunks of charcoal, as well as a number of smaller fragments, were retrieved. All but one were either completely non-diagnostic or constituted the remains of incinerated wood. The single exception appeared to be part of a carbonized seed, judging by its spherical exterior--unfortunately too fragmentary to be identifiable.

The meager yield of faunal and floral evidence and the complete absence of fish and mussel remains are surprising, considering that the Fox Lake components of the Pederson, Big Slough and Mountain Lake sites of southwestern Minnesota (above, p. 16)--from a somewhater later time period than the aceramic component at 21-BE-44 but all in a very similar setting--all produced bones and bone fragments by the hundreds (Anfinson 1982; Shane 1982). This discrepancy is all the more striking in view of the fact that all culturally positive levels at 21-BE-44 were water-screened through one-eighth inch mesh while most of the evidence from the other three sites was retrieved from one-quarter inch mesh (at Mountain Lake even one-half inch mesh) and water-screening through the finer mesh was used only for a couple of units at Pederson and Big Slough (Anfinson 1982:67).

As all three of these sites occur in locations that are very comparable to that of 21-BE-44--on islands/peninsulas

in shallow lakes surrounded by prairie--the difference in yield of paleoenvironmental evidence is rather puzzling. Given the apparent stability and continuity of environmental conditions and general subsistence patterns from the Late Archaic to the end of the prehistoric period (Anfinson 1982:54), one would expect the intensity and nature of animal and plant procurement to be basically similar at all four of these sites. Considering the rather small number of units as yet excavated on 21-BE-44, as well as the fact that they sample only a limited part of the entire site, we can probably assume that the relative scarcity of organic evidence in the tested areas might be unrepresentative of the site as a whole, the result of bias in the selection of excavation units. Until such assumptions are proven right or wrong by future work on the island, we can at least extrapolate from the Pederson-Big Slough-Mountain Lake evidence in order to give a tentative picture of the subsistence patterns at this site. Although the faunal evidence at the three sites include species from all the environmental zones in their vicinity (p. 9), the prairie zone appears to have been the most important source of game, with prairie species providing over 95 percent of the meat consumed at the Pederson and Mountain Lake sites, and with bison in clear predominance (approximately 90 percent)--Shane 1982:52. Though probably present in much smaller numbers, deer and elk would also have been a fairly important source of meat (and, like bison, of hides and bone for raw materials). Muskrat from the adjacent marshlands seems to have been the most important of the smaller animals. Fish appears to have been another important food resource, particularly at the Pederson Site.

A count of the skeletal elements of bison, undertaken for all three sites, indicated that limb elements were considerably more frequent than trunk elements. This would indicate that the animals were butchered away from the habitation sites and that only meat, hide and limbs were brought back for further processing. The low number of bison bones that were indicative of the age of the individual precluded any determinations regarding age frequency distribution or the use of selective versus non-selective hunting techniques (Shane 1982:48, Anfinson 1982:63).

An interesting observation was made about the abundant fish remains from the Pederson Site, which are almost identical in species representation and frequencies to a sample taken by shoreline seining at this site during a 1951 Minnesota Department of Natural Resources survey. Although the similarities could be coincidental, they suggest that prehistoric populations may have used similar methods immediately adjacent to the habitation site (Shane 1982:48).

As mentioned in Chapter III, sites in lacustrine settings in the prairie-lake region are generally interpreted as warm season base camps while those in sheltered riverine settings are more likely to have been used during the winter months. Many of the animals and most of the plant resources of the lacustrine settings would have been rather inaccessible, even completely unavailable during the winter--fishing through thick ice would have been nearly impossible, many of the birds would be wintering elsewhere and many of the mammals would have sought out more sheltered, wooded habitats. Because of the scarcity of wood, fuel for the campfire would have been hard to find. By comparison, the deeper, more wooded river valleys would have offered plenty of fuel, game and protection from the prairie wind during the winter months.

Dating and Cultural Affiliation

The completely aceramic nature of the evidence in the 1983 units, as well as the direct association between a fire basin and a side-notched projectile point type which, though long-lived, apparently has been found already in late Archaic context elsewhere, both seem to indicate a Late Archaic date for the lowest occupation level on the island. Radiocarbon samples, collected from a couple of the fire basins in this level, will be submitted for dating during the Fall of 1985.

The dating of the ceramic occupation(s) will have to await more comprehensive excavation results from the southwestern and southern parts of the island--at this time. The lack of diagnostic neck and rim sherds and reliable charcoal samples precludes anything beyond educated guessing. As indicated above on p. 68 , body sherds appear to be Late Woodland in character, probably representative of the Lake Benton phase which has been dated to approximately A.D. 900-A.D. 1500 (?).

As recent reconnaissance surveys have identified a number of aceramic (in three instances apparently Archaic) sites within a ten mile radius of Lura Lake (above, p. 19), it should be possible to arrive at a fairly detailed regional definition of late Archaic lifeways through future, more intensive investigations and intersite comparisons. Similarly, a closer comparison between the ceramic component(s) on the island and those of several other Woodland sites in the area (specifically a few habitation sites on the shores of Rice Lake a few miles to the west of Lura Lake) might serve to elucidate the nature of the local ceramic sequence and late prehistoric subsistence patterns. Unfortunately, most of the other sites in the area have been badly disturbed by cultivation, although a few undisturbed deposits have been recorded during recent reconnaissance

surveys, along the Rice Creek drainage (Clark A. Dobbs, personal communication).

VI. CONCLUDING REMARKS: EVALUATION OF SITE SIGNIFICANCE AND RESEARCH POTENTIAL; MANAGEMENT RECOMMENDATIONS

From the previous description and discussion of 21-BE-44, it seems clear that this site meets several of the National Register criteria, specifically those referring to the possession of locational and environmental integrity as well as the potential for yielding significant prehistoric evidence.

The nearly complete integrity of the setting and the cultural evidence is, as mentioned, quite exceptional. Located on an island which never has been cultivated and which, in most parts, retains a native vegetation cover of mature hardwoods, the site has escaped the impact of Euro-American settlement--in that sense, it is fairly unique among prehistoric sites in the heavily farmed and populated southern part of Minnesota.

It also appears to have very considerable research potential, not only because of the undisturbed state of the cultural deposit but also for the following reasons:

- limited testing has, so far, identified at least two, possibly three cultural components; considering the favorable location and prehistoric habitation potential of this island, it seems likely that more extensive testing would reveal an even greater cultural complexity;

- the earliest of the known components appears to date back to the Archaic, a cultural period which still remains fairly poorly documented by undisturbed habitation evidence; the presence of distinct features at this site could add significantly to our understanding of that period;

- the later component(s) appear(s) to be affiliated with one or several prairie/lake oriented ceramic traditions of the later prehistoric period, traditions which are different from but appear to be contemporary with the river oriented Blue Earth Oneota manifestation; while the latter has been quite well documented by recent, systematic surveys within the Blue Earth River drainage, the former remain rather poorly known--again, the cultural evidence from 21-BE-44 could make a significant contribution;

- the preservation of organic evidence seems well above

average--some identifiable faunal remains were found even in the lowest level, as were sizeable pieces of charcoal, a charred seed and clearly defined patterns of organic soil staining.

The site is presently being nominated to the National Register of Historic Places. Below are some recommendations for the future management of this cultural resource, should it be declared eligible for the Register.

At present, the cultural evidence on the island is threatened in two ways:

- by potentially severe wave/wind/rain erosion all along the west/northwest side of the island;

- by recreational use of the island as part of the county administered Daly Park.

Continued recreational use of the island could be compatible with the future preservation of the cultural evidence provided that:

- such use is limited to the upkeep of/hiking along mowed nature trails through what is otherwise left alone as a wildlife refuge;

- the park management finds a less destructive way of posting features of interest than the present method of sinking thick wooden posts well into the subsoil.

The erosion of the shoreline presents a much greater problem. To summarize the main points presented in the preceding chapters:

a) It has been established that fairly unrelenting erosion affects nearly 300 meters of the west/northwest edge of the island. The erosion is caused predominantly by wave activity, but is further aggravated by strong west/northwest winds which tend to topple partially undercut trees along the upper part of the eroding bank, and by rain, which causes considerable slumping down the bank during heavy storms.

b) The erosion has been particularly intense during periods of high water levels. Above normal lake levels, caused by seasons of unusually intense precipitation, have often been compounded by inefficient drainage from the lake--the original outlet, blocked by the construction of County Road 152 along the western shore of the lake, has been replaced by an artificial outlet which tends to become clogged. The outlet is under the

management of the Minnesota Department of Natural Resources.

c) During the most recent period of high water levels (most of 1982 and 1983), the erosion progressed at the rate of several meters per year in some of the most exposed areas. The perimeter survey in May of 1983 established that at least one-two meters had been lost along the central parts of the west/northwest bank during the preceding eight months. Continued work at the site during September-October 1983 and October-November 1984 provided an opportunity to monitor the subsequent rate of erosion and to determine that the latter had slowed down somewhat in the year between these two field investigations, probably, to a large extent, because of a return to more normal water levels.

Unless such fluctuations in lake level could be minimized, continued erosion could be expected to remove as much as five-ten meters of shore within a five year period. With stricter control of the lake level, that rate could probably be reduced by at least fifty percent. The removal of larger trees from the vicinity of the upper bank would also reduce the impact of erosion due to storm damage. It is unlikely, however, that such measures could completely eliminate the impact of erosion on the archaeological deposit--the two-four meter high, nearly vertical, at times even undercut banks have already been damaged to the point where even fairly minor wave/wind/rain activity would cause continued harm.

Considering the above, <u>bank stabilization</u> would be the only effective way of completely protecting the cultural deposit to its present extent. Because of the inaccessibility of the erosion area, however, it would also be more costly and complicated than most projects of that nature. The following facts, provided by Steve Michel, Park Supervisor for Blue Earth County, illustrate some of the problems involved. During the winter of 1983-84, the Blue Earth County Highway Department (which also administers the county parks) proceeded to stabilize approximately 450 meters of eroding shoreline in the mainland portion of the park, along the eastern shore of the lake due north of the island. This bank had suffered erosion damage very comparable to that on the island. In order to create the one to three slope recommended for successful stabilization and still avoid further loss of usable parkland, it was decided to add clay fill along the face of the vertically eroded bank rather than to cut it back further. Both the clay fill and the rocks used for rip rap were obtained fairly locally. The transporting of them, however, still presented some problems as the existing park road, built

mostly for recreational use, would not carry the weight of such heavy truckloads. Instead, the fill had to be brought in along an easement obtained across frozen farmlands in the middle of the winter. The total cost for this project, including the fill, the filter blanket, labor and transportation, came to a total of $119,138 for the 450 meter stretch of stabilized bank.

It would be unrealistic to project the cost for similar work along the 300 meter stretch of eroding bank on the island by simply basing it on two thirds the cost of the county project. In order to transport the necessary amount of fill to the island, it would be necessary to build a temporary road along the existing causeway to the island and to use it, for added carrying capacity, during the winter months. Another possibility, though probably not a very safe one, would be to transport the fill in smaller truckloads across the ice. Either way, the cost for the project would probably at least equal, possibly exceed, the amount spent on the mainland portion of the shore.

Information given by staff at the St. Paul Office of the Department of the Army, Corps of Engineers, supported the estimates given above. Bank stabilization through a method involving a) the contouring of the eroding bank, b) the adding of rocks to the base and up the slope, and c) the protection of the new slope by means of a filter blanket, would, by their estimates, cost something like $75,000 for a 300 meter stretch of eroding shore (depending, of course, on the height of the bank, the availability and pricing of the rocks, etc.). Transportation problems like those encountered in the case of the island would then add considerably to the normal price range, probably by at least fifty to seventy-five percent. In addition, although this second method would involve less fill and transportation cost than the one used by Blue Earty County, it would, instead, require fairly extensive mitigation of those parts of the site that would be lost during the recontouring of the bank.

Another alternative which has been suggested would involve the construction of a breakwater some distance out from the eroding bank. If such a barrier was created by depositing a low wall of rocks in the shallows some eight-ten meters out into the lake, where the water normally is less than knee-deep, it would presumably require less rock and less labor than the process of bank stabilization. The problems with transportation, however, would be the same. In addition, such a barrier would only be effective if the lake level could be maintained at or below its normal elevation. If the undercutting impact of waves were to be eliminated, the erosion caused by wind and rain would affect mostly the upper part of the bank, a process which might cause the bank to become stabilized by natural means before erosion cut it back past the zone already mitigated by the

September/October 1983 and October/November 1984 excavations.

If the alternatives suggested above have to be rejected, the third option would seem to be that of intermittent monitoring by qualified archaeologists, supplemented by mitigation through excavation as necessary. From a cultural resource management perspective, this would clearly be the least desirable option as considerable portions of the site might be wasted between the periods of monitoring, and as mitigation presumably would affect only a certain percentage of the endangered cultural deposit. Although this might be the cheapest solution for the moment, it also has the potential of becoming, in the long run, a costly and unpredictable liability.

The monitoring would be achieved by a) using the existing datum points to remap the western part of the island and then comparing the location of the shoreline with that indicated on the map drawn in May 1983, and by b) inspecting the eroding bank for new damage and cultural evidence. Judging by the 1983 experience, such a task could be accomplished by two archaeologists in a period of two to three days.

The size of subsequent mitigation efforts is hard to estimate--presumably, each phase would be at least as extensive as the 1983-84 effort.

As for the cost of such monitoring and mitigation, it seems fairly impossible to project what such expenditures would be nine-ten or even four-five years from today. The mitigation aspect could possibly be at least partially financed through a cooperative agreement with an academic institution willing to sponsor either an advanced field school or some other research project on the island.

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Appendix A: Minnesota Archaeological Site Forms for 21-BE-44 and 21-BE-45

MINNESOTA ARCHAEOLOGICAL SITE FORM

COUNTY	SITE NAME	FIELD NUMBER	STATE NUMBER
BLUE EARTH	DALY PARK ISLAND	23-5	21 BE 44

OWNER
Blue Earth County, Parks Dept.

U.S.G.S. QUAD
Delavan 7.5'

SITE LOCATION
Island in Lura Lake, part of Daly County Park.

LEGAL DESCRIPTION
SW / SE / NE & SE / SW / NE & NW NW / NE / SE & NE / NW / SE
sec. 25
T. 105 R. 27 twnsp:

SITE TYPE
artifact scatter

PROBABLE CULTURAL COMPONENTS:
Woodland

SITE DESCRIPTION / ENVIRONMENTAL SETTING
Thin scatter over much of island in large lake.

SITE CONDITION	CURRENT LAND USE	SITE AREA
mostly undisturbed	some erosion of west side of island	c. 15 acres

NATURE OF NEAREST WATER	DISTANCE TO WATER	DIRECTION OF SITE FROM WATI
Lura Lake	adjacent	north, south, east, west

ELEVATION OF SITE: 1030-1040 feet
ELEVATION OF NEAREST WATER: 1030 feet

NATURE, EXTENT OF INVESTIGATION: shovel tests to 65 cm.

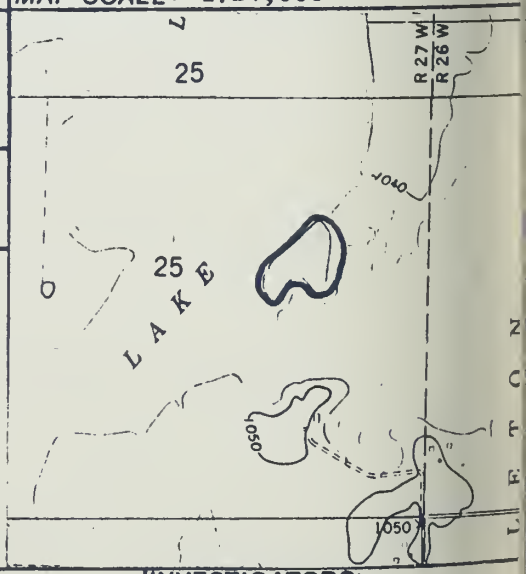
ARTIFACTS OBSERVED, RECOVERED:
One projectile point, one bifacial tool, one grit-tempered sherd, flakes, and bones recovered.

LOCAL COLLECTIONS, INFORMANTS:

WRITTEN REFERENCES
Minnesota Statewide Archaeological Survey Summary; 1977-1980. MHS. Jan. 1981

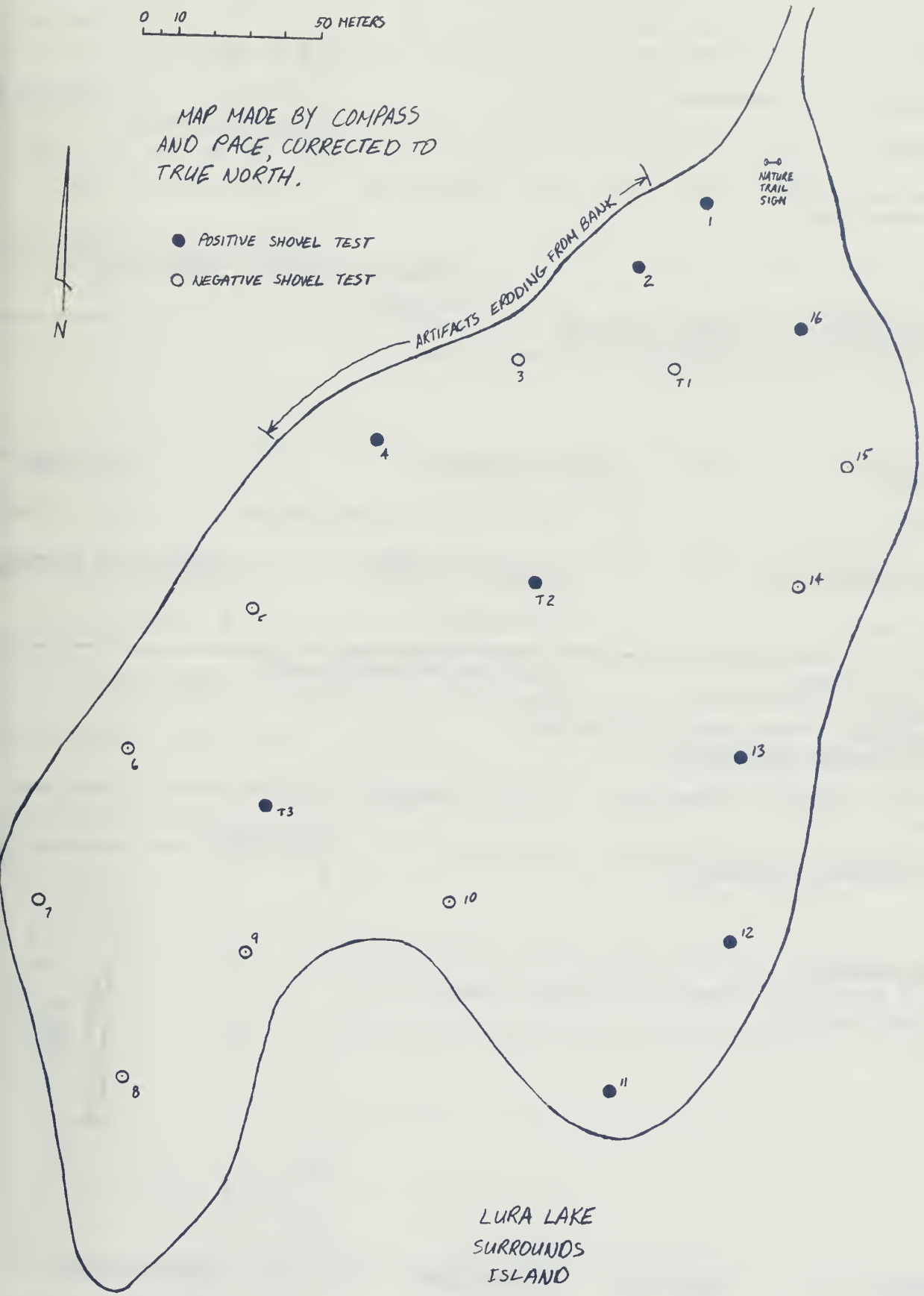
COMMENTS:

MAP SCALE: 1:24,000



ACCESSION NOS.	PHOTO NOS.	REPOSITORY:	INVESTIGATORS:
156-15		MHS/MnSAS	Budak, Lofstrom/1979
		PROJECT:	DATE:

F.N. 23-5 (ISLAND IN OALY PARK)



Bindak
June 1979

MINNESOTA ARCHAEOLOGICAL SITE FORM

COUNTY	SITE NAME	FIELD NUMBER	STATE NUMBER
BLUE EARTH	DALY PARK	23-6	21 BE 45

OWNER
Blue Earth County, Parks Dept.

U.S.G.S. QUAD
Delavan 7.5' & Sterling Center 7.5'

SITE LOCATION
Shoreline on east side of Lura Lake in Daly Park camping and swimming area.

LEGAL DESCRIPTION
E½ E½ NE sec. 25 and SW SE SE sec. 24
T. 105 R. 27 twnsp:

SITE TYPE
artifact scatter

PROBABLE CULTURAL COMPONENTS:
Woodland

SITE DESCRIPTION / ENVIRONMENTAL SETTING
Thin scatter eroding from banks and on road surfaces.

SITE CONDITION	CURRENT LAND USE	SITE AREA
disturbed	Park construction and erosion	c. 15 acres

NATURE OF NEAREST WATER	DISTANCE TO WATER	DIRECTION OF SITE FROM WAT
Lura Lake	adjacent	east

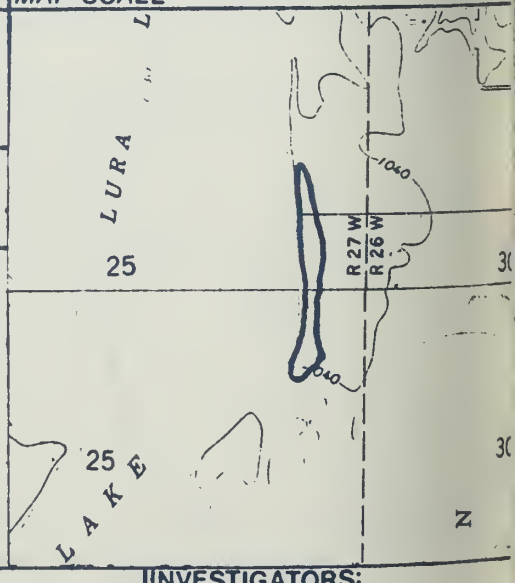
ELEVATION OF SITE: 1030 - 1040 feet

ELEVATION OF NEAREST WATER: 1030 feet

NATURE, EXTENT OF INVESTIGATION: Shovel tests to 60 cm depth.

ARTIFACTS OBSERVED, RECOVERED:
No artifacts fround in shovel tests. One grit-tempered sherd and several flakes were recovered.

MAP SCALE:



LOCAL COLLECTIONS, INFORMANTS:

WRITTEN REFERENCES
Minnesota Statewide Archaeological Survey, Summary: 1977-1980. MHS Jan. 1981.

COMMENTS:

ACCESSION NOS.	PHOTO NOS	REPOSITORY:	INVESTIGATORS:
		MHS/MnSAS	Budak, Lofatrom/1979
		PROJECT:	DATE:

Appendix B: Statement of Work

SECTION F

DESCRIPTION/SPECIFICATIONS

Archaeological Survey of
BLM Island Blue Earth 01
(Blue Earth County, Minnesota)

1.0 Purpose and Background

The Bureau of Land Management (BLM) is required to identify, evaluate, protect and provide for the appropriate public and research use of prehistoric and historic cultural resources on lands and resources under its jurisdiction; and to insure that BLM initiated or authorized actions do not inadvertently harm or destroy non-federal cultural resources. These requirements are mandated by the Antiquities Act of 1906; the Reservoir Salvage Act of 1960, as amended; the National Historic Preservation Act of 1966, as amended; the National Environmental Policy Act of 1969; Executive Order 11593 (May 1971); the Federal Land Policy and Management Act of 1976; and the Archaeological Resources Protection Act of 1979. This solicitation is being developed to assist the BLM in protecting cultural resources under its jurisdiction in Blue Earth County, Minnesota. This procurement has as its objective a program of archaeological survey, limited and controlled data recovery, and recommendations for site protection.

1.1 A BLM Class I (cultural resources overview; existing data inventory) inventory in Minnesota, conducted under contract in 1979, provided a compilation of existing cultural resource sites on public domain lands in that state. This inventory identified site 21-BE-44, located on BLM island Blue Earth 01 (Blue Earth County, Minnesota). This site was first located during an archaeological reconnaissance of Blue Earth and Faribault counties conducted by the Statewide Archaeological survey of the Minnesota Historical Society. At the time that this site was recorded, erosion was occurring along the western shore of the island that was destroying part of the site. The site was recently revisited and the erosion that was originally observed by the Minnesota Historical Society in 1979 continues. This procurement will accomplish an archaeological survey and limited and controlled data collection on site 21-BE-44, in order to recover the information currently being destroyed.

1.1.1 Site 21-BE-44 is a prehistoric archaeological site situated on an unnamed island in Lura Lake, Minnesota (Section M, Enclosure 1). The site is located in the SW 1/4 of the NE 1/4 of Section 25, Township 105 N, Range 27W in southern Blue Earth County, Minnesota. The island is approximately 13 acres in size and the site appears to extend over most of the island. This was determined at the time that the site was originally recorded when small tests were placed over the entire

island and the shores were carefully examined. The limited artifactual material recovered during the testing of the site provisionally suggests an occupation sometime in the Woodland period, which in this area occurs roughly between 200 B.C. and A.D. 900. The island's topography, the land contours, and shape of the island and nearby shore suggest that it may have been a peninsula at one time.

1.2 The BLM surface lands in Minnesota, including the island in question, are being considered for various land transactions (i.e. transfer, withdrawal, exchange, public sale, lease for Recreation and Public Purposes). The BLM's Management Framework Plan (MFP) identified specific opportunities for transferring jurisdiction of all BLM surface lands in Minnesota to other Federal agencies, State or local government, or to private individuals or entities. Such actions could effect some existing cultural values and thereby require compliance with Section 106 (National Historic Preservation Act of 1966) procedures.

With regard to BLM island Blue Earth 01, upon which site 21-BE-44 is located, Blue Earth County's Daly Park has filed an application with BLM for title transfer under the Recreation and Public Purposes Act. When Blue Earth County bought the parkland, they inadvertently assumed that the island was included in that parkland acquisition. Consequently, the county developed the island and is currently utilizing it as a wildlife habitat and nature-recreation trail. The nature-recreation trail is used for hiking, cross-country skiing, and snowshoeing. The island trail is part of an interpretive trail system within Daly Park that is maintained as a mowed pathway in the summer and is ungroomed in the winter. In connection, with the current use of the island, minor erosion of the upper soil levels has occurred along the nature trail and in unvegetated areas of the island; in addition, there probably has been some minor disturbance of the sub-surface cultural deposits from the placement of signs and posts throughout the island. By far the most serious disturbance to the site is a result of natural causes, specifically, erosion by wind and water action. This is limited to a small area along the northwest edge of the site.

.0 Objectives

The following objectives shall be accomplished through the completion of this procurement.

2.1 Assessment of the present physical condition of the archaeological site and the island, and the potential for future damage to either or both through natural and man-produced causes.

2.2 Recovery of information which is currently being destroyed

2.3 Provision of recommendations (if needed) for stabilization, protection and/or additional data recovery on site 21-BE-44

2.4 Discussion of the inter-relationship between site 21-BE-44 and other sites in the Faribault and Blue Earth counties area. Discuss the site's relationship to current applicable generalized regional models of prehistoric culture history and culture process.

The BLM is soliciting potential contractors with prehistoric expertise, as well as those with large regional (state-wide) capabilities.

3.0 Statement of Work

3.1 General. Provide a program of limited and controlled data recovery, and recommendations for site protection of one lake island in Lura Lake, Blue Earth County, Minnesota. The program and recommendations shall provide the following:

3.1.1 Framework to assist in developing stabilization and protection measures for a threatened cultural resource.

3.2 Location. BLM-administered island Blue Earth 01 is located in Lura Lake, Blue Earth County, Minnesota (Section M, Enclosure 2). Blue Earth County is situated in the south-central part of the state approximately 20 miles south of Mankato.

3.3 Task 1 - Additional Field Investigations

The task is to initiate some additional field investigations of site 21-BE-44. These additional field investigations are necessitated by the currently deteriorating condition of the site. The Principal Investigator and those who are in direct charge of field work shall meet the professional qualifications as spelled out in Title 36 CFR Part 66 procedures. The following general procedures are provided:

3.3.1 Survey Boundaries: The physical boundaries of site 21-BE-44 that are being eroded shall be accurately delineated and recorded. This information will provide future investigators a baseline from which to determine whether or not site erosion is stabilized or expanding.

3.3.2 Map Disturbed Areas: An accurate map of the disturbed portions of site 21-BE-44, including the boundaries of the island, shall be prepared. This will, of necessity, require that a permanent datum be installed at an appropriate location. Photographs should be taken whenever such records would be of value for archival or analytic purposes, or an as aid in revisiting the site or areas within the site where disturbance is occurring. In view of BLM's intention to have this site periodically

monitored, these photographs will be an important part of the baseline information. In order for the photographs to be most useful, it is important that descriptions be provided and that they be referenced to key markers on the map.

3.3.3 Data Recovery: In general, collection of artifacts and other materials from archaeological sites located during survey should be kept to the minimum necessary to complete the identification and evaluation process. However, in the case of 21-BE-44, the contractor should attempt to reasonably recover any information, including artifactual material, that is being destroyed as a result of soil erosion. The information currently being destroyed should be recovered in a prudent manner that will not accelerate site and soil erosion.

In connection with this data recovery program, same excavation may be necessary. This should be kept to an absolute minimum. Any artifacts, faunal material, radiocarbon samples, flotation samples, or other materials collected must be provenienced with respect to horizontal and vertical controls. Other contextual information such as stratum, orientation of individual specimens, etc. shall be recorded as necessary and appropriate. Any cultural features encountered during excavation shall be mapped and thoroughly described, and stratigraphic profiles shall be drawn for all excavation units. All hand-excavated material will be sifted through one-eighth inch mesh hardware cloth. Emphasis will be placed on recovery of materials <u>in situ</u>.

3.3.4 <u>Specimen Samples</u>. Various cultural strata and/or features may undergo flotation, soil chemical testing, or other appropriate analytical procedures. Depending on specimen availablity, various radiocarbon samples will be collected using appropriate techniques.

3.3.5 <u>Laboratory Analysis</u>. All data gathered will be subjected to laboratory analyses and considered in light of similar sets of data from nearby sites. At a minimum, lithic materials will be examined for temporal-cultural attributes including manufacturing techniques, style, morphological context, patina and weathering. Comparison with other relevant type collections will be accomplished. Ceramics will be analyzed using traditional methods of typing including analysis of paste, temper, core, hardness, carbon streaking, color, manufacturing technique, morphology, etc., where reasonable and possible. At a mininum, faunal remains will be examined for species

representation, butchering techniques, percent distribution of animals by number and weight, and modification of bone for use as tools.

3.3.6 Cataloguing Procedures. Cataloguing procedures will follow those currently in use at local universities and other institutions. All artifacts will be washed, dried, given preliminary analyses, weighed, measured, and categorized within a typological framework. These data, along with other relevant information, will be entered on standardized catalog cards. Each individual tool or artifact, excluding debitage and flakes, will receive consecutive catalog numbers that will be either inked directly on the artifact or written on an attached label or tag. Debitage and flakes will receive catalog numbers by groups or classes although they will be weighed and measured individually. Data from the catalog cards will be entered on master catalog sheets in sequential order and placed into binders for safekeeping. Specimens and other materials shall be catalogued using a form(s) supplied by the Contractor and approved by the COAR prior to use.

3.3.7 Curation. Data and materials recovered from lands under the jurisdiction or control of a Federal agency are the property of the United States Government. They shall be maintained by the Government or on behalf of the Government by qualified institutions through mutual agreement. A qualified institution is one equipped with proper space, facilities, and personnel for the curation, storage and maintenance of the recovered data and materials. The exact nature of the requisite space, facilities, and personnel will vary depending on the kinds of data and materials recovered, but in general it is necessary for a qualified institution to maintain a laboratory where specimens can be cleaned, labeled, and preserved or restored if necessary; a secure and fireproof storage facility organized to insure orderly maintenance of materials; a secure and fireproof archive for the storage of photographs, notes, etc. and a staff capable of caring for the recovered data and material.

3.3.8 Backfilling. Following completion of field activities, all excavated units shall be backfilled and any other disturbance rehabilitated to the satisfaction of the COAR.

3.3.9 Photographs. Overall ground level site photographs will be taken of the BLM island and the archaeological site. Documentation will include both color slide and black-and-white shots of in-progress field work, in situ artifacts and ground features.

3.4 Task 2 - Report Preparation. Upon completion of the required survey/data recovery program, and data analyses, the contractor shall prepare a professional quality report, with appropriate appendices, in accordance with the standards used in preparing copy for American Antiquity. The Principal Investigator and those who are in direct charge of report writing shall meet the professional qualifications as spelled out in the Title 36 CFR Part 66 procedures. The report will include, at a minimum, the following:

3.4.1 Abstract. Provide a 250 word or less abstract of the report. The abstract will outline the context and provide reference to specific highlights from the narrative.

3.4.2 General Information. Identify the island in question, reasons for the survey/data recovery program, methods used during field work, problems encountered in undertaking work, and steps taken to resolve them. Reference the personnel employed and the roles of each person, as well as a schedule of time spent on data review, field work and report preparation.

3.4.3 Environmental Backgrounds. Briefly discuss past and present environmental factors that are important to the understanding of the area's prehistoric and historic human use and occupation. Examples of these factors include climatic changes and processes and paleoclimatic conditions; hydrological history, history of regional vegetation with respect to the succession of dominant communities and exotic species and the interplay of the above. Other examples include the ages and evolutionary sequences and the various landforms of the area. Information from sources such as palynological data, radiometric dates, and ethnobotanical information for the area should be considered.

3.4.4 Field Procedures. Discuss the procedures employed during field investigations, including mapping techniques.

3.4.5 Laboratory Procedures. Discuss the standard laboratory procedures employed during the preliminary analyses of the artifacts.

3.4.6 Cultural Resource Synthesis. Provide a synthesis of the existing cultural resource data depicting the human use and occupation of the area focusing on the period(s) of site(s) occupancy. Include, as appropriate, discussion of identified and potential cultural and environmental chronologies, site boundaries, site function(s), subsistence exploitation(s), and site relationships to regional prehistoric cultural behavior and culture history.

3.4.7 Future Needs. Discuss the present condition and potential for further deterioration or possible enhancement of the site(s), and suggested recommendation for further data recovery and/or protection/stabilization, if needed.

3.4.8 Appendices. Provide relevant appendices which have been developed as a result of the preceding, or have been required by the delivery order. Include in this section a list of catalog and accession numbers of artifacts, notes, photographs, and other data generated under this contract.

3.4.9 References. Provide a list of all references directly utilized in the report.

3.4.10 Site Maps and Graphics. Provide appropriate charts, tabulations and graphics necessary to support the narrative. Include site map(s) showing contours and significant surface features.

4.0 Deliverables.

The Contractor shall prepare and submit the following items to the Contracting Officer's Authorized Representative (COAR).

4.1 Data Recovery and Analysis Report

4.1.1 Draft. One (1) original of the data recovery and analysis report, with appropriate graphics, as specified paragraph 3.4.

4.1.2 Final. One (1) unbound camera-ready original plus three (3) copies of the data recovery and analysis report, as specified in paragraph 3.4. The report shall be typed or printed on 8 1/2 x 11 inch paper, and shall be single spaced. Maps within the camera-ready copy will not be fold out, but 8 1/2 x 11 inch. The photographic plates in the camera-ready original must be original black-and-white glossy photographs.

Copies of the report may be xerox type photo reproductions. However, the text, graphics and maps must maintain a high degree of readability and clarity. Black-and-white photos may be in the form of plates reproduced from the original glossy photo.

4.1.3 One (1) original plus three (3) copies of site maps (paragraph 3.4.10) at a scale specified in the proposal or as agreed upon through negotiations with the Contracting Officer or the COAR.

4.1.4 The original negatives and one (1) original of each black-and-white photograph and color slide taken as specified in paragraph 3.3.9.

4.1.5 Complimentary republication copies of popular and professional papers resulting from data generated under this contract.

5.0 Delivery Schedule/Place

5.1 The contractor shall complete all requirements under this contract within 60 days after award of contract.

5.2 The BLM prefers that field work be accomplished during Spring, 1983, although the offeror may request in their proposal to conduct field work during Summer, 1983. The decision as to when field work will proceed shall be made by the Contracting Officer. Regardless of field work dates, all work for this contract shall be completed no later than August 1, 1983.

5.3 Data Recovery and Analysis Report.

5.3.1 A draft of the data recovery and analysis report shall be completed and delivered within forty (40) days after award of contract.

5.3.2 BLM will review the draft report within ten (10) days and return it to the Contractor for necessary rework.

5.3.3 The Contractor shall have ten (10) days to make the necessary changes and deliver the final site testing and analysis report.

5.4 Place of Delivery

5.4.1 Deliveries will be received by the COAR (or designated representative) at:

Bureau of Land Management
Eastern States Office
350 South Pickett Street
Alexandria, Virginia 22304

Appendix C: Supplementary Information for Site Maps

Reference Trees

Number (on Map)	Species	Condition	Location
1	Oak	dead	N24.3/W0.5
2	Hawthorne	live	N21/W01
3*	?	dead	N26/W04
4	Eastern Hophornbeam	live	N15/W11
5*	?	dead	N14.5/W16
6	Elm	dead	N4.5/W13.5
7	Oak	dead	N6.5/W16
8	Bur Oak	live	S08/W23
9*	?	dead	S06/W33
10*	Eastern Hophornbeam	live	S11/W40
11	Box Elder	live	S24/W36
12	Elm	dead	S21/W50
13*	?	dead	S30/W60
14*	?	dead	S36/W62
15	Ash	live	S41/W46.5
16	Eastern Hophornbeam	live	S44.5/W68.5
17	Green Ash	live	S68.7/W82
18*	?	dead	268° from #17, 13.6 m from shore
19*	?	dead	5 m from shore and S80/W97
20	Elm	live	S100/W105
21*	?	dead	S93/W110
22	Elm	dead	S111/W113
23	?	live	S111/W120
24*	?	dead	10 m from S140/W132 at 338°
25	Oak	dead	S158/W135
26	?	dead	S158/W139
27*	Elm	dead	15 m from # 26 at 338°
28*	Elm	dead	10 m from # 26 at 260°
29	Oak	dead	10 m from S180/W150 at 354°

* indicates tree in lake or resting against eroding bank.

Test Unit Elevations (NE Corner Stake) in Relation to Arbitrary Datum ±0 m

N13/W08 - 99.505 m
S17/W40 - 99.945 m
S67/W86 - 100.21 m
S68/W87 - 100.23 m
S107/W112 - 100.22 m
S224/W118 - 100.125 m

Trail Marker Coordinates

1. Nature Trail Sign - N36-38/E18-22
2. Wild Rose - N34.7/E16.7
3. Bur Oak - S10.7/W19
4. Box Elder - S26/W34.5
5. Eastern Hophornbeam - S47/W66
6. Green Ash - S70.2/W80
7. Milkweed - S164.5/W126.4
8. White Oak - S189.5/W146
9. Kentucky Coffee Tree - S211/W131
10. Label Missing - S235.5/W109.5
11. Common Elderberry - S190.5/E38
12. European Gooseberry - S107/E52
13. Staghorn Sumac - S94/E55
14. American Hackberry - S07/E37.7

Appendix D: Lists of Cultural Evidence

LITHICS AND CERAMICS

The information about the cultural evidence is arranged in five columns:

1) Type of Artifact

The following abbreviations are used for the lithics:

PDF for primary decortication flake
SDF for secondary decortication flake
TF for tertiary flake
R/RF for retouch/rejuvenation flake
SH for shatter
FCR for fire-cracked rock

2) Raw Material (Lithics) or Temper (Ceramics)

The following abbreviations are used for the lithic raw materials:

OOL for oolitic chert
CH for non-oolitic chert (GMC for Grand Meadow Chert)
JAS for jasper
AG for agate
CHAL for chalcedony
SIL for siltstone
SST for silicified sandstone
QTZ for quartz
BAS for basalt
GR for granite
ST for sandstone
LT for limestone
SH for shale

3) Dimensions/Weight

Fire-cracked rock is described by weight only except in the case of fire-cracked artifacts.

Flaked lithics are described in terms of length/width/thickness (height), expressed in millimeters. Fractions of millimeters are only given for thickness of flakes and for finished artifacts. Examples:

21/13/2.3 = 21 mm in maximum length/13 mm in maximum width/2.3 mm in maximum thickness

15ap/10/2 = 15 mm of preserved maximum length on a fractured item

12x14/6 = length/width x length/width (followed by thickness) on item where the longitudinal axis can not be determined

4) Depth within Unit

5) Coordinates within unit, expressed in centimeters, measured from NE corner of unit.

N13/W08	30-40 cm	Grindstone (fractured)	BAS	57x40x36 mm	30-37 cm	S.40/W.42
		FCR-cobble	GR	ca. 1.4 kg	30-37 cm	S.47-.60/ W.40-.55
		TF	OOL	23 ap x 16/4	40 cm	S.10/W.45
	40-50 cm	TF	OOL	22/20/5	40-44 cm	S.60/W.47
		PDF	SST	8ap x 19/4	40-45 cm	screen
	50-60 cm	FCR-cobble fragment	GR	45 g	53-56 cm	S.25/W.65
		TF	OOL	13ap/24/2.5	58 cm	S.65/W.43
		TF	OOL	12/11/2.5	57 cm	S.65/W.55
		TF	OOL	6ap/11/3	55-60 cm	SE¼ -- screen
S16/W39	30-40 cm	FCR-cobble	QTZE	ca. 350 g	35-40 cm	S.13-.18/W.14-.20
		FCR-2 fragments	GR	58 g	35-40 cm	S.10-.17/W.38-.40
	40-50 cm	Grind/hammer stone	BAS	109x89x58	40-45 cm	S.36-.44/W38.94-39.05
S16/W40	20-30 cm	TF	CHAL	15/17/4	25 cm	S.81/W.17
		FCR-fractured cobble	GR	ca. 200 g	24-30 cm	S.69-.81/W.94-.99
		FCR-cobble fragments	GR	ca. 230 g	24-30 cm	same as above
		FCR-fractured cobble	GR	170 g	23-30 cm	S.62-.68/W.75-.83
		FCR-cobble fragments	GR	ca. 50 g	28-30 cm	S.62-.68/W.64-.70
		FCR-cobble fragment	GR	ca. 200 g	24-29 cm	S.48-.55/W.07-.16
		FCR-cobble fragment	GR	495 g	27-35 cm	S.71-.80/W.10-.18
	30-40 cm	SDF	CH	11/14/2	32 cm	S.57/W.15
		FCR-cobble fragments	GR	ca. 70 g	30-33 cm	S.86-.92/W.23-.30
S17/W40	30-40 cm	FCR-cobble fragment	GR	ca. 30 g	35-40 cm	screen
	40-50 cm	TF	CHAL	11/13/4	45 cm	S.15/W.81
		TF	QTZ	8/8/3	50 cm	S.30/W.49
		Cobble used for polishing	BAS	70x59x33	43-46 cm	S.52-.59/W.48-.54
		FCR-fragment	GR	ca. 510 g	36-41 cm	S.05-.15/W.02-.15
		FCR-cobble	GR	ca. 240 g	41-45 cm	S.23-.30/W39.96-40.04
		FCR-cobble	GR	ca. 110 g	40-45 cm	S.25-.31/W.37-.42
		FCR-cobble	GR	ca. 550 g	45-50 cm	S.72-.80/W.49-.56
		FCR-2 cores of disintegrating cobbles	GR	355 & 85 g	45-50 cm	S.38-.46/W.72-.80
S18/W41	30-40 cm	Grind/hammer stone	BAS	95x82x67	37-43 cm	S.48-.58/W.00-.08
		FCR-large, bun shaped boulder apparently used as grinding surface	GR	19 cm diam. 10.5 cm high	30-41 cm	S17.87-18.06/ W41.00-.18
		FCR-cobble frag.	GR	145 g	30-36 cm	S.08-.11/W.37-.41
		FCR-cobble frag.	GR	85 g	33-38 cm	S.07-.11/W.40-.47
		FCR-cobble frag.	GR	105 g	28-32 cm	S.22-.28/W.31-.36
		FCR-cobble frag.	GR	112 g	33-38 cm	S.20-.24/W.45-.51
		Grindstone (fire-cracked)	GR	49x48x38	35-39 cm	S.24-.29/W.81-.86
		FCR-split cobble	GR	708 g	39-46 cm	S.12-.20/W40.96-41.08
S45/W65	NEGATIVE					

Findspot 3 (S65-66/W87-88)		TF	CH	11x11/2.5	Eroding out of uppermost 50 cm of bank.
S67/W86	30-40 cm	PDF	CH	15/24/8	S½ (from screen)
	40-50 cm	TF	OOL	13ap/11/2.5	same as above
		TF	OOL	6ap/7/1	same as above
S68/W86	20-30 cm	SDF	OOL	25ap/32/5.5	NW¼ -- screen
		TF	OOL	9ap/19ap/4	same as above
	30-40 cm	Retouched blade	OOL	12ap/10/2	40 cm S.04/W82
	40-50 cm	TF	OOL	24/14/3	45 cm S.46/W.84
		TF	OOL	15ap/18/3	43 cm S.09/W.83
		TF	OOL	14ap/31/4	42 cm S.00/W.81
		PDF	CH	25x20/4	45 cm S.34/W.77
		SDF	OOL	13/21/5	40-50 cm screen NW¼
		TF	OOL	11ap/10/2.5	same as above
		TF	OOL	7ap/9/1.5	" " "
		TF	OOL	15/12/2	" " "
		TF	OOL	12ap/11/2.5	" " "
		TF	OOL	9ap/13/2	" " "
		SDF	OOL	10ap/12/2	40-50 cm screen NE¼
		TF	OOL	12/18/2	same as above
		TF	OOL	10/10/2	" " "
		SDF	OOL	6/9/2	" " "
		TF	OOL	8/9/2	" " "
		TF	CH	13/15/4.5	" " "
		TF	OOL	13/13/2	" " "
		TF	OOL	9ap/9/2	" " "
		TF	CH	10ap/12/2	" " "
		Flake fragment	OOL	max. 12mm	" " "
		4 " "	OOL	max/ 7-8mm	" " "
		TF	OOL	13ap/12/2	45-50 cm S.71/W.35
		TF	OOL	9apx6ap/0.8	" " S.72/W.89
		TF	OOL	19/20/5	" " S.63/W.02
		TF	OOL	11/16/4	40-50 cm screen SE¼
		TF	SST	10x10/3.5	same as above
		SH	OOL	16x8x4	" " "
		TF	OOL	7ap/4/1.5	" " "
		TF	OOL	10ap/16/4.5	45-50 cm S.92/W.64
		TF	OOL	16ap/20/3	" " S.83/W.79
		TF	OOL	20/15/4	" " S.78/W.60
		TF with retouch	OOL	15/19/3.7	" " " "
		SDF	OOL	10ap/8/2	40-50 cm screen
		SH	OOL	11x5x2	same as above
		SH	OOL	14x7x7	" " "
		TF	OOL	9/17/4	" " "
		TF	OOL	13ap/15/3.8	" " "
		TF	OOL	8ap/11/2	" " "
		TF	OOL	5ap/10/2.5	" " "
		TF	OOL	8ap/12/4	" " "
		TF	OOL	14/10/3	" " "
		TF	OOL	7ap/8/11	" " "
		TF	OOL	8ap/8/2	" " "
		TF	OOL	6ap/5/1.3	" " "
		TF	OOL	6ap/9/2	" " "

S68/W86	40-50 cm	TF	OOL	8ap/8/1.3	40-50 cm	screen
		TF	OOL	6ap/5/2	" "	"
		TF	OOL	4/12/3	" "	"
		TF	OOL	10ap/6/1.5	" "	"
		TF	OOL	8ap/5/2	" "	"
		TF	CH	5.5 max./0.6	" "	"
		TF	CH	4 max./0.5	" "	"
		TF	OOL	6.5 max/0.5	" "	"
		Flake fragment	OOL	10 max.	" "	"
		" "	OOL	" "	" "	"
		" "	OOL	" "	" "	"
		" "	OOL	9 max.	" "	"
		" "	OOL	7 max.	" "	"
		" "	OOL	10 max.	" "	"
		FCR-part of cobble	GR	380 g	" "	S.45-.50/W.39-.44*
		FCR fragment	SH	201 g	50 cm	S.44-.49/W.66-.73
		FCR fragment	ST	35 g	50 cm	S.44-.48/W.64-.68
	50-60 cm	PDF	CH	47x44x24	50-52 cm	S.44-.48/W.62-.66
		PDF	OOL	35/50/10	50-53 cm	S.50-.55/W.25-.28
		SDF	OOL	16apx11ap/4.5	50-60 cm	NE¼ -- center
		SDF	OOL	15apx13ap/3.5	" "	" "
		TF	OOL	9ap/14/3	" "	" "
		TF	OOL	8ap/9/1.2	" "	" "
		TF	OOL	20/18/5.3	55 cm	S.59/W.42
		TF	OOL	18/14/3	56 cm	S.62/W.36
		TF	OOL	24/22/5.2	54 cm	S.73/W.29
		TF	OOL	18/15/3.4	54 cm	S.69/W.21
		TF	OOL	8/12/1.7	53 cm	S.75/W.29
		TF	OOL	9ap/14/4	55 cm	S.80/W.18
		TF	OOL	10ap/17/2.8	55 cm	S.90/W.23
		TF	OOL	6/10/1	50-60 cm	screen, SE¼
		TF	OOL	11ap/9/3	" "	" "
		TF	OOL	9/10ap/2	" "	" "
		TF	OOL	10ap/9/2	" "	" "
		TF	OOL	9ap/11/1.5	" "	" "
		TF	OOL	9ap/10/2.5	" "	" "
		TF	OOL	7/8/1.8	" "	" "
		TF	OOL	9/6/2	" "	" "
		SDF	OOL	22x15/5	52 cm	S.78/W.60
		TF	OOL	32ap/34/4	50-53 cm	S.83/W.79
		TF	OOL	12ap/12/2	51 cm	S.92/W.64
		SDF	OOL	23/22/6	53 cm	S.76/W.65
		TF	OOL	12ap/15/2.5	54 cm	S.78/W.73
		TF	OOL	12ap/13/3.5	53 cm	S.76/W.75
		TF	OOL	13ap/13/3	56 cm	S.89/W.82
		TF	OOL	10ap/17/2.5	54 cm	S.93/W.80
		TF	CH	8ap/11/2.5	50-60 cm	screen
		TF	OOL	10ap/14/2.3	" "	"
		TF	OOL	7ap/11/1.5	" "	"
		TF	OOL	15ap/15/4	" "	"
		TF	OOL	9ap/9/3.6	" "	"
		TF	OOL	6ap/11/2.5	" "	"
		TF	OOL	5ap/6/1.4	" "	"

* in darker feature

S68/W86	50-60 cm	TF	OOL	9ap/5/1	50-60 cm	screen
		TF	OOL	10/6/1.6	" "	"
		TF	OOL	9/6/1	" "	"
		TF	OOL	8/5/1.5	" "	"
		TF	OOL	6/4/0.8	" "	"
		SH	OOL	11x7x4	" "	"
		SDF	OOL	10x7/1.2	" "	"
		SH	OOL	10x7x3	" "	"
		Flake fragment	OOL	11 max.	" "	"
		" "	OOL	9 max.	" "	"
		" "	OOL	5 max.	" "	"
		TF	OOL	7ap/7/1.3	" "	"
S68/W87	20-30 cm	SH	QTZ	19x10x4	25 cm	S.55/W.15
	30-40 cm	TF	OOL	31/16/3	38 cm	S.52/W.16
		SDF	OOL	20/16/6	39 cm	S.56/W.19
		TF	OOL	9ap/12ap/2	39 cm	S.50/W.42
		TF	OOL	9ap x 20ap/3	38-39 cm	S.22-.40/W.10-.20
		SDF	OOL	12ap/15/4.6	" "	same as above
		TF	OOL	6ap x 12ap/1.6	" "	" " "
		TF	OOL	8ap x 19ap/3	" "	" " "
		TF	OOL	19ap/13/2.5	39 cm	S.31/W.52
		TF	OOL	15/12/1.8	39 cm	near the above
		Grindstone	BAS		38-48 cm	S.28-.37/W.16-.24
		FCR fragment	GR		38-42 cm	S.37-.40/W.16-.24
	40-50 cm	TF	OOL	32/21/5.4	42 cm	S.23/W.28
		TF	OOL	9ap/15/3	45 cm	S.74/W.73
		FCR fragment	GR g	59 g	41-45 cm	S.43-.47/W.40-.47
		FCR fragment	GR	disintegrated	45 cm	S.77/W.77
S69/W87	20-30 cm	TF	OOL	22ap/15/2.5	27-30 cm	screen
	30-40 cm	TF	OOL	10 max.	30-40 cm	screen
		TF	OOL	9 max.	" "	"
		TF	OOL	5 max.	" "	"
	40-50 cm	PDF	OOL	24/16/4	41 cm	S.80/W.62
		TF	OOL	20/13/2	41 cm	S.56/W.81
		TF	OOL	30ap/27/33	45 cm	S.30/W.72
		TF	OOL	11ap/15/3.3	" "	S.34/W.43
		TF	OOL	11ap/9/1.5	" "	Feature B
		TF	OOL	8ap/8/1.5	" "	" "
		TF	OOL	27 x 14ap/1.7	" "	Feature C
		TF	OOL	26/17/3	" "	" "
		SDF	OOL	20 x 19/6.5	40-45 cm	screen, S½
		TF	OOL	14/13/2	" "	" "
		TF	OOL	8 max.	" "	" "
		TF	OOL	5ap/5/0.8	" "	" "
		TF	OOL	11/11/2	" "	" N½
		TF	OOL	13 x 13ap/2	" "	" "
		TF	OOL	7 x 6/0.8	" "	" "
		SH	QTZ	7 x 5 x 2	" "	" "

S69/W87	40-50 cm	SH	QTZ	10 x 6 x 4	40-45 cm	screen, N½
		TF	OOL	6ap/6/1	" "	" "
		TF	OOL	4/6/1	" "	" "
		TF	OOL	4/5/1.4	" "	" "
		TF	OOL	9 max.	" "	" "
		TF	OOL	7ap/7/1	45-50 cm	" "
		SDF	OOL	9 x 12/3	" "	betw. Feat. B & C
		TF	OOL	5/8/1.5	" "	same as above
		TF	OOL	5ap/5/0.7	" "	" " "
		TF	OOL	12ap/10/1.8	45-51 cm	Feature C
		TF	OOL	5/5/1.9	" "	" "
		TF - deliberately notched	OOL	28/20/3.2	45-50 cm	Feature C area
		TF	GMC	32/17/7	" "	" " "
		TF	OOL	15ap/21/4.5	" "	" " "
		TF	OOL	12ap/12/3.4	" "	" " "
		TF	OOL	10ap/11/2.3	" "	betw. Feat. C & D
		TF	OOL	6ap/9/0.9	" "	" " " "
		TF	OOL	10/6/1.5	" "	" " " "
		TF	OOL	13 x 5 x 1	" "	" " " "
		TF	OOL	9 max.	" "	" " " "
		TF	QTZ	7 max.	" "	" " " "
		TF	OOL	19/26/4.5	" "	Feature D
		TF	OOL	9/15/4	" "	screen
		TF	OOL	7 max.	" "	"
		TF	OOL	8/11/2.5	" "	"
		TF	OOL	5/4/0.9	" "	"
		TF	OOL	4/4/0.7	" "	"
		TF	OOL	8/4/0.8	" "	"
		TF	OOL	4/5/1	" "	"
		SH	OOL	7 max.	" "	"
		Flake fragment	OOL	7 max.	" "	"
		FCR-cobble	GR	212 g	45 cm	
		FCR-cobble	GR	225 g	45-50 cm	betw. Feat. B & C
		FCR fragments	GR	25 g	" "	screen
	50-60 cm	SDF	CH	24 x 15/4	57 cm	S.27/W.60 (Feat.F)
		TF	OOL	15ap/30/5.5	57 cm	S.46/W.57 (" ")
		TF	OOL	20ap/17/3	57 cm	S.22/w.31 (" C)
		TF	OOL	25/21/5.5	57-59 cm	S.88/W.67 (" E)
		TF	OOL	21/18/4.3	" "	S.36/W.54
		TF	OOL	9/5/1.1	50-60 cm	screen
		TF	OOL	11 x 5/1.5	" "	"
		TF	OOL	19ap/16ap/2.6	" "	"
		TF	OOL	18/5/1.5	" "	"
		TF	OOL	6ap/5/1.2	" "	"
		SDF	OOL	6 x 7/2	" "	"
		Flake fragment	OOL	5 max.	" "	"
		" "	CH	4 max.	" "	"
		" "	CH	8 max.	" "	"
		" "	OOL	7 max.	" "	"
		FCR fragments	GR	ca. 30 g	50-53 cm	S.84-.94/W.04 beside Feature D
		FCR cobble fragment	GR	ca. 100 g	60 cm	S.72/W.85, " E

S69/W87	60-65 cm	TF		OOL	17/18/4.2	62 cm	S.08/W.38
S70/W87	30-40 cm	FCR		GR	38 g	38 cm	S.03-.06/W.25-.28
	40-50 cm	PDF		GMC	42/48/16	45-47 cm	S.05-.09/W.08-.13
		TF		GMC	13ap/18/4.7	47 cm	S.30/W.40
		TF		OOL	8ap/7/1.2	43 cm	S.10/W.25
		TF		OOL	11ap/14/2	42 cm	S.98/W.34
		TF		AG	8ap/8/1	" "	S.85/W.43
		TF		OOL	13ap/17/4	48 cm	S.56/W.96
		TF		OOL	12ap/7/1.2	44 cm	S.74/W.66
		TF		OOL	7ap/10/1.3	50 cm	S.84/W.56
		TF		OOL	3ap/5/1	45 cm	S.82/W.66
		TF	- utilized/ modified	OOL	29/27/5.2	" "	S.59-.62/ W.65-.68
		TF		OOL	23ap x 13ap/4.5	48 cm	S.45-.48/W.66-.68
		TF		OOL	10ap/9/2.3	" "	same as above
		TF		OOL	8ap x 6ap/0.8	44 cm	S.30/W.73
		TF		OOL	6ap/4/2.5	45 cm	S.30/W.68
		TF		OOL	9/9/2	40-50 cm	screen
		TF		CH	8/8/1.5	" "	"
		TF		OOL	7/7/1.5	" "	"
		TF		OOL	8ap/13/2.6	" "	"
		TF		CH	8ap/10/0.8	" "	"
		TF		OOL	7ap/4/1.3	" "	"
		SDF		OOL	18/14/3.4	" "	"
		TF		OOL	14/6/1.7	" "	"
		FCR	- cobble	LT	255 g	43-45 cm	S.03-.07/ W.03-.08
		FCR	fragment	GR	43 g	45 cm	S.16/W.01
		FCR	"	GR	28 g	45-47 cm	S.36/W.40 in feature
		FCR	- cobble	LT	113 g	" "	S.95-.100/ W.37-.40
		FCR	fragment	GR	58 g	48-50 cm	S.77-.82/ W.02-.05
		FCR	"	GR	29 g	44-45 cm	S.98/W.62
		FCR	- cobble	GR	650 g	45-55 cm	S.88-.96/ W87.96-88.02
		FCR	- cobble	GR	185 g	49-56 cm	S.65-.73/ W87.96-88.02
		FCR	- cobble fragm.	GR	42 g	50 cm	S.48-.53/ W.58-.62 and W.66-.70
		FCR	- core of cobble	GR	170 g	43-48 cm	S.40-.48/ W.57-.65
	50-60 cm	TF		OOL	24/26/4	59 cm	S.58-.62/W.33-.36
		TF		OOL	7ap/12/1.8	55 cm	S.10/W.99
	60-70 cm	TF		OOL	5 x 11/2	60-65 cm	screen
		TF		QTZ	7 x 5/1.6	65-70 cm	"
		TF		OOL	7/4/1.7	65 cm	darker area in SW ¼
		TF		OOL	4ap/7/1.5	" "	same as above

S70/W88	30-40 cm	TF	QTZ	15ap/21/8	33 cm	S.45/W.20
		TF	OOL	18ap/17/3	34 cm	NE¼, center
		SDF	OOL	16ap/12/4	35-40 cm	screen
		TF	OOL	12/9/1.8	" "	"
	40-50 cm	TF	OOL	20/29/4	45 cm	S.20/W.18
		SDF	OOL	17/30/6	46 cm	S.87/W.56
		TF	CH	9/7/2.5	46 cm	S.91/W.65
		TF	OOL	10ap/8/1.4	49 cm	S.80/W.45
		TF	OOL	9/5/1.8	45-50 cm	screen
		TF	OOL	11ap x 9ap/0.9	40-50 cm	"
		TF	OOL	6ap x 7ap/1.5	" "	"
		FCR fragment	ST	104 g	45-50 cm	around S.59/W.66
		FCR fragment	LT	85 g	" "	same as above
	50-60 cm	TF	OOL	10ap/15/2	52 cm	S.12/W.10
		SH	GMC	16 x 23/10	52 cm	S.03/W.21
		TF	OOL	5ap/8/0.7	51 cm	S.24/W.64
		TF	OOL	12ap/10/2.5	60 cm	S.07/W.62
		TF	CH	9ap/9/3.5	55-60 cm	screen SWSW
		TF	CH	12/7/1.8	50-60 cm	screen, NW¼
		R/RF	CH	10ap/4/0.7	" "	"
		TF	CH	5/5/1.1	" "	"
		TF	SST	6 x 8/2	" "	"
		FCR fragment	GR	57 g	53 cm	S.15/W.40
		FCR "	LT	85 g	51 cm	S.42/W.85
		FCR - cobble	GR	185 g	49-54 cm	S.59/W.67
		FCR - cobble	GR	199 g	52-57 cm	S.95-.99/ W.88-.91
		FCR - cobble	GR	188 g	52-58 cm	S.89-.93/ W.49-.54
		Grindstone (fire-cracked fragment)	GR	41ap x 29 x 30	52-55 cm	S.75-.79/ W.38-.40
	60-70 cm	TF	CH	15ap/15/4	63 cm	S.62/W.57
		TF	SST	42 x 29/15	69 cm	S70.98-S71/ W.71-.76 (in dense clay)
		TF	OOL	10ap/13/2	60-70 cm	screen
		TF	OOL	10ap/9/1.5	" "	"
	70-75 cm	TF	CH	13ap/8/1.6	71 cm	S.43/W.81
S71/W88	30-40 cm	TF	CH	14/18/4	36-40 cm	S.28/W.77
		SH	CH	20 x 21/4.5	33 cm	S.30/W.50
		TF	OOL	10ap/12/2	39 cm	S.57/W.23
		TF	OOL	11/8/1.7	35-40 cm	screen
		FCR - cobble	GR	255 g	37-42 cm	S.26-.34/W.67-.75
		FCR fragment	LT	49 g	38-41 cm	S.24/W.67
		FCR - cobble frag.	GR	56 g	37-40 cm	S.24-.30/W.58-.64
		FCR - cobble "	GR	28 g	38-41 cm	S.24/W.55
		FCR - cobble	GR	900 g	38-46 cm	S.12-.24/W.23-.33
		FCR fragment	GR	28 g	39-40 cm	S.24/W.18
		FCR fragments	GR	disintegrated	39-42 cm	S.69-.77/W.31-.35
		FCR fragment	ST	"	39-41 cm	S.85-.88/W.48-.51
		FCR - cobble	GR	355 g	39-44 cm	S.89-.98/W.58-.66
		FCR - fragment	GR	350 g	39-45 cm	S.67-.75/W.94-.99

S71/W88	40-50 cm	Checked piece	CH	33/30/27	40-43 cm	S.41-.44/W.33-.36
		Projectile point	OOL	32/20/5.7	48 cm	S.10/W.85-.88
		TF	OOL	25 x 30/9	44 cm	S.40/W.16
		TF	OOL	5ap/9/1.8	45-50 cm	screen
		FCR - 10 fragments	ST	tog. ca. 85 g	45-50 cm	scattered in
			GR			N½NW¼ and E 2/3
		FCR - cobble frag.	GR	170 g	" "	S.58-.62/W.70-.75
	50-60 cm	TF	CH	17 x 12/3	55 cm	S.02/W.48
		SH	SST	29 x 14/12	55 cm	S.86/W.74
		TF	OOL	4ap/8/1.5	50-55 cm	screen
		FCR fragment	GR	74 g	" "	S.58-.62/W.70-.76
		FCR fragment	BAS	85 g	" "	S.65-.70/W.75-.79
		FCR fragment	ST	14 g	55 cm	S.96/W.96
		TF	CH	25/18/4	50-55 cm	screen
		SH	QTZ	12 x 17 x 7	" "	"
S71/W89	30-40 cm	TF	OOL	15/7/1.5	30-40 cm	screen
		TF	OOL	9/11/2.7	" "	"
		TF	CH	6ap x 7/0.6	" "	"
	40-50 cm	Fractured biface	OOL	24ap/25/8.4	45-47 cm	S.98-.99/W.18
		Scraper	OOL	15ap/18.7/4	" "	S.88-.90/W.98-.99
		TF	BAS	21ap/29/5.5	43 cm	S.42/W.51
		TF	OOL	7ap/11/1.5	40 cm	S.52/W.63
		TF	OOL	6ap/7/1.5	" "	S.55/W.64
		Flake fragment	OOL	4 max./1	" "	S.54/W.67
		TF	OOL	16ap/15/3	40-50 cm	screen
		SDF	OOL	14ap x 4ap/2	" "	"
		Pebble with shallow groove -- polisher?	SH	41 x 21 x 15	48-50 cm	S.82-.83/W.13-.16
		FCR fragment	LT	312 g	45-47 cm	S.13-.18/W.26-.32
		FCR - cobble	GR	disintegrated	48-50 cm	around S.10/W.38
		FCR - cobble	GR	"	40-44 cm	" S.86/W.77, at edge of dark lens
		FCR fragment	GR	"	40-42 cm	around S.61/W.74
		FCR - 3 cobbles	GR	"	45-50 cm	" S.75/W.17
	50-60 cm	SH	CH	22 x 14 x 8	52 cm	S.88/W.66, in dark lens
		SDF	CH	15ap/17/3.8	50-51 cm	S.60/W.04, in dark lens
		Flake fragment	OOL	6ap x 6ap/0.7	50-60 cm	screen
		FCR, Group I: fragment	?	46 g	50-55 cm	S.89-.93/ W88.98-89.03
		cobble fragm.	GR	28 g	" "	S.85-.89/W.00-.04
		cobble "	GR	30 g	" "	S.81-.84/W.03-07
		fragment	QTZE	29 g	" "	S.84-.87/W.04-.07
		cobble fragm.	BAS	27 g	" "	S.84-.88/W.07-.10
		fragment	SH	20 g	" "	S.83-.86/W.10-.14
		FCR, Group II: 3 cobble fragm.	QTZE	tog. 98 g	" "	S.84-.89/W.32-.36 S.87.-.92/ W.35-.40 S.88-.91/W.40-.43
		fragment	BAS	31 g	" "	S.92-.96/W.39-.46

S71/W89 (cont'd)	50-60 cm	FCR, Group II: fragment	GR	59 g	50-55 cm	S.97-.99/W.42-.45
		2 fragments	GR	tog 47 g	" "	S.96-.99/W.46-.48
S72/W88	40-50 cm	SDF modified into crude scraper	OOL	21.5/18/10	45 cm	S.66-.68/W.88-.91
		SDF	OOL	18ap/12/4.3	" "	S.11/W.08
		SDF	CH	6 x 19/3	" "	S.69/W.11
		TF	OOL	25/19/4.6	50 cm	S.36/W.83 | at base
		TF	OOL	22/16/2.8	" "	S.41/W.80 | of lens
		SDF	OOL	5ap/11/3.5	40-45 cm	screen
		TF	OOL	7ap/4.5/0.9	45-50 cm	"
		FCR - cobble fr.	GR	240 g	40-43 cm	S.90-.96/W.40-.46
		FCR - cobble fr.	GR	118 g	42-46 cm	S.46-.51/W.17-.22
		FCR - cobble fr.	GR	52 g	42-44 cm	S.36-.40/W.61-.65
		FCR - cobble fr.	GR	1.3 kg	39-53 cm	S.74-.85/ W87.90 - **.06
		FCR - cobble fr.	GR	122 g	44-49 cm	S.04-.09/W.00-.05
		FCR - cobble fr.	GR	57 g	46-48 cm	S.00-.05/W.36-.44
		Hammerstone (fire-cracked)	GR	455 g 104 x 78 x 62	43-50 cm	S.26-.36/W.55-.63
		FCR - cobble	GR	482 g	48-54 cm	S.50-.58/W.74-.82
		FCR - cobble frag.	GR	149 g	42-47 cm	S.20-.27/W.82-.86
		FCR - 3 cobble fr.	GR	128 g	44-49 cm	S.08-.14/W.74-.84
		FCR - 2 " "	GR	290 g	48-54 cm	S.64-.70/W.00-.05
S72/W89	35-40 cm	SH	CH	25 x 15 x 9	40 cm	S.72/W.82
		TF	OOL	7ap x 10ap/1.7	" "	S.75/W.78
	40-50 cm	TF	CH	23ap/8/1.8	47-48 cm	S.48/W.41
		Smooth pebble	JAS	37 x 24 x 17	48-50 cm	S.60-.63/W.18-.21
		FCR - cobble fr.	GR	77 g	41-43 cm	S.23-.27/W.75-.81
		FCR - fragments	GR ST	135 g	45-50 cm	S81-.98/W.32-.47
		FCR - cobble	GR	340 g	46-51 g	S.13-.20/W.07-.14
		FCR - cobble fr.	GR	142 g	46-50 cm	S.20-.25/ W88.98-89.02
		FCR fragment	GR	57 g	47-49 cm	S.07-.11/W.30-.34 in dark lens
		FCR fragment	GR	58 g	48-50 cm	S.02-.05/W.13-.19 in dark lens
		FCR fragment	GR	10 g	41-43 cm	S.23-.26/W.97-.99
		FCR fragment	GR	9 g	45 cm	S.49/W.86
		FCR fragment	GR	26 g	49-51 cm	S.98/W.72-.75
		FCR - cobble frag.	GR	disintegrated	45-48 cm	S71.99-72.03/ W.76-.84
		FCR - cobble frag.	GR	"	47-52 cm	S.72-.80/W.04-.12
		FCR - cobble fr.	GR	"	49-53 cm	S.45-.52/W.68-.76
	50-60 cm	FCR - cobble	QTZE	42 g	50-55 cm	S.34-.38/W.40-.43
		FCR fragment	ST	49 g	" "	S.38-.41/W.50-54
		FCR fragments	GR	21 g	" "	between the above
		FCR fragments	GR	18 g	54-55 cm	S.73-.75/W.05-.08

S72/W90	40-50 cm	TF	SIL	15/7/1.5	40-45 cm	screen, NW¼
		TF	QTZ	9ap/12/3.3	" "	"
		TF	CHAL	7ap/11/2.5	45-50 cm	" "
		FCR fragment	GR	29 g	40 cm	S.90/W.10
		FCR fragment	QTZE	46 g	40-42 cm	S.24-.30/W.88-.91
		FCR - cobble frag.	GR	87 g	48-49 cm	S.08-.15/W.82-.90
		FCR - cooble frag.	GR	disintegrated	49-55 cm	S.86-.93/W.70-.76
		FCR - cobble frag.	GR	57 g	" "	S.93-.96/W97-.99
	50-60 cm	SH	CH	31 x 17/6	55 cm	S.52/W.11, at base of dark lens
		Fractured grind-stone	ST	39 x 36/29	50-55 cm	S.10-.14/W.59-.63
S89/W103	Negative					
Findspot 6 (S108.5-109/ W114.5-115)		Cobble used as polisher (?)	BAS	80 x 68 x 39	Eroding out of uppermost 40-50 cm of bank	
		SH	CH	18 x 13/4.5	same as above	
S107/W112	40-50 cm	PDF	CH	31 x 24 x 18	45 cm	NE corner
		TF	OOL	19ap/19/3	45 cm	S.56-.58/W.20-.22

Gopher Mound 1.	neck sherd	grit temper		35/27/5	(Type B1)
	3 body sherds	"	"	24x21/5-5.5	(" B2)
				27x21/3.8	(" ")
				11x8/3.8	(" ")
	2 body sherds	"	"	18x9/3.3	(Type D)
				13x10/3.2	(" ")
	SDF	AG	14/25/5		
	TF	OOL	25/10/3		
	FCR fragments				
Gopher Mound 2.	body sherds	fine grit temper		24x19/4-4.4	(Type C)
				14x13/3.8	(" ")
	FCR fragments				
Gopher Mound 3.	FCR fragments				
Gopher Mound 6.	SDF	CH	29ap/14/5.5		
Gopher Mound 7.	body sherd	fine grit temper		28x27/5-5.3	(Type B2)
	FCR fragment				
Gopher Mound 8.	TF	CH	11ap/10/1.5		
	FCR fragments				
Gopher Mound 10.	4 body sherds	fine grit temper		20x16/5.5	(Type C)
				16x3/5.3	(" ")
				16x10/5	(" ")
				11x12/5.2	(" ")
	body sherd	very fine grit/ temper		12x9/2.5	(Type E)
	FCR fragments				

S224/W118	0-10 cm	TF	OOL	22ap/33/4	5-10 cm	S.54/W.82
		Grindstone fragment	GR	48x27x18	6-10 cm	center, SW¼
		FCR fragment	GR	35x27x18	9cm	S.45/W.81
		FCR fragment	GR	27x17x9	5-10 cm	S54/W.82
	10-20 cm	Body sherd (Type A)	coarse granite temper	30x18x8.3		screen, SE¼
		FCR fragment	LT	37x20x19		S.78-.82/W.22-.32
		FCR fragment	GR	40x37x24		" " " "
	20-30 cm	Fractured abrader	ST	26x19x16	25 cm	NE¼, N wall
		SH	CHAL	35x17x11	30 cm	NE¼, center
		Body sherd (Type C)	fine grit	18x16/4.2	28-30 cm	screen, SE¼
		FCR - cobble	LT	44x40x23	29 cm	S.53-.58/W.45-.50
	30-40 cm	SH	CHAL	23x12apx4	31 cm	S.14/W.49
		SH	CHAL	31x17x9	35 cm	S.16/W.11
		SH	CH	28x14x8	33 cm	SE¼, center S wall
		Fractured grindstone	ST	65apx40ap/64	30-34 cm	S.68-.74/W.16-.25
		FCR - cobble	GR	90x82x71ap	29-35 cm	S.57-.65/W.22-.34
	40-50 cm	Pebble used as knapping/hammer-stone?	LT	61x37x37	42-46 cm	S.20-.26/W.20-.24
S224/W111	20-30 cm	Retouch flake	CH* same	4x4/0.5	20-30 cm	screen
	30-40 cm	TF	CH*	9ap/14/2.3	31 cm	S.16/W.03
		FCR?	GR	disintegrated	38-40 cm	S.08-.12/W.34-.36
	40-50 cm	SDF	CH	20x10/5.4	41 cm	S.25/W.40
		TF	CH	11ap/11ap/1.6	" "	S.20/W.42
		Hammerstone	GR	ca.90x70x35	39-42 cm	S.22-.28/W.13-.21
		FCR?	GR	50x40x15	39-41 cm	S.27-.30/W.16-.20
S227/W115	0-10 cm	TF	CH	13ap/14ap/2		screen
	10-20 cm	TF	OOL	11ap/17ap/4.1		screen
	20-30 cm	2 body sherds (Type C)	fine grit temper	20 and 9 max. width resp.	25-30 cm	scatter in N½
		SDF	JAS	15/12/3.5	" "	" " "
		TF	CH	8ap/12/1.7	" "	" " "
		TF	CHAL	10ap/12/1.7	" "	" " "
		TF	OOL	11ap/10ap/1.2	" "	" " "
		TF	OOL	23ap/20/3.3	28 cm	S.14/W.36
		FCR fragments	ST	33 and 36 max. width resp.	27 cm	S.04/W.15

S227/W115	30-40 cm	PDF	SST	53/46/15	32 cm	S.12/W.30
		FCR - cobble	GR	47 max. width	34 cm	S.00-.07/W.34-.37
		FCR - cobble	GR	80 max. width	35 cm	S.23-.25/W.04-.06
		PDF	CH	39/34/11	36 cm	S.46-.48/W.15-.17
		FCR - cobble frag.	BAS	45 max. width	" "	at S.32/W.32
		SDF	CH	22/10/3.4	" "	S.35/W.33
		TF	CH	8ap/12/1.3		screen
		TF	CH	9ap/11ap/1.9	30-40 cm	"
S227.5/W115	20-30 cm	2 body sherds (Type C)	fine grit temper	16x15/4-4.5 18x16/5-5.5	22 cm	S.15/W.15
		TF	OOL	12ap/16ap/2	27 cm	S.38/W.14
		TF	CH	10ap/15/3.2	29 cm	S.02/W.40
		TF	SIL	33/19/3.4	" "	S.04/W.44
		2 body sherds (Type C)	fine grit temper	7 max. width/4-4.5	20-30 cm	screen
		2 body sherds (Type D)	grit temper	12 and 14 max. width resp.	" "	"
		TF	CH	13ap/15/1.6	" "	"
	30-40 cm	TF	CH	15/11/3.1	31 cm	S.47/W.35
		FCR fragment	LT	39ap x 15ap x 29 ap	32-34 cm	S.25/W.46
		FCR - cobble fr.	GR	50 max. width	32 cm	S.38/W.20
		SDF	OOL	43/47ap/10	35 cm	S.02/W.10
		SDF	OOL	20/43/7.5	36 cm	S.01/W.23-.25
		Fractured grind-stone	GR	54ap x 38ap x 49ap	39 cm	S.40/W.45
S228/W115	10-20 cm	Body sherd (Type B2)	very fine grit temper	20x17/3.5	20 cm	S.48/W.11
		TF	CH	15ap/15/1.7	" "	" "
	20-25 cm	2 body sherds (Type D)	very fine grit/sand temper	both 25 mm max. width and 3 mm max. thickness	21-24 cm	S.09/W.37 and S.06/W.11
		3 body sherds (Type B2)	similar to the above	all 12-16mm max. width and 3.5-4 mm mas. thickness	20-25 cm	S.13/W.28, S.07/W.11 and S.21/W.10
		Body sherd (Type B2)	same as the above	12 max. width/ 4 max. thickness	" " " "	screen
		TF	CH	10/10/1.5	" "	"

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