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A PHASE ONE ARCHAEOLOGICAL SURVEY OF THE COTTONWOOD, REDWOOD, AND YELLOW
MEDICINE DRAINAGES IN SOUTHWESTERN MINNESOTA

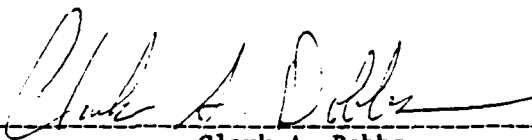
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INSTITUTE FOR MINNESOTA ARCHAEOLOGY REPORTS OF INVESTIGATIONS NUMBER 15

March 1989

FINAL VERSION


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This project was sponsored by the U.S. Army Corps of Engineers (St. Paul District) in cooperation with the U.S. Dept. of Agriculture Soil Conservation Service. This report is submitted in fulfillment of the terms of Contract Number DACW 37-85-M-1113 between the U.S. Army Corps of Engineers and the Institute for Minnesota Archaeology, Inc.



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MANAGEMENT SUMMARY

During April, May and June 1986, archaeologists from the Institute for Minnesota Archaeology (IMA) conducted a Phase I archaeological survey in Yellow Medicine, Redwood, and Cottonwood subbasins of the Minnesota River basin. This survey was sponsored by the St. Paul District U.S. Army Corps of Engineers and the U.S.D.A. Soil Conservation Service. The survey was undertaken as part of the comprehensive planning for flood control projects in the 639 study area.

The principal objective of the survey was to develop a predictive model for the distribution and location of archaeological sites within the three subbasins. This model was to be integrated with a geomorphological study of the area that was undertaken by the Waterways Experiment Stations (WES) of the U.S. Army Corps of Engineers.

A stratified random sampling procedure was employed to structure the field investigations. Strata were defined on the basis of information provided by WES. A total of 2,300 acres were examined during the field portion of the survey. A total of 65 40-acre sample units (1,706 acres) and 594 acres that were selected to test the predictive model were surveyed. Two previously known prehistoric archaeological sites were visited and evaluated. Thirty-five previously unrecorded sites were located and examined. One buried archaeological site was discovered and several other areas that have the potential to contain buried sites were identified.

Three different models were constructed based on the data gathered during the field portion of the project.

One model describes possible prehistoric settlement types that may be present within the study area. This model is presented as the first step in creating broader models of prehistoric settlement patterns in southwestern Minnesota.

Two predictive models of prehistoric archaeological site location were generated. One of these was based only on information obtained from the Minnesota State site files. The other was based solely on the data obtained during the archaeological survey.

The second predictive model will be of most use to managers. The model may be accepted at a 90% level of confidence for the entire survey area. The model cannot be used with a statistical level of confidence for the individual subbasins. This model suggests that prehistoric archaeological sites will occur with differing frequencies in different geomorphic regions within the study area. These frequencies are expressed as number of sites per 40-acre sample units. Confidence intervals for predicted frequencies of site occurrence are as follows:

Floodplains of major streams - .611 to .675

Confluences of major and tributary streams - .182 to .246

Terraces and uplands - .010 to .190

Reservoirs - .528 to .901

The high frequency of site occurrence in the reservoir stratum is surprising and may be due to the small sample size for this strata. The other estimates are consistent with the observed frequency and distribution of prehistoric archaeological sites in southwestern Minnesota.

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ACKNOWLEDGMENTS

Any archaeological project is, of necessity, the result of the effort and involvement of a number of individuals. This particular survey is no exception. I would like to thank all of those who made this particular project possible.

Sandy Blalock (St. Paul District) administered the project and brought an excitement and verve to the survey that is often lacking in contract work. Sandy was especially helpful in ensuring that we received all of the documentary materials that we needed. Robert Larson (Waterways Experiment Station, Corps of Engineers) conducted the geomorphological research with care and communicated his findings to us in an enthusiastic fashion.

The St. Paul District arranged to have the project director attend a workshop at the Waterways Experiment Station on geomorphology and archaeology. This workshop was particularly helpful and I would like to thank Lawson Smith and Roger Saucier (Waterways Experiment Station) for their insights into both geomorphology and the archaeological process.

During the course of the survey, IMA field teams examined more than 2000 acres in southwestern Minnesota. The cooperation of all the landowners who permitted us to examine their property was essential to the completion of this study. More than 80% of the property owners contacted agreed to let us wander across their land and to all of these individuals we owe a debt of thanks.

I particularly wish to thank the IMA staff members involved in the 639 survey. Despite inclement spring weather and less than luxurious housing conditions, they diligently drove, walked, and probed their way across a large portion of southwestern Minnesota. Kim Breakey was responsible for organizing the myriad details of the fieldwork and supervising the project when I was not in the field. Kim also assisted in the final editing and production of this report. Jim Becker developed the sampling strategy, analyzed the results, and worked in the field. Jeff Tollefson worked in both the field and laboratory and provided valuable insights into the nature of southwestern Minnesota. Evan Engwall assisted with the fieldwork in June. Carolyn Hackel kept the accounts and ensured that the administrative side of the project was in good order. Jeanne Lundquist kindly volunteered several days to assist with fieldwork in June.

I. INTRODUCTION AND BACKGROUND

1. INTRODUCTION

During the spring and early summer of 1986, the Institute for Minnesota Archaeology (IMA) conducted an extensive archaeological reconnaissance of the Cottonwood, Redwood, and Yellow Medicine river basins in southwestern Minnesota. The project was a Phase I survey sponsored by the U.S. Army Corps of Engineers (St. Paul District) and was undertaken under the terms of Contract DACW 37-86-M-1113 between the Corps of Engineers and the Institute for Minnesota Archaeology, Inc.

The objective of this survey was to develop a predictive model for use by the St. Paul District and professional archaeologists. This model can be used in planning flood control projects and to structure future archaeological research (Appendix I: Project Scope of Work).

This particular archaeological project is part of the 639 flood control project (Section 2.00, Scope of Work) which is being jointly conducted by the Corps of Engineers and the U.S.D.A. Soil Conservation Service (SCS). The entire 639 study area includes the drainage areas of the Yellow Bank, Lac qui Parle, Yellow Medicine, Redwood, and Cottonwood Rivers (Figure 1). These rivers are major tributaries of the Minnesota River and drain north and east into the Minnesota. Archaeological survey's have been completed in other portions of the 639 project area (Fridley 1974; Watson 1976; Watson and Oothoudt 1977; Woolworth Research Associates 1977; Hudak 1978; AFS Inc. 1980; AFS Inc. 1982; Beissel, Brown, Brown and Zimmerman 1984). This archaeological survey was limited to the Yellow Medicine, Redwood, and Cottonwood drainage basins.

The St. Paul District initiated a geomorphological survey of the Yellow Medicine, Redwood, and Cottonwood drainages that was undertaken in conjunction with the archaeological survey of that area. The goals of the geomorphological survey were: 1.) to describe the geomorphic development of these three river subbasins; 2.) to determine the relationship between the geomorphic development and the location of cultural resources within the subbasins, including the potential for buried sites (Section 5.00 in Appendix I).

The geomorphological survey was conducted by Mr. Robert Larson of U.S. Army Corps of Engineers, Waterways Experiment Station (WES). In November 1986, Larson, Sandy Blalock (St. Paul District) and Clark A. Dobbs (IMA) visited the project study area for two days. At this time, the initial goals of the geomorphological work and the archaeological reconnaissance were discussed and a general research strategy was

outlined. The research program was further refined during a series of meetings during the winter. These meetings included Blalock, Dobbs, and other IMA staff. Larson was able to attend several of these meetings in the spring.

The field program for the survey was defined during the first two weeks of April. The maps for the report had been forwarded to the IMA, although the report itself was not completed. Therefore, the geomorphological portion of the program was based on earlier discussions with Larson.

Between April 15 and June 15, a three person field team conducted the archaeological survey in the Cottonwood, Redwood, and Yellow Medicine subbasins. The project director participated in the fieldwork on a part-time basis. The first five weeks of the fieldwork were hampered by an unseasonably high amount of rain. During several weeks, there were only one or two days during which field conditions were adequate to conduct fieldwork. The field crew spent these rain days contacting landowners, arranging permission to visit selected field sites, and examining private collections of artifacts from the area.

The contract under which this project was conducted was modified (DACW37-85-M-1113) to provide limited additional funds for more soil corings of selected sample areas and computer mapping to correlate archaeological site distributions with geomorphic units. We had thought that digitized soils information was available for the study area. We subsequently learned that this information was not available and that it would have to be digitized by hand into the CAD program we were using. This proved to be far too time consuming to conduct under the contract modification. Moreover, the emerging field results indicated that investing these funds in more soil-corings would be most useful. Therefore, all of the contract modification funds were used for additional fieldwork. The results of these cores have been incorporated into the text of this report.

Analysis of the materials recovered during the survey took place between June 15 and June 30. The project director prepared the report during August-September 1986 and June-July 1987.

Artifacts and survey records are permanently curated at the Institute for Minnesota Archaeology, Inc., Minneapolis, MN.

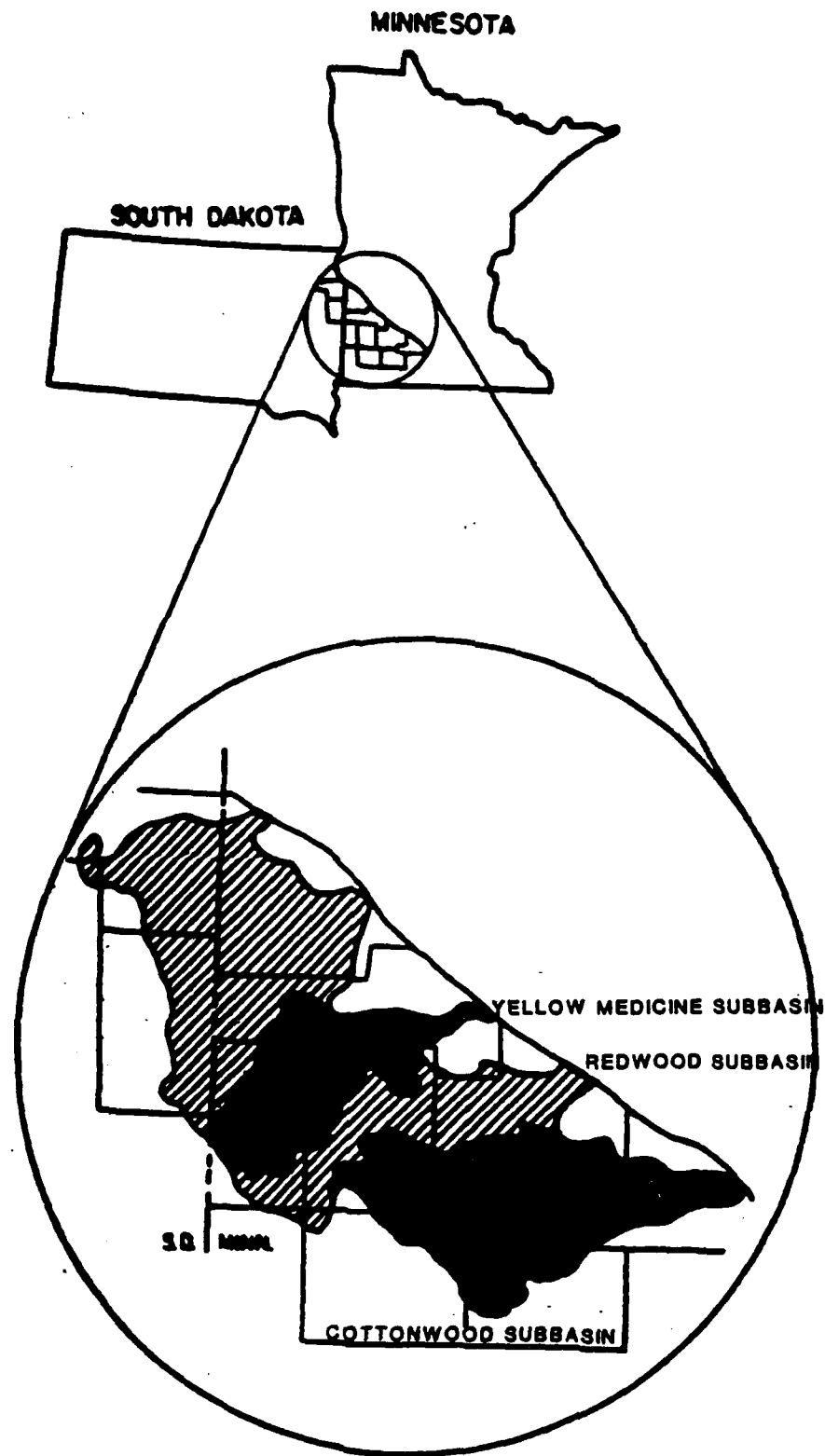


FIGURE 1. Location of survey area - regional map showing watersheds of Redwood, Cottonwood, and Yellow Medicine river basins.

2. THEORETICAL AND METHODOLOGICAL OVERVIEW

The goals of the St. Paul District COE are to develop a predictive model that can be used to plan archaeological research, plan flood control projects within the 639 Project Area, and to examine specific areas to determine the presence or absence of cultural resources.

The goals of the Institute for Minnesota Archaeology are to develop a regional model of settlement for southwestern Minnesota that may be compared with similar models the Institute has developed for the Blue Earth River Valley, the Lake Pepin Region, the Anoka Sand Plain, and the Morrison-Crow Wing County area. These models form the base for the second stage of the Institute's study of the evolution of human ecosystems in southern and central Minnesota.

There is not complete congruence between these two sets of goals. In developing the survey strategy, we attempted to reconcile the conflicts between the need for complete regional coverage of the study area, the limited resources available, and the specific areas which the Corps of Engineers wanted to investigate.

The principal goal of both agencies is to develop an initial predictive model for site location in the Yellow Medicine, Cottonwood, and Redwood drainages. The research strategy for this survey, therefore, was designed to principally address this goal.

Archaeology, like other scientific disciplines, has undergone a series of changes in the way in which its practitioners study and interpret the past. The study of prehistory in North America began principally as an antiquarian pursuit. The extensive mound studies of the Smithsonian Institution, the Northwestern Archaeological Survey, and others during the closing years of the nineteenth century provided a valuable set of information on one aspect of prehistoric life in eastern North America.

Archaeology began to develop as a profession early in the twentieth century and the number of excavations conducted in the United States expanded dramatically. By the early 1930's, scholars like James B. Griffin and Will McKern began to synthesize and organize the large amount of information that was being collected throughout the country. Although the McKern Taxonomic System was a valuable tool for its time, it rapidly became apparent that this system could not cope with complex and dynamic aspects of cultural change.

In the early 1960's, archaeologists like Phillip Phillips and Gordon R. Willey began developing the techniques of settlement archaeology using Julian Stewards model of cultural ecology as a theoretical basis for their work. Despite the elegance of the early work of Willey and others, settlement archaeology did not immediately become a part of every scholars toolkit. However, by the mid-1970's, the examination and dissection of prehistoric settlement patterns was an integral part of most archaeological investigations.

It is probably not coincidental that cultural resource management emerged as an important force in American archaeology at the same time that settlement studies began to be more commonly employed. Most cultural resource management work is concerned, at least initially, with the location of archaeological sites. This is, of course, precisely the type of information that settlement archaeology generates. Moreover, the study of prehistoric settlement patterns involves explaining why archaeological sites are located where they are and how these locations have changed through time. As cultural resource managers seek to move beyond project-specific surveys, predictive models of human settlement behavior are needed. The techniques of settlement archaeology are particularly amenable to generating such models.

The underlying assumption of settlement research is that there is a strong relationship between the material remains of human settlement on a landscape and the cultural systems of the people occupying these settlements. Archaeological sites are treated as 'artifacts' in and of themselves. The distribution of particular types of sites, the relationship of these sites to various aspects of both the physical and social environment, and the changing patterns of settlement over time can be used to develop models of cultural change and interaction. These models have the potential to be more dynamic than those that are based solely on the study of individual artifacts.

There are several distinct stages in any settlement study.

During the first stage, an initial archaeological survey is conducted to develop a preliminary model of where archaeological sites may be located and what types of settlements are present within the study area.

The second stage involves a more intensive survey that is conducted to test the model generated and to obtain more detailed information about settlement types. A revised model of settlement patterning within the study area may then be generated.

Finally, detailed surface studies and excavations are conducted at archaeological sites from each settlement type to evaluate the model developed during the second stage of study.

This survey of the Yellow Medicine, Redwood, and Cottonwood drainages is a Phase I survey designed to generate information on the distribution and character of archaeological sites within the study area. This information is used to create an initial predictive model of site location within these river drainages.

A stratified random sampling design was used to structure the survey. This type of sampling design allows the archaeologist to generate estimates about the probability that archaeological sites may occur in a particular setting. This sampling design was modified to accommodate both the available resources and the additional specific areas that the COE wanted investigated.

Collections of cultural debris were recovered in a systematic fashion from each site examined during the survey. The assemblage from each site was analyzed using standard IMA protocols. These data were used to generate an initial model of settlement types and two predictive models of site location in the study area.

The final result of the survey are two models of site location as we presently understand it. The models are simple and straightforward. However, they can be used as a beginning point for future research and management of the archaeological resources in this region.

3. PHYSICAL SETTING

a. Introduction

The relationship between the physical environment and human cultural systems is a subject of ongoing interest to archaeologists and other social scientists. The physical environment, like human cultures, is a dynamic system that continually changes through time.

Changes in the physical environment can affect the nature of settlement patterning. Shifting distribution of critical resources, or the presence/absence of such resources, caused by changes in the environment, could have a profound effect on the location of human settlement.

The archaeological record as we perceive it today is a function of a number of dynamic changes in the landscape itself. Sites have been eroded, buried, or modified by physical and biological agents since the sites themselves were occupied.

This section contains a brief summary of the environment within the study area based on the work of a number of scientists. For a more detailed treatment of the topic, the reader may wish to consult the original references (e.g. Weaver 1954; Watts and Bright 1968; Wright 1972a; 1972b; Matsch 1972; Heinzelmann 1975; Van Zant 1976; Baker and Van Zant 1980; Anfinson 1982; Grimm 1982). A more detailed description of the geomorphological study conducted by Larson (n.d.) is also included.

b. Environmental summary

One principal goal of this survey was to examine the relationship between the location of archaeological sites and geomorphological features of the landscape in the Yellow Medicine, Cottonwood, and Redwood River drainages. The companion volume to this survey (Larson, in preparation) provides a detailed discussion of the geomorphology of this study area. The following brief summary provides background material for the reader who may not have access to Larson's work. This summary is based on the work of a number of other scholars and the

reader is referred to their investigations for a more detailed treatment of the subject.

The modern landscape in southwestern Minnesota is a product of glacial activity during the Pleistocene, mass-wasting of glacial ice during the early Holocene, subsequent aggradation and erosion, and modern (post 1860) agriculture and development.

The major processes that have shaped the landscape include glaciation over the underlying bedrock, deposition of moraines and other glacial debris, stream development and downcutting, catastrophic flooding, wind erosion and deposition, and extensive draining and surface modification by modern farmers.

The major landforms in the area include the Coteau des Prairies, the Minnesota River Valley, smaller river valleys (e.g. the Yellow Medicine, Cottonwood, and Redwood), lakes and dried-up lakebeds, and upland areas underlain by ground moraine and other glacial debris.

The climate of southwestern Minnesota tends to be relatively xeric and climatic events (e.g. thunderstorms, tornadoes, blizzards) are often abrupt and severe. Water is a particularly important factor for vegetation, animals, and humans. The availability of water, especially springs and streams, has fluctuated significantly during the last 11,000 years.

The vegetation of the region has also changed over time. Baker and Van Zant (1980) have evaluated vegetation change at Lake West Okoboji in northwestern Iowa and the following discussion is based on their work.

During the immediate post-glacial period the landscape was probably covered with a boreal spruce forest. This forest was rapidly replaced with a mixed deciduous forest dominated by oak, elm, and other species. Between 9000 and 7700 years ago, the deciduous forest was replaced with prairie flora. Prairie vegetation has been the dominant plant community throughout southwestern Minnesota since that time.

The mid-continental dry period (Altithermal) resulted in almost complete deforestation of the region and the expansion of prairie between about 7700 and 3200 years ago. Beginning about 3200 years ago, oak and other arboreal species began to reappear. Gallery forests in protected river valleys and forest fringes around prairie lakes apparently began to be reestablished at this time. From 3200 years ago until the time of European settlement in the mid-nineteenth century, the vegetation of the region was dominated by tall-grass and mid-grass prairie with small gallery forests in areas protected from fire and with adequate moisture.

No detailed studies of the mammalian fauna of the region have been conducted. Based on the limited archaeological and historic data available, it appears that the principal game animal in the region was the bison (*Bison* spp.). During the historic period, the Coteau region

was known as a particularly important bison hunting area. Although other game resources (e.g. fish, deer, and elk) were available, their importance pales in comparison to bison.

No detailed study of the local chert resources has been conducted in southwestern Minnesota. It appears that cherts present in the glacial till were utilized for tool manufacture. However, cherts within the glacial till have often been subjected to freeze-thaw cycles and are sometimes heavily weathered. They are poorly suited for the manufacture of chipped-stone tools. It is possible that local sources of chert are present in bedrock outcrops in the Couteau or along river valleys, but the existence and/or location of such outcrops is presently unknown.

Two limiting factors may have been particularly important in structuring human settlement in this region of southwestern Minnesota.

The first limiting factor is potable water. Although drinking water could have been obtained from lakes and streams, it is far more probable that springs were the preferred source of water for drinking and cooking. The distribution of springs is not uniform and not all springs would have continued flowing during periods of drought and increased temperature. There should be a strong relationship between certain settlement types and the presence of free-flowing springs.

The second limiting factor is the availability of arable land. The adoption of horticulture 1000 years ago revolutionized the culture and adaptive systems of aboriginal groups in the Upper Midwest. Few major horticultural villages are known to exist in southwestern Minnesota and these border the Minnesota River Valley. This is probably due to the fact that prehistoric farmers planted their crops in protected floodplain areas where the soil was easily worked. There are very few expanses of arable land like this away from the Minnesota River. The absence of good farmland may explain why the inhabitants of this area participated in the horticultural revolution of the eleventh through fourteenth centuries A.D. in only a limited way.

c. Geomorphology

One goal of this study was to articulate the relationship between geomorphological units and processes and the location of archaeological sites within the survey area. Robert Larson (Waterways Experiment Station, Corps of Engineers) is preparing a geomorphological review of the three river drainages included within this study. A preliminary draft of this study was made available in May of 1983 and was used in developing the strata for the sampling design.

Larson prepared generalized descriptions of landforms on a series of topographic maps. According to Larson (n.d.:5):

"A series of twenty-one U.S. Geological Survey topographic maps (1:24,000 scale) were used as a base for the construction of Geologic/Cultural Resource Potential Maps. Each map has the surface materials identified as to their glacial, fluvial or lacustrine origin. Reports, maps and borings were used to identify specific environments of deposition of the surface materials, but in most cases the exact location of the boundary between respective areas could not be delineated without extensive field work".

Detailed descriptions of three of these maps were included in the draft report. These maps and their accompanying descriptions are shown below (Figs. 2-4). The descriptions are taken verbatim from Larson (n.d.:10-12).

FIG. 2: CANBY SE QUADRANGLE

(Map enclosed in separate envelope)

Canby SE, Minn., 1:24,000 Scale Map. A prime example of a terminal moraine area in the uplands is the topography portrayed on the Canby SE Quadrangle. The area has several kettle lakes and almost every section has hatched contour lines indicating topographic depression. In early post glacial time the area would have ponds and lakes covering as much as 50 percent of the upland surface. Many of the lakes would have been connected during wet climatological periods and closed basins during dry periods. Eventually the lakes would overtop their outlets and begin eroding the outlet level causing the successive lowering of the lake. In many instances the lowering of the outlet caused the basin to be open and only a intermittent flowing creek would occupy the valley. As this upland area evolved, streams cutting headward from the brink of the Coteau slope lowered the base level of the upland drainage and stream valley erosion drained many lakes. The remnant lakes of Dorser State Wildlife Management Area are an example of a large lake being drained by headward erosion of, in this case, the Lac qui Parle River. Pearch Lake will eventually be drained by the tributary of the Yellow Medicine River. Bukowski and Swenson Lakes in the southeast corner of the map were drained by the Yellow Medicine River or its tributary. Inhabitants of early postglacial time had an abundance of lakes, most of which were shallow and small. *Note: crosshatching refers to areas of "high potential to contain archaeological sites" as indicated by Larson.

FIG. 3: PORTER SW QUADRANGLE

(Map enclosed in separate envelope)

Porter SW, Minn., 1:24,000 Scale

The Porter SW Quadrangle has two significant topographic attributes. The first is the glacial deposits which trend northwest-southeast along the slope of the Coteau. These deposits are the recessional moraine deposits overlying glacial till which was deposited at the base of the glacier. The second feature is the parallelism of the rivers flowing down the slope of the Coteau. The parallelism of the moraine ridges is a result of the ice meltback being rather uniform. The ice was stagnant or nearly so and did not contain enough debris to build large ridges. If large ridges would have resulted, the prevalent drainage would have sloped downvalley almost parallel to the trend of the slope. In other words, large ridges would have enhanced drainage almost perpendicular to the present drainage. Low ridges permitted overflowing of water from swales into successively lower swales downslope. The erosion of outlets at these overflow points is what eventually developed the downslope river drainages (trellis drainage pattern). On some maps, especially near the base of the Coteau slope, the drainage is controlled by the swales wherein the rivers flow parallel to the slope before eventually crossing a recessional moraine to flow to the Minnesota River. There is a paucity of kettle lakes on the slope of the Coteau because of the steepness of the active erosion on the slope. Undoubtedly some kettles existed on the slope in early post glacial time. *Note: crosshatching refers to areas of "high potential to contain archaeological sites" as indicated by Larson.

FIG. 4: COTTONWOOD QUADRANGLE

(Map enclosed in separate envelope)

Cottonwood, Minn., 1:24,000 Scale

Once into the Minnesota River Lowland the trends of river courses and the morphology of the river valleys reveal a history of stream meandering. The lowland river course trends are generally parallel to the recessional moraine ridges. The river valleys have well established flood plains and occasionally have alluvial fans on the margin of the flood plain where tributaries enter the main stream valley. Over flow channels exist in this lower reach of the major rivers and the channels follow the swales and occasionally cross moraine ridges in low areas. Like the uplands, the Minnesota River lowland area has kettle lakes. The lakes of the lowland have either been drained by natural erosion of outlets, which were probable (sic) very low in relief and due to the emplacement of drainage ditches. Many of the river channels and flood areas of the lowland underwent aggradation (vertical accretion of sediments) in during (sic) the early and middle Holocene Period. The erosion of these aggraded sediments is most dramatically displayed near the Minnesota River where the tributary channels steepen markedly. Upstream indicators of the erosion are the terraces which are found along the Redwood and other Minnesota tributaries. *Note: crosshatching refers to areas of "high potential to contain archaeological sites" as indicated by Larson.

II. SAMPLING, FIELD METHODS, AND RESULTS

1. SAMPLING AND SAMPLE DESIGN

a. Rationale and implementation

The principal goal of this survey was to develop a predictive model of site location within the Yellow Medicine, Redwood, and Cottonwood drainage basins. Estimates of the frequency with which sites occur within the study area are needed to develop such a model. The best way to derive such estimates would be to examine every acre within the drainage basins. Since this is impossible, probabilistic sampling techniques were used to obtain a sample of the entire study area that could be examined. This sample may then be used to develop estimates of the frequency with which sites occur. These estimates are presumed to be valid within certain levels of confidence and precision (see MHS 1981:65-71 for an extensive discussion of sample size, confidence, and the problems of sampling in archaeological survey).

The Scope of Work specified that a random sampling design would be employed in this survey and that the initial results of the sample would then be tested in the field. After review and discussion of various sampling options, a two-tiered stratified random sampling procedure was adopted.

The sample unit employed was a forty acre tract of land (quarter-quarter section). The use of this particular sample unit follows the standard practice of other survey work that has been conducted in the Upper Midwest (e.g. Lovis 1976; MHS 1981).

The entire survey area was initially considered as a total universe. The survey area was then stratified on the basis of geomorphic information. It was then stratified again based on drainage basin. The result was a two-tiered sampling design that could be used to evaluate the presence/absence of archaeological properties within the entire universe, within individual drainage basins, and within particular strata across the entire universe.

b. Sample size and selection

The levels of confidence and precision with which estimates may be accepted are contingent on the size of the sample that is examined. The first task when planning a sampling strategy for a large-scale archaeological survey, therefore, is to determine the minimum number of sample units necessary to adequately cover the survey area within a specific confidence interval.

The minimum sample size for this survey was calculated following the formula used by the Minnesota Statewide Archaeological Survey (MHS 1981:66-67) as derived from Dixon and Massey (1969:80). This formula is:

$$n = \frac{Z^2 \times P \times Q}{D^2}$$

Where:

n = number of sample units

z = confidence coefficient

p = rate of site occurrence in sample population

q = 1-p

D = desired precision of the estimate expressed as a +/- probability around p

The sample universe was divided into four strata (see discussion of stratification below). These strata were: floodplain, stream confluence, terrace, and reservoir area. Since the confluence stratum is a subset of the floodplain stratum, and the reservoir stratum may be considered a subset of the terrace stratum, the four strata were collapsed into two sets and the minimum sample size for the strata was calculated at a 95% confidence interval using the following indices:

	Floodplain/confluence	Terrace/reservoir
p	.9	.1
d	.10	.10
z	1.96	1.96
q	1-p	1-p
n	35	35

Using these figures, the minimum sample size for the entire survey area is 70. Based on the total area of the study area, the size of the survey crew, and the time allotted for the completion of the survey, it was estimated that a total of 90 forty-acre sample units could be

effectively surveyed. Since this was more than the minimum sample size, 90 units were selected. This provided for the possibility that certain units could not be examined for various reasons.

Earlier work by the Statewide Archaeological Survey (MHS 1981) in the Cottonwood and Rock River drainages in southwestern Minnesota seemed to indicate that there would be a greater chance of locating sites in floodplains and near intermittent streams rather than in other areas. To test this observation, each strata in our sample was weighted based on minimum sample size and the estimated rate of site occurrence. These weights were: floodplain - 20%, confluence - 17%, terrace - 50%, reservoir - 13%.

The terrace stratum has the largest total surface area of all strata within the study universe. Current evidence indicates that this stratum has low site density. The heavier weighting of the terrace stratum was employed to increase the chances of locating any possible sites. The units selected in the reservoir stratum include 30% of all reservoir areas under consideration by the Corps.

The sample units were selected using a computerized random number generator. Each part of the legal description for a forty acre section within the survey area was given a numeric code. Five-digit random numbers were generated that gave the legal description of a sample unit. Sample units were drawn from one stratum at a time. Coded legal descriptions that fell outside of the particular stratum, within a known site area, or within areas previously surveyed by the Statewide Archaeological Survey, were discarded and replaced by the next coded legal description.

The total number of sample units defined for the entire study area and the number of units actually completed are shown in Table 1. Table 2 shows the number of sample units defined and the number actually completed for each sub-basin. Table 3 lists all of the sample units defined and notes whether or not each unit was examined.

TABLE 1: SAMPLE UNITS FOR TOTAL STUDY AREA

STRATA	DEFINED	EXAMINED	%
Floodplain	19	14	74.00%
Confluence	14	14	100.00%
Terrace	44	30	68.00%
Reservoir	13	7	54.00%
TOTAL:	90	65	

TABLE 2: SAMPLE UNITS FOR SUB-BASINS

YELLOW MEDICINE SUB-BASIN

STRATA	DEFINED	EXAMINED	%
Floodplain	6	6	100.00%
Confluence	3	5	60.00%
Terrace	12	10	66.67%
Reservoir	4	2	50.00%
TOTAL:	25	23	

REDWOOD SUB-BASIN

STRATA	DEFINED	EXAMINED	%
Floodplain	7	5	71.43%
Confluence	6	5	83.33%
Terrace	17	11	64.71%
Reservoir	5	3	60.00%
TOTAL:	35	24	

COTTONWOOD SUB-BASIN

STRATA	DEFINED	EXAMINED	%
Floodplain	6	3	50.00%
Confluence	5	4	80.00%
Terrace	15	9	60.00%
Reservoir	4	2	50.00%
TOTAL:	30	18	

TABLE 3: SAMPLE UNITS DEFINED FOR EACH SUB-BASIN

* PERMISSION DENIED BY LANDOWNER OR AREA HEAVILY IMPACTED

** SAMPLE UNIT ELIMINATED FROM SURVEY

#A UNIT SHIFTED FROM ONE SUBBASIN DESIGNATION TO ANOTHER

YELLOW MEDICINE RIVER SUBBASIN

STRATA	#	1/4; 1/4	SEC	TWP/RANGE	QUAD
FLOODPLAIN	1	NE1/4; NE1/4	27	T114N R41W	NORMANIA
	2	SW1/4; SE1/4	36	T115N R41W	WOOD LAKE NW
	3	SW1/4; SW1/4	33	T115N R40W	WOOD LAKE NW
	4	NE1/4; SE1/4	10	T114N R40W	WOOD LAKE NW
	5	NE1/4; NW1/4	12	T113N R42W	GREEN VALLEY
	6	NW1/4; SW1/4	32	T115N R40W	WOOD LAKE NW
CONFLUENCE	7	SW1/4; SE1/4	31	T115N R40W	WOOD LAKE NW
	8	UNIT SWITCHED TO REDWOOD RIVER SUBBASIN 6A			
	9	NE1/4; NE1/4	2	T114N R41W	NORMANIA
	10	UNIT SWITCHED TO REDWOOD RIVER SUBBASIN 7A			
	11	NE1/4; NE1/4	25	T113N R43W	MINNEOTA
TERRACE	** 12	SW1/4; SW1/4	7	T114N R40W	WOOD LAKE NW
	* 13	NE1/4; SE1/4	36	T114N R42W	NORMANIA
	14	SE1/4; NW1/4	33	T115N R40W	WOOD LAKE NW
	15	NE1/4; NW1/4	35	T115N R40W	WOOD LAKE NW
	16	UNIT SWITCHED TO REDWOOD RIVER SUBBASIN 23A			
	17	SE1/4; SE1/4	11	T112N R43W	MINNEOTA
	18	SW1/4; SW1/4	6	T113N R41W	GREEN VALLEY
	** 19	SE1/4; SW1/4	7	T114N R40W	WOOD LAKE NW
	20	UNIT SWITCHED TO REDWOOD RIVER SUBBASIN 17A			
	21	NE1/4; SW1/4	26	T113N R41W	GREEN VALLEY
	* 22	SW1/4; NW1/4	32	T114N R40W	WOOD LAKE NW
	23	NW1/4; NE1/4	20	T113N R42W	MINNEOTA
	* 24	NW1/4; NE1/4	31	T115N R40W	WOOD LAKE NW
	25	UNIT SWITCHED TO REDWOOD RIVER SUBBASIN 30A			
RESERVOIR	26	SE1/4; SW1/4	24	T114N R41W	WOOD LAKE NW
	* 27	SE1/4; SE1/4	1	T113N R45W	PORTER SW
	* 28	SE1/4; SE1/4	17	T113N R45W	PORTER SW
	29	NE1/4; NW1/4	22	T113N R45W	CANBY SE
	30	NE1/4; SE1/4	32	T113N R44W	PORTER SW

REDWOOD RIVER SUBBASIN

<u>STRATA</u>	<u>#</u>	<u>1/4; 1/4</u>	<u>SEC</u>	<u>TWP/RANGE</u>	<u>QUAD</u>
FLOODPLAIN					
	1	NE1/4; NE1/4	14	T111N R42W	MARSHALL
*	2	SE1/4; SE1/4	5	T111N R41W	MARSHALL
	3	NE1/4; SE1/4	33	T111N R36W	ROWENA
	4	NE1/4; NW1/4	34	T112N R41W	MARSHALL
	5	SW1/4; NE1/4	15	T112N R41W	GREEN VALLEY
*	6	SE1/4; SE1/4	34	T113N R41W	GREEN VALLEY
	6A	SE1/4; NW1/4	5	T112N R41W	GREEN VALLEY
CONFLUENCE					
	7	SE1/4; NE1/4	14	T111N R42W	MARSHALL
	7A	NW1/4; SE1/4	6	T112N R41W	GREEN VALLEY
*	8	NW1/4; SE1/4	20	T112N R38W	LUCAN
	9	NW1/4; SE1/4	24	T112N R38W	LUCAN
	10	NW1/4; SW1/4	13	T112N R40W	SCHOOL GROVE LAKE
	11	SW1/4; SW1/4	23	T111N R42W	MARSHALL
TERRACE					
*	12	NE1/4; NW1/4	34	T111N R40W	DUDLEY
	13	SW1/4; SE1/4	9	T112N R41W	GREEN VALLEY
	14	SW1/4; SW1/4	7	T111N R36W	ROWENA
	15	NE1/4; SE1/4	31	T113N R40W	COTTONWOOD
	16	NW1/4; SE1/4	36	T112N R42W	GREEN VALLEY
*	17	SW1/4; NE1/4	2	T111N R42W	MARSHALL
**	17A	NE1/4; SE1/4	9	T112N R41W	GREEN VALLEY
	18	SE1/4; SW1/4	27	T112N R39W	MILROY
	19	SE1/4; NW1/4	12	T111N R38W	WABASSO
	20	NW1/4; SW1/4	18	T112N R38W	ECHO
	21	SW1/4; SW1/4	20	T111N R40W	DUDLEY
**	22	SE1/4; NW1/4	13	T112N R40W	SCHOOL GROVE LAKE
*	23	SE1/4; NE1/4	23	T112N R38W	WABASSO
**	23A	NE1/4; SW1/4	4	T112N R41W	GREEN VALLEY
	24	SE1/4; NW1/4	24	T111N R42W	MARSHALL
	25	NW1/4; NW1/4	2	T111N R37W	WABASSO
	26	SW1/4; NE1/4	35	T113N R41W	GREEN VALLEY
RESERVOIR					
	27	SW1/4; NE1/4	35	T109N R43W	CURRENT LAKE
	28	NW1/4; NE1/4	16	T110N R43W	DEAD COON LAKE
	29	SE1/4; SE1/4	17	T111N R42W	LYND
*	30	NW1/4; SE1/4	30	T112N R42W	LYND
*	30A	SE1/4; NW1/4	8	T112N R41W	GREEN VALLEY

COTTONWOOD RIVER SUBBASIN

<u>STRATA</u>	<u>#</u>	<u>1/4; 1/4</u>	<u>SEC</u>	<u>TWP/RANGE</u>	<u>QUAD</u>
FLOODPLAIN					
	1	NW1/4; SW1/4	3	T109N R32W	SLEEPY EYE
**	2	SE1/4; SE1/4	20	T110N R40W	AMIRET
	3	NE1/4; SE1/4	36	T110N R41W	AMIRET
*	4	NW1/4; NE1/4	35	T110N R32W	SLEEPY EYE
*	5	NE1/4; SW1/4	5	T109N R31W	ESSIG
	6	NW1/4; NE1/4	16	T109N R32W	SLEEPY EYE
CONFLUENCE					
	7	NW1/4; NE1/4	13	T110N R40W	MILROY SE
*	8	NW1/4; SE1/4	2	T109N R41W	AMIRET
	9	NE1/4; NW1/4	22	T110N R40W	AMIRET
	10	NE1/4; NW1/4	1	T109N R41W	AMIRET
	11	NW1/4; SW1/4	35	T110N R31W	ESSIG
TERRACE					
	12	SW1/4; NW1/4	27	T110N R40W	AMIRET
**	13	SE1/4; SE1/4	18	T110N R38W	WABASSO SW
	14	NE1/4; SE1/4	26	T110N R40W	MILROY SE
**	15	NE1/4; NW1/4	34	T110N R31W	ESSIG
*	16	SW1/4; NW1/4	36	T110N R38W	WABASSO SE
	17	SW1/4; SW1/4	8	T109N R40W	AMIRET
	18	NE1/4; NW1/4	1	T109N R31W	ESSIG
	19	SE1/4; SW1/4	25	T110N R41W	AMIRET
	20	NW1/4; NW1/4	5	T109N R32W	SLEEPY EYE
	21	NE1/4; SW1/4	20	T110N R38W	WABASSO SW
**	22	SE1/4; NW1/4	12	T109N R38W	WABASSO SE
**	23	SW1/4; SE1/4	20	T110N R40W	AMIRET
	24	NE1/4; NW1/4	13	T109N R41W	AMIRET
**	25	NE1/4; SE1/4	10	T109N R31W	ESSIG
	26	NW1/4; NW1/4	22	T110N R39W	MILROY SE
RESERVOIR					
	27	NW1/4; NW1/4	18	T110N R40W	AMIRET
	28	NW1/4; SE1/4	28	T111N R41W	MA...
*	29	SE1/4; NE1/4	23	T108N R38W	LAMBERTON
*	30	SE1/4; NW1/4	24	T108N R36W	SANBORN NE

c. Stratification

Simple random samples are appropriate when there is no prior knowledge about the universe being sampled. However, when some prior knowledge about the sample universe is available, stratified random samples are more efficient because this type of sampling design incorporates existing information about the sample universe into the sampling design.

There are more strata within the Yellow Medicine, Redwood, and Cottonwood drainages than were incorporated in this study. The shores of prairie lakes are generally considered to have a high probability of containing archaeological sites. Likewise, the margins of intermittent stream courses appear, in retrospect, to be important loci.

Only four strata were used in the survey. There were two reasons for this decision. First, the principal areas of interest of the Corps of Engineers were in the floodplain and immediately adjacent upland areas. Second, the strata were defined using the draft report on the geomorphology of the study area prepared by Larson (n.d.).

Larson (n.d.) defined a series of overflow channels as a number of areas that he felt had been created by catastrophic flooding. Based on field examinations of some of these channels and discussions with Larson, these overflow channels were excluded from the survey since it appeared that any archaeological sites within these landforms had probably been destroyed during the catastrophic flood episodes.

The reservoir stratum consisted of all 40 acre tracts within all of the possible reservoir areas as defined on project maps provided by the Corps. This is a 'hybrid' strata because it was defined on the basis of criteria other than geomorphological considerations. Moreover, it includes both areas that are immediately adjacent to intermittent streams and areas that are in an upland setting.

The terrace stratum was based on Larson's series of geomorphic maps. Although this geomorphic unit is not discussed in the section on map units in Larson's report (Larson n.d.:6-10), it appears to cover landforms that are away from the floodplain. The boundaries for the terraces stratum on the maps constructed by Larson are indefinite. In general, this stratum appears to conform to what archaeologists working in Minnesota would term uplands. Upland areas normally are underlain by moraine deposits of various types.

The floodplain stratum consists of all 40 acre tracts within the floodplains of the Yellow Medicine, Cottonwood, and Redwood rivers. The floodplains of smaller tributary streams were not included in this stratum. The definition of floodplains followed Larson's (n.d.) delineation of these geomorphic units.

The confluence stratum included all 40 acre tracts where a smaller tributary stream joined one of the three major rivers. This stratum is not, technically, a geomorphic landform. However, existing information on site distribution in southern Minnesota indicates that the confluence of two streams tends to be an area where archaeological sites are commonly located.

d. Evaluation of sampling

Later in this report, a predictive model of site distribution within the study area will be presented. Since this model is based on the results of the sampling procedures described above, it is important to evaluate how reliable estimates based on these procedures are.

Reliability of estimates

Ninety sample units were selected from the study area. A minimum of 70 units was required to accept the survey results at a level of 95% confidence. However, only 65 sample units were examined. Further, the number of sample units for each strata within each subbasin was relatively low. Using the formula employed to determine sample size, it is possible to reassess the level of confidence at which the survey results may be used.

Estimates for the frequency of site occurrence in the survey universe as a whole may be accepted at a level of 90% confidence. Results for the floodplain/confluence strata may also be accepted at 90% confidence and the results for the terrace/reservoir strata may be accepted at 95% confidence.

The number of sample units for each subbasin are too small to be used to make statements about site occurrence within the subbasins themselves. However, the number of sample units examined in the Redwood and Yellow Medicine is relatively large (23 and 24 respectively). Therefore, the estimates for these two subbasins should be useful and will serve as estimates that can be tested by additional survey. The number of sample units completed in the Cottonwood subbasin is low and the survey results for this subbasin must be used with caution. The number of intuitive units examined in the Cottonwood is high, however, and the estimates for the floodplain strata in this area should be relatively accurate.

It might be possible to improve the estimates of site occurrence in the study area by adding the random sample units in Brown and Redwood Counties that were examined by the Statewide Archaeological Survey. However, since these sample units were selected for counties rather than individual drainages, we have not attempted to include them in this study.

Utility of geomorphology

Understanding the landscape and the processes that have shaped it is essential to any archaeological research program. In recent years, archaeologists and geomorphologists have collaborated in many projects to more carefully understand the interaction of humans and their physical environment, as well as the processes that have formed archaeological sites themselves (e.g. Benn and Bettis 1985; Benn 1986; Stein 1988). This type of interdisciplinary effort has resulted in a more sophisticated understanding of prehistoric settlement and the discovery of archaeological sites that otherwise might have never been discovered.

Geomorphological information was used in two different ways in this survey. First, Larson (n.d.) prepared a draft report on the geomorphology of the project area that was used to structure the archaeological investigations. This report was supplemented with two field conferences and one laboratory conference between Larson, COE staff, and IMA archaeologists. Second, the project director and field staff received additional training in geomorphology from Larson.

The utility of these two approaches was different.

Limited training in geomorphology, particularly in the processes that shaped the southwestern Minnesota landscape, was very useful. This training provided the field staff with a more sophisticated understanding of the landforms on which they were working and a clear notion of the potential for sites that existed in different physiographic settings. Moreover, it provided everyone involved in the project with a common working vocabulary that was helpful.

The geomorphological report prepared for the project (Larson n.d.) was less useful than the field training. The report provides a good overview of the glacial geology of the region and contains general maps of various surficial features that may be of interest. However, the maps and discussion in the text of the report are too general to be of particular use to archaeologists. The lack of fine-grained detail, particularly for the floodplain unit, caused two problems.

First, it was difficult to draw boundaries for different strata used in the sampling procedure because the definition of the geomorphological units was often unclear and no well-defined boundaries were provided on the project maps.

Second, the level of detail provided within the floodplain strata was not adequate to delineate where buried archaeological sites might exist. The development of the river floodplains in southwestern Minnesota is complex. Far more resolution is needed if a careful sampling strategy designed to locate deeply buried sites in riverine settings is to be employed.

Non-standard terminology is employed to describe certain aspects of the landscape. For example, the term 'terraces' was used to describe areas

away from the river floodplains. This usage is confusing because the term terraces is normally employed to describe specific features formed by rivers within a floodplain. In southern Minnesota, it is conventional to refer to floodplains of streams and rivers, margins of bluffs overlooking streams and rivers, uplands that are away from rivers, and so on. Larson's 'terrace' unit in some localities contains portions of floodplains, bluff margins, and upland settings.

Finally, the geomorphological report addresses questions that would more fruitfully be considered by the archaeologists on the project or by both the archaeologists and geomorphologists working on the project. For example, Larson (n.d.) delineates areas of 'high potential' on several maps. These areas were generally of little use to the field staff because they did not take into account the existing knowledge about human settlement behavior and prior study in the area. It also was not made clear why these areas were considered to have high potential. In future it is recommended that questions that involve both cultural and geomorphological components be discussed and prepared jointly by the scientists involved in the project.

To summarize, the geomorphological training received by the field crew was most helpful and the report itself provided a good introduction to the geomorphology of the project area. However, because of the low resolution of detail within the report, it was not nearly as helpful as it might have been.

2. FIELD METHODS

a. Plan of work

The plan of work for the survey involved five stages.

During the early spring of 1986, IMA archaeologists reviewed the existing literature on the 639 study area, obtained information on known archaeological sites, and prepared the sampling design for the study.

Field investigations began on April 15, 1986. During April and May, IMA archaeologists conducted field-checks on most of the sample units that had been previously defined. Although the field crew was hampered by the unseasonably high level of rainfall during April and May, a number of sample units were examined during this period.

By late May, it became apparent that almost all sites in the study area were located in or immediately adjacent to the floodplain. Therefore, a series of 'intuitive' study areas were examined based on the results of the preceding sample units. The results of these intuitive studies tended to confirm the observations drawn from the sample units.

During late May and the first half of June, the field crew re-visited several known sites within the study area, tested newly discovered sites, and examined cut-bank profiles in several parts of the study area.

Analysis of the data recovered during the project took place during June and September of 1986. Report preparation took place in September-October 1986 and May-July 1987.

b. Field methods utilized

The objective of the field portion of this survey was to determine whether or not archaeological sites were present within sample units and intuitively selected portions of the study area. To accomplish this objective, two different sets of procedures that employed seven different field techniques were used.

Field techniques:

a.) **Pedestrian survey.** The surface of the ground was inspected by survey teams walking along linear transects spaced 15 meters apart. This method was only used in areas that were under cultivation. Sample units and/or intuitively selected areas were not examined unless surface conditions were acceptable. In general, acceptable surface conditions consisted of a ploughed field that had been cultivated and allowed to weather through one or more cycles of heavy rain.

b.) **Shovel testing.** Shovel tests at least 30 cm on a side were excavated by hand and fill from each test was screened through 1/4" mesh. Shovel tests were always excavated into the parent material of the soil (Zone C) or at least 15 cm below the point at which the last artifacts were found. Where transects of shovel tests were used, the tests were spaced at 15 meter intervals.

c.) **Auger testing.** Auger tests were excavated using a bucket auger with a 4" diameter bucket. The texture and color of the sediments from each bucket load was described and the contents of the bucket was screened through 1/4" mesh. Where transects of auger tests were used, the tests were spaced at 15 meter intervals. Auger tests were excavated to variable depths depending on the character of the sediments within the test, ability of the auger to penetrate the sediments, and the level of the water table.

d.) **Soil probes.** A soil probe with a 3/4" bit was used to examine natural stratigraphy. Transects of soil probe tests were not used. The fill from each probe was visually inspected for artifactual debris but was not screened.

e.) **Cut bank profiles.** Eroding banks along the rivers were visually examined for cultural material and evidence of sites buried beneath alluvium.

f.) **Informant interviews.** Wherever possible, IMA archaeologists inquired about finds of artifacts by landowners, farmers, and other individuals. No systematic program of informant location was instituted but more than 100 individuals were queried about the presence of archaeological materials in the area. Staff at the Lyon and Redwood County Historical Societies were contacted, collections at their museums were examined, and the project was discussed with them. We were unable to visit the Brown County Historical Society due to limited visitors hours.

g.) **Systematic surface collection.** When an archaeological site was discovered in a cultivated field, the boundaries of the site were established and flagged. The site was sketched onto a U.S.G.S. 7.5 minute series map and if necessary a separate sketch map of the site was prepared. Then, the site was walked by the survey team using transects spaced at 5 meter intervals. All artifacts, debitage, animal bone, etc. was collected and bagged.

Procedures

After obtaining permission to examine a particular sample unit or intuitively selected area, the survey team inspected it. The team attempted to determine the nature of the geomorphological processes that had formed the land surface within the area based on Larson's (n.d.) report and the training they had received. The team assessed the possibility that buried deposits of cultural debris might be located within the survey area and then proceeded to examine the survey area. Most of the areas inspected were under cultivation. In cultivated areas, the first step in the field examination was to walk the area and look for cultural debris on the ground surface. Next, an auger test or shovel test was excavated to determine the nature of the subsurface sediments and evaluate the possibility that archaeological materials might be present that had not been located during the initial surface walkover.

In areas where surface visibility was poor (e.g. wooded areas, pastures, etc.) or in locations where it seemed possible that buried deposits of cultural materials might be present (e.g. the base of toe slopes, floodplains, etc.) additional auger tests were excavated to determine whether or not such deposits were present. The boundaries of the site were located and plotted on the appropriate U.S.G.S. 7.5' series topographic map. When necessary, an additional sketch map of the site area was drawn.

Pedestrian survey was the principal field technique used during the survey. When sites were discovered on the surface, additional subsurface testing was conducted to determine whether or not additional sites were buried beneath the ground surface. Where buried sites were not discovered, the information from the archaeological site on the

ground surface was used to develop an estimate of the probable age of the land surface on which it was located.

If an archaeological site was located in a cultivated area, a separate set of procedures was employed. The boundaries of the site were located and plotted on the appropriate U.S.G.S. 7.5' series topographic map. When necessary, an additional sketch map of the site area was drawn. A field number was then assigned to the site. Next, a systematic surface collection of the site was obtained and additional auger or shovel tests were excavated to determine how deep the cultural deposits might extend below the ground surface.

Evaluation of field methods

The 639 survey area is quite large and the sample units and intuitively selected survey areas that were examined were scattered throughout 6 different counties. More than 80% of the study area is under cultivation. During the time the fieldwork was conducted, most fields had just been planted and landowners were often understandably reluctant to allow any activity that would significantly injure the emerging crops. As a result, we did not employ the use of heavy equipment or large vehicle-mounted augers in this project.

Pedestrian survey was the principal field technique used during this survey. This technique is rapid, allows a survey team to cover large areas of ground in relatively short periods of time, and is the most efficient way of discovering sites that are exposed on the ground surface. A three-person survey team can examine between 100 and 150 acres per day, depending on field conditions and how widely separated the survey areas are. Moreover, the kind of rapid and wide-ranging survey that can be accomplished using pedestrian reconnaissance provides an excellent introduction to the landforms, archaeological assemblages, and site types that exist within a particular study region.

There are four limitations to pedestrian survey. First, it is effective only where there are significant areas that are under cultivation. Second, it requires an investment of time to locate landowners and obtain their permission to examine their property. Third, pedestrian survey will only locate sites that are on the ground surface. As a consequence, in geomorphic environments where there has been substantial aggradation over time, many sites may not be located. Fourth, the effectiveness of pedestrian survey is completely conditional upon the conditions of the fields being examined. It is possible to completely overlook an archaeological site simply because the surface conditions are inadequate. Therefore, adequacy of surface visibility must be an important criterion in evaluating any survey where this technique is used.

Where fields have been plowed or cultivated and allowed to weather through at least one heavy rainstorm, surface visibility is usually excellent. However, there are several situations where visibility is

poor. These include fields that are covered with 'trash' from previous harvests, fields that are being farmed under the minimum tillage method, or fields that have been ploughed or cultivated but that have not weathered. In southwestern Minnesota, the optimal time for surveys that employ pedestrian reconnaissance is early and late spring. The ideal time for such studies are immediately after the snow-cover has melted but before fields are cultivated for spring farming. Because of the increasing incidence of minimum tillage or no-till farming practices, pedestrian survey techniques are generally not effective during the autumn months. Pedestrian survey is also ineffective after the crops have reached a height of 12" or more and therefore pedestrian survey after early to mid June is generally not productive.

Shovel testing is a useful technique for determining whether cultural materials are present in areas where surface visibility is poor or nonexistent. Shovel testing is time intensive and the reliability of the results are dependent on the interval used between individual shovel tests. When 15 meter intervals between tests are used, we estimate that one person can excavate 20 tests per day. However, this number may be considerably less if heavy clay soils, large roots, or gravel deposits are encountered.

Another significant limitation of shovel testing is that shovel tests can generally be excavated only to a depth of one meter below the ground surface. Shovel testing is most useful in areas where cultural materials are suspected to be within 50 to 75 cm of the ground surface.

Auger testing with a bucket auger is a useful technique for examining sub-surface deposits of material, particularly when it is suspected that these materials may be deeper than 1 meter below the ground surface. A gross profile of the stratigraphy can be obtained by carefully examining the contents of each bucket load and noting changes in sediment color and texture. Cultural materials can be found in the auger when the fill is carefully screened through 1/4" mesh. The chances of finding cultural material with a small auger bucket is related to the density of the sub-surface materials.

Auger testing is time intensive. We estimate that a two-person crew can excavate one auger test per hour when the test is excavated to a depth of between two and three meters. This assumes that all fill from the auger bucket is screened and that the sediments in each bucket load are described. The number of tests that can be excavated is closely related to the sediments that are being examined. Clay soils take much longer to dig simply because it is difficult to remove them from the auger bucket.

One limitation of auger testing is that it is difficult or impossible to work around large roots or cobbles. It is often necessary to relocate the auger test if these kinds of materials are encountered during the excavation.

Soil probes with a 3/4" bit were used to examine soil stratigraphy and to probe for buried cultural materials. Although it is possible that cultural material may be found using a soil probe, the small size of the bit makes this unlikely. We found that soil probes were generally ineffective in the glacial deposits of southwestern Minnesota. In areas where the sediments contained gravel and cobbles the probe could not penetrate these sediments. In areas where clay or silty clay sediments were predominant, we found that the bit of the soil probe often became plugged.

The examination of cut bank profiles is a rapid way to examine the natural stratigraphy along stream banks and to locate any deposits of cultural debris that may be eroding out of the bank. There are several distinct limitations to this technique. First, the examination of cut-banks can only be done when water levels in streams are low. During most of the 639 survey, water levels were quite high. Second, the examination of cut banks provides information only on the particular surface that is exposed at that time. Most of the floodplain areas examined during this survey were quite extensive. While the examination of cut banks allowed us to examine one small portion of the floodplain, they were not useful in developing a broader understanding of where sites might be located within the entire floodplain area.

Systematic surface collection is a valuable technique for obtaining information from archaeological sites discovered during the course of a survey. It is also a relatively rapid way to determine the limits of a site and to ensure that comparable collections from sites throughout a study area are available for analysis. The collection of 'grab samples' of cultural debris make it impossible to analyze and compare sites within a particular study area or region. When it is not possible to systematically collect material from a site, we feel it is best to leave the artifacts in place.

3. RESULTS

a. Summary of results

Two thousand three hundred acres in the Yellow Medicine, Redwood, and Cottonwood subbasins were examined during the 639 survey. Of this total, 1,706 acres were contained within 65 random sample units and 594 acres were contained within areas intuitively selected by the Principal Investigator after most of the sample units had been examined.

Two previously recorded sites, the Gautefald and Gillingham sites, were revisited. Thirty-five new sites were located and studied. Twelve of these sites were in the Yellow Medicine subbasin, 10 were in the Redwood subbasin, and 13 were in the Cottonwood subbasin. One of these sites is buried within the floodplain of the Cottonwood River.

Two specific areas that warrant additional investigation were located.

Most of the sites discovered during the survey are small, thin scatters of flakes. Pottery was not commonly found on most of the sites. All of the sites have the potential to provide information about the prehistoric occupation of southwestern Minnesota and specific recommendations about the treatment of each individual site is contained in Section 4.2 of this report. One site, 21BW61, was tested.

b. Previously recorded sites

The Gillingham site (21YM3/21YM15)

The Gillingham site is affiliated with the Cambria archaeological culture. The site is in the Yellow Medicine subbasin and is situated on the bluffs overlooking the Minnesota River. The site was first visited by T.H. Lewis as part of the Northwestern Archaeological Survey. Lewis' findings are reported in Winchell (1911:116-117), where the site is described as follows:

"The enclosure is on N.W. 1/4, S.W. 1/4 of the section, and about 100 feet above the river. The mounds are farther southeast and about 100 feet above the bottomland. No. 9 is nearly on the center of section line. There are two other mounds and one embankment nearly obliterated. Of the existing mounds, the largest is 64 ft. by 4 ft. The dirt taken from the ditch was used in leveling up the sides, especially on the inside. The excavation varies from 13 ft. to 17 ft. in width and from 2 ft. to 3 1/2 ft. in depth."

Lloyd Wilford (University of Minnesota) worked on the site in the late 1940's but reports that the site was subsequently destroyed by a gravel mine (Wilford 1951).

The IMA survey crew visited this site complex in May 1986 to verify Wilford's observation that the site had been completely destroyed. The survey team could not obtain permission to do a detailed assessment of the site area. However, a brief surface walkover revealed that the majority of the site has indeed been destroyed by gravel mining. It is possible that some remnants of the habitation area remain, but if this is the case, the remnants will be badly disturbed. One mound remains of the group described by Lewis. Because there were no other landmarks to tie the mound into, the survey team could not determine which of the mounds described by Lewis was still present. The mound is on the edge of the gravel pit and a fence runs across it. Three-quarters of the mound is within a pasture and the remaining quarter is on the gravel pit side of the fence. This portion of the mound is badly deflated.

Gautefald site (21YMI)

The Gautefald site is affiliated with the Cambria archaeological complex and is situated along Spring Creek where the creek enters the Yellow Medicine River. Lloyd Wilford excavated at the Gautefald site in 1948.

IMA archaeologists visited the site on June 4, 1986.

The surface conditions of the site were good. However, a careful walkover of the site revealed that only a few artifacts were present on the ground surface. Ole Gautefald, the former owner of the property, had a very large collection of artifacts from the site and it appears that he has removed almost all of the cultural material from the site surface.

Gautefald's collection is stored in a farm building on the property, although there was some discussion about donating the material to a local museum. IMA archaeologists conducted an initial review of the collection in the field, although a detailed analysis has not yet been completed.

The Gautefald collection contains a variety of animal bone. Most specimens in the collection appear to be domesticated farm animals although two phalanges and two molars of *Bos* are large enough to fall within the size range for *Bison*.

Brown chalcedony is the most common raw material in the collection. There are 163 flakes of brown chalcedony, some of which (11 or more) appear to have been utilized. There are 24 scrapers of brown chalcedony and the average size of these is approximately 2 cm by 2 cm. The remainder of the lithics in Gautefald's collection includes the following raw materials, listed in order of decreasing frequency: Rapid Member chert, Prairie du Chien chert, Tongue River silica, Yellow Jasper (heat-treated and non-heat-treated specimens), fine-grained basalt, quartz, and silicified sandstone. Tools included in the collection (other than those made of brown chalcedony) include 10 triangular projectile points, 18 notched points (10 side-notched and 8 expanding stemmed points), and 13 broken points. There are 97 scrapers, 71 bifacial tools (19 of which are quite large ranging in size from 5 to 11 cm) and 112 utilized/retouched flakes.

The pottery sherds from the Gautefald collection appear to be almost exclusively affiliated with the Cambria archaeological complex. A single bodysherd with incised lines and grit tempering may possibly be affiliated with Fox Lake.

Ninety-five percent of the sherds from the Gautefald site are grit-tempered and about five percent are tempered with shell. Decoration on the sherds includes (in order of decreasing frequency) cord-wrapped stick impressions, incised lines, trailed lines, and punctates. None of the sherds were large enough to determine any patterns of decoration,

but the trailed lines seemed to be straight rather than curvilinear. The Middle Missouri variant influence noted in many Cambria collections is apparent at the Gautefald site also. There is considerable variation in decorative techniques and motifs, although some of this variation may be due to the fact that Ole Gautefald collected artifacts from more than one site.

The site is presently under cultivation and it appears that it has suffered some damage from sheet erosion. Two auger tests were excavated and no intact cultural materials were noted in the auger tests. Further, the plow zone seems to be rather deep and the soils at the site are composed of silty clay and clay sediments.

The results of Wilford's investigations and our initial examination of the Gautefald collection suggest that 2LYM1 was not a major village but rather functioned as a secondary camp used principally for the procurement of bison and possibly other resources. Further investigations at the site might produce significant information about this aspect of Cambria. However, given the disturbed nature of the site, such investigations would probably not be given a high priority in future research programs.

c. New sites located during this survey

Thirty-five previously unrecorded sites were discovered during the course of this survey. These sites were generally relatively small although several were rather large and dense. The situation, methods, and artifacts recovered from these sites are described in this section. Discussion of the sites is arranged by river subbasin rather than county. The location, legal description, and State Site forms for each of these sites is included in Appendix II.

Yellow Medicine Subbasin

LINCOLN COUNTY

SITE NUMBER - 21LN16

STRATA: Reservoir area

SAMPLE UNIT: 30

PHYSIOGRAPHIC SETTING: Upland moraine

METHODS/COMMENTS: Controlled surface collection

CULTURAL AFFILIATION: Indeterminate

ARTIFACTS:

QUARTZITE - 1 UTILIZED/RETOUCHED FLAKE

TOTAL: 1 TOOL

LYON COUNTY:

SITE NUMBER - 21LY19

STRATA: Floodplain

SAMPLE UNIT: 5

PHYSIOGRAPHIC SETTING: Uplands overlooking floodplain

METHODS/COMMENTS: Controlled surface collection

CULTURAL AFFILIATION:

ARTIFACTS:

UNIDENTIFIED - 1 NOTCHED POINT
 2 UTILIZED/RETOUCHED FLAKE
 1 SECONDARY B FLAKE
 2 TERTIARY FLAKES
QUARTZITE - 1 NOTCHED POINT
 1 UTILIZED/RETOUCHED FLAKE
 1 BIFACIAL CORE
 4 TERTIARY FLAKES
TONGUE RIVER SILICA - 1 UTILIZED/RETOUCHED FLAKE
 1 SHATTER
GRANITIC - 1 TERTIARY FLAKE
UNIDENTIFIED CHERT - 1 SCRAPER
 1 TERTIARY FLAKE
OOLITIC CHERT- 1 UTILIZED/RETOUCHED FLAKE

TOTAL: 8 TOOLS, 1 CORE, 10 FLAKES

SITE NUMBER - 21LY21

STRATA: Floodplain

SAMPLE UNIT: 5

PHYSIOGRAPHIC SETTING: Uplands overlooking floodplain

METHODS/COMMENTS: Controlled surface collection

CULTURAL AFFILIATION:

ARTIFACTS:

UNIDENTIFIED - 1 UTILIZED/RETOUCHED FLAKE
QUARTZ - 1 SMALL CORNER-NOTCHED PROJECTILE POINT
AGATE - 2 SHATTER

QUARTZITE - 2 UTILIZED/RETOUCHED FLAKES
1 SECONDARY B FLAKE
2 TERTIARY FLAKES
2 SHATTER

TONGUE RIVER SILICA - 1 TERTIARY FLAKE
UNIDENTIFIED CHERT - 2 TERTIARY FLAKES
COLITIC CHERT - 1 BIFACIAL TOOL

TOTAL: 5 TOOLS, 10 FLAKES

SITE NUMBER - 21LY28

STRATA: Reservoir area

SAMPLE UNIT: 29

PHYSIOGRAPHIC SETTING: Upland moraine

METHODS/COMMENTS: Controlled surface collection

CULTURAL AFFILIATION: Indeterminate

ARTIFACTS:

QUARTZITE - 4 UTILIZED/RETOUCHED FLAKES
1 BIFACIAL CORE
5 TERTIARY FLAKES
7 SHATTER

TONGUE RIVER SILICA - 1 UTILIZED/RETOUCHED FLAKE
1 SECONDARY B FLAKE
1 TERTIARY FLAKE
1 SHATTER

TOTAL: 5 TOOLS, 1 CORE, 16 FLAKES

SITE NUMBER: 21LY29

STRATA: TERRACE

SAMPLE UNIT: 18

PHYSIOGRAPHIC SETTING: Upland moraine

METHODS/COMMENTS: Controlled surface collection

CULTURAL AFFILIATION: Indeterminate

ARTIFACTS:

UNIDENTIFIED CHERT - 1 UTILIZED/RETOUCHED FLAKE

BONE - 1 UNIDENTIFIABLE

TOTAL: 1 FLAKE, BONE

YELLOW MEDICINE COUNTY:

SITE NUMBER - 21YM38

STRATA: Intuitive

SAMPLE UNIT: NA

PHYSIOGRAPHIC SETTING: Moraine (adjacent to lake)

METHODS/COMMENTS: Controlled surface collection

CULTURAL AFFILIATION: Indeterminate

ARTIFACTS:

QUARTZITE - 3 UTILIZED/RETOUCHED FLAKES

1 IRREGULAR CORE

1 TERTIARY FLAKE

COOLITIC CHERT - 1 UTILIZED/RETOUCHED FLAKE

UNIDENTIFIED CHERT - 2 TERTIARY FLAKES

BONE - 1 UNIDENTIFIABLE

TOTAL: 4 TOOLS, 1 CORE, 3 FLAKES, BONE

SITE NUMBER - 21YMS9

STRATA: Floodplain

SAMPLE UNIT: 6

PHYSIOGRAPHIC SETTING: Upland moraine

METHODS/COMMENTS: Controlled surface collection

CULTURAL AFFILIATION: Indeterminate

ARTIFACTS:

UNIDENTIFIED - 1 IRREGULAR CORE

QUARTZITE - 3 TERTIARY FLAKES

1 THINNING FLAKE

BONE - 1 UNIDENTIFIABLE

TOTAL: 1 CORE, 4 FLAKES, 1 BONE

SITE NUMBER - 21TM40

STRATA: Floodplain

SAMPLE UNIT: 2

PHYSIOGRAPHIC SETTING: Floodplain and terrace

CULTURAL AFFILIATION: Woodland

METHODS/COMMENTS: Controlled surface collection, four shovel tests, one soil probe. Majority of site probably destroyed by existing farm home and/or farmyard.

ARTIFACTS:

UNIDENTIFIED - 1 SECONDARY B FLAKE
QUARTZITE - 1 BIFACIAL TOOL
 1 PRIMARY FLAKE
OOLITIC CHERT - 1 BIFACIAL TOOL
CERAMIC - 1 GRIT TEMPERED BODY SHERD

TOTAL: 2 TOOLS, 2 FLAKES, CERAMIC

SITE NUMBER - 21YM41

STRATA: Floodplain

SAMPLE UNIT: 1

PHYSIOGRAPHIC SETTING: Floodplain set back from river

METHODS/COMMENTS: Controlled surface collection, two soil probes (both negative).

CULTURAL AFFILIATION: Indeterminate

ARTIFACTS:

QUARTZITE - 1 IRREGULAR CORE

TOTAL: 1 CORE

SITE NUMBER - 21YM42

STRATA: Intuitive

SAMPLE UNIT: NA

PHYSIOGRAPHIC SETTING: Terraces adjacent to floodplain

METHODS/COMMENTS: Controlled surface collection

CULTURAL AFFILIATION: Indeterminate but possibly Archaic based on scraper type and bifacial knife.

ARTIFACTS:

BROWN CHALCEDONY - 1 BIFACIAL KNIFE

QUARTZITE - 1 BIFACIAL CORE

3 TERTIARY FLAKES

TONGUE RIVER SILICA - 1 LARGE SCRAPER, HEAT-TREATED

BONE - 10 UNIDENTIFIABLE

SHELL - 3 FRAGMENTS

TOTAL: 2 TOOLS, 1 CORE, 3 FLAKES, BONE, SHELL

SITE NUMBER - 21YM43

STRATA: Intuitive

SAMPLE UNIT: NA

PHYSIOGRAPHIC SETTING: Terrace adjacent to floodplain

METHODS/COMMENTS: Controlled surface collection and one soil probe.
Site is immediately adjacent to the Gautefald Site (21YM1).

CULTURAL AFFILIATION: Woodland

ARTIFACTS:

BROWN CHALCEDONY - 1 UTILIZED/RETOUCHED FLAKE
BONE - 1 UNIDENTIFIED
CERAMICS - 2 GRIT TEMPERED BODY
SHELL - 1 FRAGMENT

TOTAL: 1 TOOL, BONE, CERAMICS, SHELL

SITE NUMBER - 21YM44

STRATA: Floodplain

SAMPLE UNIT: 3

PHYSIOGRAPHIC SETTING: Terrace adjacent to floodplain

METHODS/COMMENTS: Controlled surface collection

CULTURAL AFFILIATION: Indeterminate

ARTIFACTS:

QUARTZ - 1 TERTIARY FLAKE
QUARTZITE - 1 PRIMARY FLAKE
 1 SECONDARY A FLAKE
 4 SECONDARY B FLAKES
 11 TERTIARY FLAKES
UNIDENTIFIED CHEST - 1 SCRAPER
 1 TERTIARY FLAKE
OOLITIC CHEST - 2 UTILIZED/RETOUCHED FLAKES
 2 TERTIARY FLAKES
BONE - 1 UNIDENTIFIED
SHELL - 1 FRAGMENT
GROUNDSTONE - 1 HAMMER
FIRE CRACKED ROCK - 1 GRANITIC

TOTAL: 3 TOOLS, 21 FLAKES, BONE, SHELL, GROUNDSTONE, FCR

REDWOOD RIVER SUBBASIN**LYON COUNTY****SITE NUMBER - 21LY23****STRATA: Floodplain****SAMPLE UNIT: 1****PHYSIOGRAPHIC SETTING: Uplands overlooking floodplain****METHODS/COMMENTS: Controlled surface collection****CULTURAL AFFILIATION: Indeterminate****ARTIFACTS:****QUARTZITE - 3 UTILIZED/RETOUCHED FLAKES****1 BIFACIAL CORE****6 TERTIARY FLAKES****1 SHATTER****TONGUE RIVER SILICA - 1 TERTIARY FLAKE****UNIDENTIFIED CHERT - 1 SECONDARY B FLAKE****1 TERTIARY FLAKE****2 SHATTER****OOOLITIC CHERT - 2 TERTIARY FLAKES****1 SHATTER****TOTAL: 3 TOOLS, 1 CORE, 15 FLAKES**

SITE NUMBER - 21LY24

STRATA: Floodplain

SAMPLE UNIT: 1

PHYSIOGRAPHIC SETTING: Uplands overlooking floodplain

METHODS/COMMENTS: Controlled surface collection

CULTURAL AFFILIATION: Indeterminate. Possibly early (Archaic) based on scraper form and size.

ARTIFACTS:

AGATE - 1 BIFACIAL CORE
QUARTZITE - 1 UTILIZED/RETOUCHED FLAKE
 1 SECONDARY A FLAKE
 2 TERTIARY FLAKES
TONGUE RIVER SILICA - 1 SECONDARY B FLAKE
 2 TERTIARY FLAKES
UNIDENTIFIED CHERT - 1 BIFACIAL TOOL
 1 SECONDARY A FLAKE
 2 TERTIARY FLAKES
OOLITIC CHERT - 1 SCRAPER

TOTAL: 3 TOOLS, 1 CORE, 9 FLAKES

SITE NUMBER - 21LY26

STRATA: Confluence

SAMPLE UNIT: 7

PHYSIOGRAPHIC SETTING: Upland adjacent to floodplain

METHODS/COMMENTS: Controlled surface collection

CULTURAL AFFILIATION:

ARTIFACTS:

AGATE - 1 PRIMARY FLAKE

BROWN CHALCEDONY - 1 UTILIZED/RETOUCHED FLAKE

QUARTZITE - 1 SIDE-NOTCHED PROJECTILE POINT

4 UTILIZED/RETOUCHED FLAKES

2 IRREGULAR CORES

1 BIFACIAL CORE

5 TERTIARY FLAKES

1 SHATTER

UNIDENTIFIED CHERT - 2 UTILIZED/RETOUCHED FLAKES

2 TERTIARY FLAKES

3 SHATTER

COOLITIC CHERT - 1 SIDE-NOTCHED PROJECTILE POINT

1 BIFACIAL TOOL

4 UTILIZED/RETOUCHED FLAKES

2 TERTIARY FLAKES

4 SHATTER

TOTAL: 14 TOOLS, 3 CORES, 18 FLAKES

SITE NUMBER - 21LY30

STRATA: Confluence

SAMPLE UNIT: 11

PHYSIOGRAPHIC SETTING: Uplands overlooking river floodplain

METHODS/COMMENTS: Controlled surface collection. One soil probe (negative).

CULTURAL AFFILIATION: Indeterminate

ARTIFACTS:

QUARTZITE - 1 IRREGULAR CORE

TOTAL: 1 CORE

SITE NUMBER - 21LV31

STRATA: Floodplain

SAMPLE UNIT: 5

PHYSIOGRAPHIC SETTING: Floodplain

METHODS/COMMENTS: Pedestrian survey. Systematic surface pickup. Soil probes used on natural levee's with negative results. Levee's themselves may warrant additional investigation.

CULTURAL AFFILIATION: Woodland

ARTIFACTS:

QUARTZITE - 1 NOTCHED POINT
CERAMIC - 1 DECORATED RIM

TOTAL: 1 TOOL, CERAMIC

SITE NUMBER - 21LY32

STRATA: Confluence

SAMPLE UNIT: 7A

PHYSIOGRAPHIC SETTING: Terrace in floodplain

METHODS/COMMENTS: Controlled surface collection

CULTURAL AFFILIATION: Indeterminate

ARTIFACTS:

**UNIDENTIFIED CHERT - 1 UTILIZED/RETOUCHED FLAKE
BONE - 1 UNIDENTIFIABLE**

TOTAL: 1 TOOL, BONE

SITE NUMBER - 21LY33

STRATA: Reservoir area

SAMPLE UNIT: 28

PHYSIOGRAPHIC SETTING: Moraine

METHODS/COMMENTS: Controlled surface collection. Site has gas line that runs through it.

CULTURAL AFFILIATION: Indeterminate

ARTIFACTS:

AGATE - 2 TERTIARY FLAKES

TOTAL: 2 FLAKES

SITE NUMBER - 21LY34

STRATA: Terrace

SAMPLE UNIT: 15

PHYSIOGRAPHIC SETTING: Upland moraine

METHODS/COMMENTS: Controlled surface collection.

CULTURAL AFFILIATION: Indeterminate

ARTIFACTS:

UNIDENTIFIED CHERT - 1 UTILIZED/RETOUCHED FLAKE

TOTAL: 1 TOOL

SITE NUMBER - 21LY35

STRATA: Reservoir

SAMPLE UNIT: 27

PHYSIOGRAPHIC SETTING: Uplands adjacent to floodplain

METHODS/COMMENTS: Controlled surface collection, two auger tests (both negative). Two distinct areas within the site were identified and collected.

CULTURAL AFFILIATION: Presumably Woodland but no tighter affiliation possible at this time.

ARTIFACTS:

AREA 1

UNIDENTIFIED - 1 NOTCHED POINT
 6 UTILIZED/RETOUCHED FLAKES
 1 PRIMARY FLAKE
 1 SECONDARY A FLAKE
 1 SECONDARY B FLAKE
 6 TERTIARY FLAKES
 11 SHATTER

HIXTON SILICIFIED SANDSTONE - 1 TERTIARY FLAKE

PRAIRIE DU CHIEN CHERT - 4 NOTCHED POINTS
 6 UTILIZED/RETOUCHED FLAKES
 4 IRREGULAR CORES
 3 PRIMARY FLAKES
 2 SECONDARY A FLAKES
 9 SECONDARY B FLAKES
 42 TERTIARY FLAKES
 34 SHATTER

CEDAR VALLEY CHERT - 1 BIFACIAL TOOL
 2 IRREGULAR CORES
 2 SHATTER

QUARTZ - 1 PRIMARY FLAKE
 7 TERTIARY FLAKES
 5 SHATTER

BASALTIC - 1 BIFACIAL TOOL

BROWN CHALCEDONY - 1 UTILIZED/RETOUCHED FLAKE

LAKE SUPERIOR BANDED AGATE - 1 UTILIZED/RETOUCHED FLAKE
 4 PRIMARY FLAKES
 2 SECONDARY A FLAKES
 2 SECONDARY B FLAKES
 2 TERTIARY FLAKES
 8 SHATTER

QUARTZITE - 1 NOTCHED POINT
 2 SCRAPERS
 3 BIFACIAL TOOLS
 15 UTILIZED/RETOUCHED FLAKES
 6 IRREGULAR CORES
 1 BIFACIAL CORE
 20 PRIMARY FLAKES
 9 SECONDARY A FLAKES
 21 SECONDARY B FLAKES
 132 TERTIARY FLAKES
 51 SHATTER

TONGUE RIVER SILICA - 1 SCRAPER
 6 UTILIZED/RETOUCHED FLAKES
 1 IRREGULAR CORE
 1 PRIMARY FLAKE
 16 TERTIARY FLAKES
 7 SHATTER

UNIDENTIFIED CHERT - 2 SCRAPERS
 2 BIFACIAL TOOLS
 11 UTILIZED/RETOUCHED FLAKES
 10 IRREGULAR CORES
 1 PRIMARY FLAKE
 3 SECONDARY B FLAKES
 4 TERTIARY FLAKES
 3 SHATTER

COOLITIC CHERT - 1 NOTCHED POINT
 1 PRIMARY FLAKE
 3 TERTIARY FLAKES

BONE - 6 UNBURNED, 2 BURNED, 2 TEETH

TOTAL(AREA 1): 55 TOOLS, 24 CORES, 426 FLAKES, BONE

AREA 2

UNIDENTIFIED - 1 BIFACIAL CORE
 QUARTZITE - 2 UTILIZED/RETOUCHED FLAKES
 3 TERTIARY FLAKES

TOTAL(AREA 2): 2 TOOLS, 1 CORE, 3 FLAKES

SITE TOTAL: 57 TOOLS, 25 CORES, 429 FLAKES, BONE

REDWOOD COUNTY:

SITE NUMBER - 21RM51

STRATA: Intuitive

SAMPLE UNIT: NA

PHYSIOGRAPHIC SETTING: Uplands adjacent to floodplain

METHODS/COMMENTS: Controlled surface collection

CULTURAL AFFILIATION: Indeterminate

ARTIFACTS:

QUARTZ - 1 BIFACIAL TOOL

1 TERTIARY FLAKE

QUARTZITE - 3 UTILIZED/RETOUCHED FLAKES

2 SECONDARY B FLAKES

7 TERTIARY FLAKES

4 SHATTER

1 BLADE FLAKE

UNIDENTIFIED CHERT - 1 SECONDARY A FLAKE

TOTAL: 4 TOOLS, 16 FLAKES

COTTONWOOD SUBBASIN

LYON COUNTY:

SITE NUMBER - 21LY15

STRATA: Intuitive

SAMPLE UNIT: NA

PHYSIOGRAPHIC SETTING: Floodplain

METHODS/COMMENTS: Controlled surface collection. Three auger tests (negative)

CULTURAL AFFILIATION: Indeterminate

ARTIFACTS:

UNIDENTIFIED - 2 UTILIZED/RETOUCHED FLAKES
CEDAR VALLEY CHERT - 1 SCRAPER
AGATE - 1 TERTIARY FLAKE
QUARTZITE - 1 SCRAPER
1 BIFACIAL TOOL
10 TERTIARY FLAKES
OOLITIC CHERT - 1 BIFACIAL TOOL
2 UTILIZED/RETOUCHED FLAKES
8 TERTIARY FLAKES
BONE - UNIDENTIFIED MANDIBLE

TOTAL: 7 TOOLS, 19 FLAKES, BONE

SITE NUMBER - 21LY16

STRATA: Intuitive

SAMPLE UNIT: NA

PHYSIOGRAPHIC SETTING: Edge of uplands overlooking floodplain

METHODS/COMMENTS: Controlled surface collection

CULTURAL AFFILIATION: Indeterminate

ARTIFACTS:

CONCENTRATION 1

UNIDENTIFIED - 1 BIFACIAL TOOL
AGATE - 1 IRREGULAR CORE
2 TERTIARY FLAKES
QUARTZITE - 3 UTILIZED/RETOUCHED FLAKES
1 PRIMARY FLAKE
8 TERTIARY FLAKES
9 SHATTER
TONGUE RIVER SILICA - 1 BIFACIAL TOOL
3 TERTIARY FLAKES
3 SHATTER
UNIDENTIFIED CHERT - 2 UTILIZED/RETOUCHED FLAKES
1 PRIMARY FLAKE
2 TERTIARY FLAKES
OOLITIC CHERT - 2 BIFACIAL TOOLS
2 TERTIARY FLAKES
2 SHATTER

TOTAL (CONCENTRATION 1): 9 TOOLS, 1 CORE, 33 FLAKES

CONCENTRATION 2

UNIDENTIFIED - 1 PRIMARY FLAKE
CEDAR VALLEY CHERT - 1 UTILIZED/RETOUCHED FLAKE
QUARTZITE - 1 SCRAPER
8 TERTIARY FLAKES
9 SHATTER
OOLITIC CHERT - 1 TERTIARY FLAKE
GROUNDSTONE - 1 HAMMERSTONE
1 METATE

TOTAL (CONCENTRATION 2): 2 TOOLS, 19 FLAKES, GROUNDSTONE

SITE TOTAL: 11 TOOLS, 1 CORE, 52 FLAKES, GROUNDSTONE

SITE NUMBER - 21LY17

STRATA: Intuitive

SAMPLE UNIT: NA

PHYSIOGRAPHIC SETTING: Uplands overlooking a series of terraces in floodplain.

METHODS/COMMENTS: Controlled surface collection

CULTURAL AFFILIATION: Indeterminate

ARTIFACTS:

UNIDENTIFIED - 3 TERTIARY FLAKES

1 SHATTER

CEDAR VALLEY CHERT - 1 SHATTER

AGATE - 1 SECONDARY B FLAKE

BROWN CHALCEDONY - 1 UTILIZED/RETOUCHED FLAKE

QUARTZITE - 2 BIFACIAL TOOLS

2 UTILIZED/RETOUCHED FLAKES

4 IRREGULAR CORES

1 SECONDARY A FLAKE

16 TERTIARY FLAKES

2 SHATTER

TONGUE RIVER SILICA - 1 BIFACIAL TOOL

1 UTILIZED/RETOUCHED FLAKE

1 SECONDARY B FLAKE

2 TERTIARY FLAKES

4 SHATTER

GRANITIC - 1 UTILIZED/RETOUCHED FLAKE

UNIDENTIFIED CHERT - 2 UTILIZED/RETOUCHED FLAKES

1 BIPOLAR CORE

COLLITIC CHERT - 2 IRREGULAR CORES

TOTAL: 10 TOOLS, 7 CORES, 32 FLAKES

SITE NUMBER - 21LY18

STRATA: Intuitive

SAMPLE UNIT: NA

PHYSIOGRAPHIC SETTING: Terrace in floodplain on inside of meander loop

METHODS/COMMENTS: This is a buried site located using the bucket auger. It was intuitively selected on the basis of a review of the topographic features of this area. Two auger tests were excavated and cultural material was found in each extending from 30 to 90+ cm. below surface. Given the small diameter of the auger bucket, the fact that any cultural debris was found at all is surprising. Presumably the site is fairly dense. More work is needed to evaluate this site.

CULTURAL AFFILIATION: Indeterminate

ARTIFACTS:

QUARTZITE - 1 TERTIARY FLAKE
BONE - 1 BURNED, 3 UNBURNED
SHELL - SEVERAL FRAGMENTS

TOTAL: 1 FLAKE, BONE, SHELL

SITE NUMBER - 21LY20

STRATA: Intuitive

SAMPLE UNIT: NA

PHYSIOGRAPHIC SETTING: Floodplain and first terrace inside meander loop.

METHODS/COMMENTS: Controlled surface collection and soil probe. This site is a few hundred meters north of 21LY18.

CULTURAL AFFILIATION: Indeterminate

ARTIFACTS:

AGATE - 1 UTILIZED/RETOUCHED FLAKE

QUARTZITE - 1 BIFACIAL TOOL

1 SECONDARY B FLAKE

4 TERTIARY FLAKES

1 SHATTER

TONGUE RIVER SILICA - 2 TERTIARY FLAKES

UNIDENTIFIED - 1 IRREGULAR CORE

1 TERTIARY FLAKE

OOBITIC CHERT - 1 BIFACIAL TOOL

5 TERTIARY FLAKES

1 BIPOLAR FLAKE

FIRE CRACKED ROCK - 1 189.4 G PIECE

TOTAL: 3 TOOLS, 1 CORE, 15 FLAKES, FCR

SITE NUMBER - 21LY22

STRATA: Intuitive

SAMPLE UNIT: NA

PHYSIOGRAPHIC SETTING: Uplands overlooking floodplain

METHODS/COMMENTS: Controlled surface collection

CULTURAL AFFILIATION: Indeterminate

ARTIFACTS:

QUARTZITE - 2 IRREGULAR CORES

9 TERTIARY FLAKES

TONGUE RIVER SILICA - 1 UTILIZED/RETOUCHED FLAKE

TOTAL: 1 TOOL, 2 CORES, 9 FLAKES

BROWN COUNTY:

SITE NUMBER - 21BN61

STRATA: Floodplain

SAMPLE UNIT: 6

PHYSIOGRAPHIC SETTING: Second terrace within floodplain

METHODS/COMMENTS: Controlled surface collection, soil probe, 1 x 2 meter excavation unit.

CULTURAL AFFILIATION: Historic and Oneota/Mississippian (?) based on presence of shell-tempered pottery. Possibly multiple prehistoric components.

ARTIFACTS:

SURFACE COLLECTION

UNIDENTIFIED - 1 IRREGULAR CORE
 1 SECONDARY A FLAKE
 BROWN CHALCEDONY - 1 TERTIARY FLAKE
 QUARTZITE - 1 UTILIZED/RETOUCHED FLAKE
 2 SECONDARY B FLAKES
 1 TERTIARY FLAKE
 1 SHATTER
 UNIDENTIFIED CHERT - 1 TRIANGULAR POINT
 2 SCRAPERS
 2 SECONDARY B FLAKES
 2 TERTIARY FLAKES
 OOLITIC CHERT - 1 BIFACIAL TOOL
 1 UTILIZED/RETOUCHED FLAKE
 1 TERTIARY FLAKE
 1 WHINNING FLAKE
 BONE - 70 UNBURNED, 13 BURNED, 11 TOOTH FRAGMENTS
 HISTORIC - 1 METAL SPIKE

TOTAL (SURFACE): 6 TOOLS, 1 CORE, 12 FLAKES, BONE, HISTORIC

EXCAVATION (LEVEL 1)

UNIDENTIFIED - 1 PRIMARY FLAKE
 UNIDENTIFIED CHERT - 2 TERTIARY FLAKES
 BONE - 10 UNBURNED, 1 TOOTH

TOTAL (LEVEL 1): 3 FLAKES, BONE

EXCAVATION (LEVEL 2)

UNIDENTIFIED CHERT - 1 TERTIARY FLAKE
CERAMIC - 4 SHELL TEMPERED BODY SHEERDS
BONE - 6 UNBURNED, 2 TEETH

TOTAL (LEVEL 2): 1 FLAKE, CERAMICS, BONE

EXCAVATION (LEVEL 3)

UNIDENTIFIED - 1 SECONDARY A FLAKE
QUARTZITE - 1 SHATTER
UNIDENTIFIED CHERT - 1 TERTIARY FLAKE
CERAMIC - 2 SHELL TEMPERED BODY SHEERDS
BONE - 16 UNBURNED

TOTAL (LEVEL 3): 3 FLAKES, CERAMICS, BONE

EXCAVATION (LEVEL 4)

BONE - 11 UNBURNED
CHARCOAL - 3 PIECES
HISTORIC - 1 METAL CHAIN

TOTAL (LEVEL 4): BONE, CHARCOAL, HISTORIC

EXCAVATION (LEVEL 5)

BONE - 11 UNBURNED, 1 TOOTH
CHARCOAL - 1 PIECE

TOTAL (LEVEL 5): BONE, CHARCOAL

SITE TOTAL: 6 TOOLS, 1 CORE, 19 FLAKES, CERAMIC, BONE. CHARCOAL

SITE NUMBER - 21BW62

STRATA: Intuitive

SAMPLE UNIT: NA

PHYSIOGRAPHIC SETTING: Terrace in floodplain

METHODS/COMMENTS: Controlled surface collection and soil probe

CULTURAL AFFILIATION: Indeterminate

ARTIFACTS:

UNIDENTIFIED - 2 UTILIZED/RETOUCHED FLAKES

QUARTZITE - 1 SCRAPER

2 PRIMARY FLAKES

2 SECONDARY A FLAKES

7 SECONDARY B FLAKES

8 TERTIARY FLAKES

1 SHATTER

GRANITIC - 1 TERTIARY FLAKE

UNIDENTIFIED CHERT - 1 SECONDARY A FLAKE

2 TERTIARY FLAKES

BONE - 3 VERTEBRA

TOTAL: 3 TOOLS, 24 FLAKES, BONE

SITE NUMBER - 21BW63

STRATA: Intuitive

SAMPLE UNIT: NA

PHYSIOGRAPHIC SETTING: Old terrace in floodplain but above active floodplain

METHODS/COMMENTS: Controlled surface collection and 1 auger test (negative)

CULTURAL AFFILIATION: Indeterminate

ARTIFACTS:

QUARTZITE - 1 SECONDARY A FLAKE

1 TERTIARY FLAKE

UNIDENTIFIED CHERT - 1 UTILIZED/RETOUCHED FLAKE

COOLITIC CHERT - 1 BIFACIAL TOOL

1 UTILIZED/RETOUCHED FLAKE

1 SECONDARY B FLAKE

1 TERTIARY FLAKE

TOTAL: 3 TOOLS, 4 FLAKES

SITE NUMBER - 218W64

STRATA: Intuitive

SAMPLE UNIT: NA

PHYSIOGRAPHIC SETTING: Terrace in floodplain

METHODS/COMMENTS: Controlled surface collection and soil probe
(negative)

CULTURAL AFFILIATION: Indeterminate

ARTIFACTS:

UNIDENTIFIED - 1 BIFACIAL TOOL
1 UTILIZED/RETOUCHED FLAKE
1 TERTIARY FLAKE

BROWN CHALCEDONY - 1 SCRAPER

QUARTZITE - 1 SCRAPER
1 UTILIZED/RETOUCHED FLAKE
1 IRREGULAR CORE
1 PRIMARY FLAKE
1 SECONDARY A FLAKE
3 SECONDARY B FLAKES
3 TERTIARY FLAKES
1 SHATTER

UNIDENTIFIED CHERT - 1 TERTIARY FLAKE
3 SHATTER

OOBITIC CHERT - 1 IRREGULAR CORE
1 SECONDARY A FLAKE
1 SECONDARY B FLAKE

FIRE CRACKED ROCK - 2 PIECES

TOTAL: 5 TOOLS, 2 CORES, 16 FLAKES, FCR

SITE NUMBER - 21BW65

STRATA: Intuitive

SAMPLE UNIT: NA

PHYSIOGRAPHIC SETTING: Floodplain

**METHODS/COMMENTS: Controlled surface collection and three soil probes
(negative)**

CULTURAL AFFILIATION: Indeterminate

ARTIFACTS:

QUARTZITE - 1 SECONDARY B FLAKE

3 TERTIARY FLAKES

UNIDENTIFIED CHERT - 1 IRREGULAR CORE

1 SECONDARY B FLAKE

OOBITIC CHERT - 1 TERTIARY FLAKE

BONE - 2 UNBURNED

GROUNDSTONE - 1 HAMMERSTONE

TOTAL: 1 CORE, 6 FLAKES, BONE, GROUNDSTONE

SITE NUMBER - 21EW66

STRATA: Intuitive

SAMPLE UNIT: NA

PHYSIOGRAPHIC SETTING: Terrace in floodplain

METHODS/COMMENTS: Controlled surface collection

CULTURAL AFFILIATION: Indeterminate

ARTIFACTS:

UNIDENTIFIED - 1 BIFACIAL TOOL

BROWN CHALCEDONY - 1 SCRAPER

QUARTZITE - 1 SCRAPER

1 BIFACIAL TOOL

1 UTILIZED/RETOUCHED FLAKE

1 IRREGULAR CORE

1 PRIMARY FLAKE

3 SECONDARY B FLAKES

3 TERTIARY FLAKES

5 SHATTER

UNIDENTIFIED CHERT - 1 BIFACIAL TOOL

OOOLITIC CHERT - 2 SECONDARY B FLAKES

2 TERTIARY FLAKES

TOTAL: 6 TOOLS, 1 CORE, 16 FLAKES

SITE NUMBER - 21BW67

STRATA: Intuitive

SAMPLE UNIT: NA

PHYSIOGRAPHIC UNIT: Terrace in river floodplain

METHODS/COMMENTS: Controlled surface collection

CULTURAL AFFILIATION: Indeterminate

ARTIFACTS:

QUARTZITE - 1 IRREGULAR CORE

TONGUE RIVER SILICA - 1 SECONDARY A FLAKE

BONE - 1 UNBURNED

TOTAL: 1 CORE, 1 FLAKE, BONE

d. Localities for future investigation

Many areas were observed during this survey that warrant further investigation. Two of these areas were examined and, although they did not produce cultural material, certainly would be worth additional investigation. The location of these two areas is given following the Minnesota State Site Forms in Appendix 2.

Locality One - 86RW7: This locality is along the Three Mile Creek floodplain northeast of Marshall, MN. This area was reported to IMA archaeologists by the property owner and contained bones eroding out of the bank into Three Mile Creek. A careful examination of the ground surface in the area revealed a scatter of large bones along the eroding creek edge. No cultural debris was found on the surface.

The bones were mapped and removed. A vertical profile of the stream bank was drawn and two auger tests were excavated near the bones. No cultural materials were recovered in either of the auger tests.

The bones were analyzed in the IMA laboratory by James Becker. The results of this analysis are contained in Table 4 below:

TABLE 4: BONE FROM 86RWS7

<u>Bone Number</u>	<u>Element</u>	<u>Comments</u>
13	Left femur	Major and minor trochanter, very large bovid, <u>Bison bison</u>
18	Right calcaneus	Bovid, Bos
8	Navicular	Bovid, Bos
15	Radius fragment	"
7	Phalange 1	Bos
1	Basal portion of skull	Bos
5	Lumbar vertebra	Bos
11	Canine	Bos
14	Right femur	Bison bison
	Right tibia	Bison bison, prominent medial malleolus

Locality Two: 86CWS15

This locality is along the upper edge of an alluvial (and colluvial?) fan on the northern edge of the Cottonwood River. The fan is bordered by a small deeply incised intermittent stream. The origin of the fan is unclear because it appears to be too massive to have been formed by deposition by the intermittent stream.

This area was chosen for deep testing because of the presence of the fan. Several prehistoric sites were discovered on the surface of the nearby Cottonwood River floodplain.

Three deep auger tests were excavated within this locality. Test one was located near the top of the fan, Test two was several meters downslope from Test One, and Test Three was about halfway down the fan itself.

No cultural materials were recovered from any of these auger tests. However, several buried zones that contained charcoal and distinctly different stratigraphic zones were discovered in the auger tests (Fig. 8).

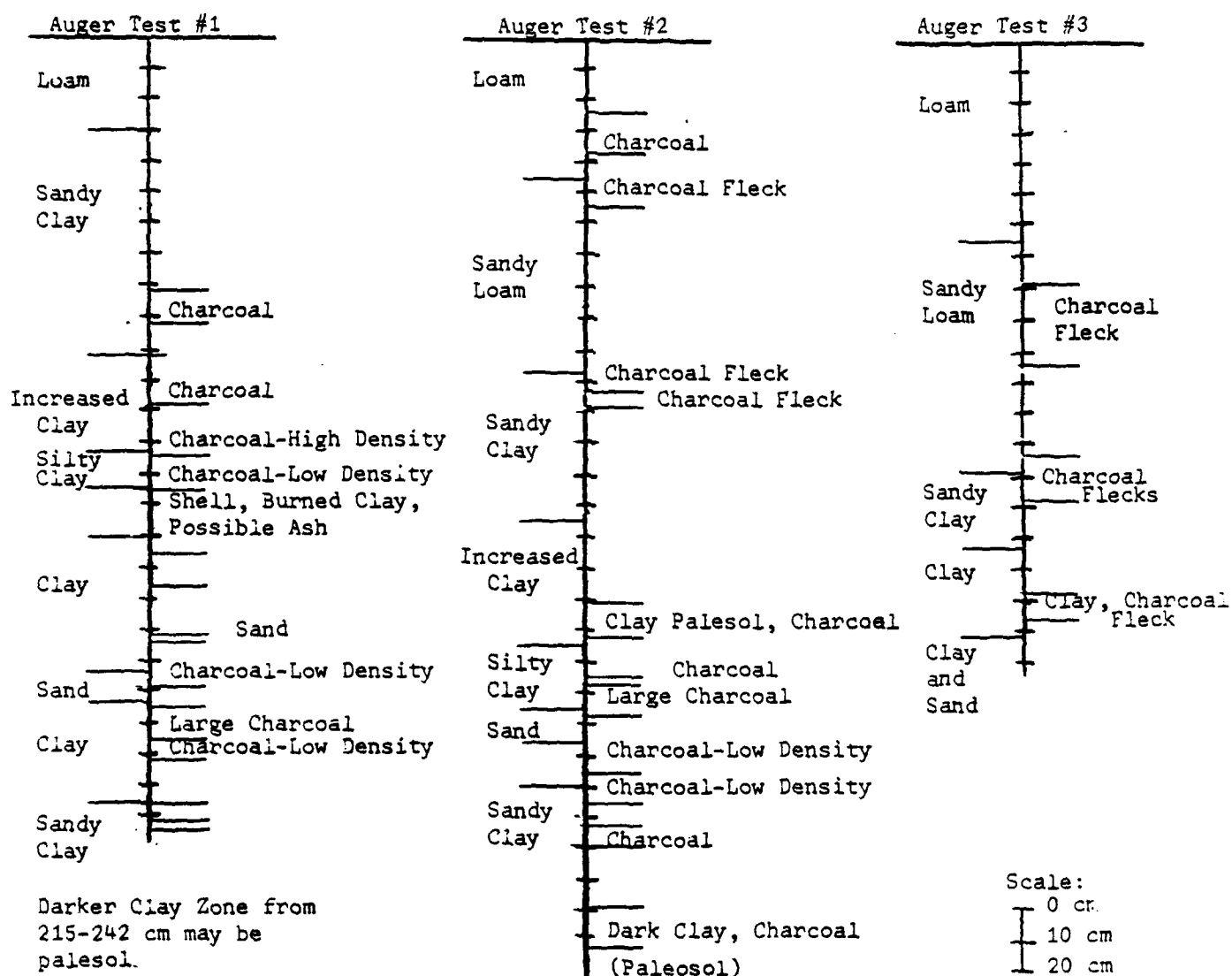
Auger test 1 was excavated to a total depth of 244 cm. Small flecks of charcoal appeared at 82 cm below surface and a denser band of charcoal appeared between 109 and 135 cm. A second zone of shell, burned (?) clay and ash (?) was discovered between 155 and 165 cm. A third zone was discovered between 215 cm and 236 cm.

Auger test 2 was excavated to a depth of 294 cm. Density of charcoal was not as high as in auger test 1, but evidence of distinct zones was still present. A few pieces of charcoal were found between 119 and 130 cm. A possible paleosol with a heavier concentration of clay and some charcoal was located between 181 and 192 cm. A second zone with charcoal was discovered between 217 and 235 cm and a deeper zone of dark clay and charcoal 'specks' was found at 294 cm.

Auger test 3 was excavated to a depth of 200 cm. The density of charcoal in test 3 was much lower than in tests 1 and 2, and the zones were not as well defined. Nevertheless, flecks of charcoal were found at 104 cm, 147 cm and in a clay zone at 176 cm.

The presence of distinct zones containing charcoal and possible paleosols in this alluvial fan is intriguing. Although no cultural materials were found in the auger tests, it is quite possible that this area contains buried archaeological sites and additional intensive testing is certainly warranted.

FIG. 8: VERTICAL PROFILES OF AUGER TESTS AT 86CWS15



III. ANALYSIS AND MODELING

1. ANALYSIS

Analysis of the cultural materials recovered during the 639 survey was conducted in June - July 1986 and June - July 1987. The objectives of the analytical portion of the study was to describe the artifacts found during the survey, develop initial settlement types that may be tested and refined by future researchers, and provide data that could be used in generating a mode of site location in the Yellow Medicine, Redwood, and Cottonwood subbasins.

a. Analytic methods

Institute archaeologists are developing a series of standard analytical protocols for various artifact classes. Methods of analyzing debitage and scrapers have been completed and a preliminary method of describing projectile points has been prepared (IMA 1986). These analytical methods were employed in describing the assemblages from the sites found during the 639 survey. Attributes for these methods are described in Appendix IV.

b. Description of stone tools and ceramics

Ceramics

Prehistoric ceramics were rarely found during the 639 survey. Only four of the 35 sites examined contained any ceramic materials and the density of ceramics at these sites was quite low. None of the ceramics were large enough to permit assignment to a particular archaeological culture.

Two grit-tempered body sherds were found at 21YM43.

One grit-tempered body sherd was found at 21YM40.

One rim-sherd was found at 21LY31. This rim fragment is quite small, grit-tempered, and both the interior and exterior body surfaces are smoothed. The lip is straight and there are small tool impressions on the exterior lip surface.

Six small smooth-surfaced shell-tempered bodysherds were recovered at 21BW61.

Scrapers

Chipped-stone endscrapers are one of the most common and ubiquitous artifacts found in the prairies and adjacent woodlands of southern Minnesota. The apparent variability in form of endscrapers is not nearly as great as the variability apparent in other classes of chipped-

stone tools (e.g. projectile points). Nevertheless, there is considerable variation within endscrapers as an artifact class and presumably there is some structure to this variability. We assume that this variability is related to the function of the endscraper, the technology of the archaeological culture that produced it, and the time period during which it was produced.

In 1983, Orrin C. Shane III (Science Museum of Minnesota) initiated an extensive study of Oneota endscrapers from the Willow Creek Locality along the Blue Earth River. Shane developed a set of attributes that could be used to study the formal morphological variation of endscrapers. The Institute for Minnesota Archaeology adopted these attributes, with some modifications, as the standard method for analyzing endscrapers in IMA collections. In 1984, Dan Wendt (IMA paraprofessional archaeologist) analyzed a set of 80 endscrapers from the Silvernale Phase Bryan site (21GD4) in Goodhue County, MN. and has subsequently analyzed an additional 250 endscrapers from other sites in Goodhue and Anoka counties, MN., and Pierce County, WIS.

Wendt's analysis of the Bryan endscrapers (Wendt 1984) produced two particularly interesting conclusions.

Wendt demonstrated that variation in length and size of endscrapers is not random but rather is the result of a process of resharpening the scrapers throughout their useful life. The width of endscrapers is a function of several variables, including the width of the hafting material. The length of the scraper, however, appears to have initially been about 2.6 times its width. When the length decreased to less than 1.2 times the width, the scraper was discarded since it could no longer be hafted and expose a working edge. Most scrapers, therefore, were discarded as exhausted stubs. Evaluation of either the length or the width of scrapers does not clearly show this trend. However, when the length/width ratio (L/W) is plotted, the resulting line clearly shows the effects of resharpening.

The next phase of Wendt's analysis was to screen the nominal variables for significant associations with each other and the effects of nominal variables on continuous variables. This screening process indicated that planview and cross section of the scrapers were involved in 20 of 26 effects with greater than 90 percent significance. On the basis of this analysis, Wendt suggested that there were two distinct types of endscrapers at the Bryan site. One of these types was trapezoidal in planview and the other was triangular (Wendt 1984).

Seventeen endscrapers were recovered during the 639 survey. These have been analyzed following Shane and Wendt's work. The objective of this analysis is to see whether the method works on non-Oneota endscraper assemblages and to evaluate the variability of endscrapers within the 639 survey area. This sample is small and conclusions based on this dataset are preliminary. However, the following discussion provides a useful model for future testing and refinement.

The protocol for analysis of the endscrapers is included as Appendix IV. The raw data for the 17 endscrapers from the 639 survey are given in Table 5.

The raw material from which the endscrapers are manufactured is principally local material dominated by Prairie du Chien chert and quartzite (Fig. 9).

The distribution of endscraper length varies significantly. However, the distribution is clearly multi-modal (Fig. 10).

Distribution of endscraper width is not as variable. However, the width distribution is also multi-modal with at least three distinct modes at 18 mm, 24 mm and 34 mm (Fig. 11).

Distribution of endscraper thickness is also widely varied and multimodal (Fig. 12).

Similarly, the variability of the length-width ratio is variable and multimodal with two obvious modes at 1.2 and 1.4 (Fig. 13).

The distribution of the length-width ratio may be used to evaluate the hypothesis that the 639 endscrapers are the endproduct of a process of resharpener throughout their useful life. Since planview should account for much of the variation in the nominal variables, it may be used to evaluate this variability.

Figure 14 shows a graph of length-width ratio plotted with planview. Raw material for each specimen is also shown. These data have been sorted first by length-width ratio and second by planview. In examining the graph, it is apparent that there is a distinct linear trend that would tend to support the hypothesis that all of the scrapers were part of an assemblage that resulted from resharpener. However, there are distinct disjunctions in the line. An examination of planview for each case suggests that these disjunctions are related to this variable.

Figure 15 presents the same data shown in Figure 14 but the data have been sorted first by planview and second by length-width ratio.

In examining Fig. 15, it is apparent that there are at least three distinct subsets within the assemblage. Each of these subsets appears to be the result of a process of resharpener. The subsets are defined by the planview of the scraper. However, it is interesting to note that the raw material within the subsets for planview 1-2 and 3 are homogenous. Scrapers with planview 1 or 2 are made of Prairie du Chien chert and scrapers with planview 3 are made of quartzite.

Although the sample size analyzed here is small, we suggest that several distinct scraper types may be defined. At present, these types are based solely on planview. As a larger sample is examined, these definitions will be revised.

Table 6 presents the data for all scrapers sorted by planview. The characteristics of scrapers with planviews 1, 3, and 7 appear to be distinct from one another. There are only one scraper for planview 2, 4, 5, 6, and 8. The data on each of these is presented for comparison with planviews 1, 3 and 7.

Planview 1 scrapers are shorter, narrower, and thinner than planview 3 scrapers. These scrapers are made of Prairie du Chien chert and are long-triangular in planview. The striking platform is either present or has been removed. The cross-section of the scraper is a scalene triangle. The dorsal surface is always flaked and the scraper may have either unifacial or bifacial retouch. There is no grinding and the dorsal view is left asymmetric. The range of the l/w ratio is from 1.45 to 1.37.

Planview 2 scrapers appear to be different from either the 1's or 3's. These may represent a subset of planview 1 scrapers.

Planview 3 scrapers are longer and wider than either 1's or 7's. They are consistently made of quartzite and are long-trapezoidal in planview. The l/w ratio ranges from 1.81 to 1.36. The striking platform is always present and lateral retouch is consistently absent. The dorsal surface is consistently not flaked and the dorsal view is commonly right-asymmetrical. Cross-section is variable.

Planview 7 scrapers are shorter and thinner than either 1's or 3's. The raw material on which the scrapers are made is either Prairie du Chien chert or quartzite. The l/w ratio of these scrapers varies from 1.29 to 1.01 and the striking platform is generally removed. Lateral retouch is generally bilateral and the dorsal surface is generally flaked.

This analysis of the endscrapers from the 639 survey suggests that there may have been at least three distinct types of scrapers used during the prehistoric period in southwestern Minnesota. These types are most easily sorted out by reference to the planview of the scraper, although there are other associated variables that are distinctly different between the various types. Further analysis of a larger set of scrapers will allow this initial model to be refined and tested.

RAW MATERIALS USED FOR SCRAPERS

FROM 639 SURVEY

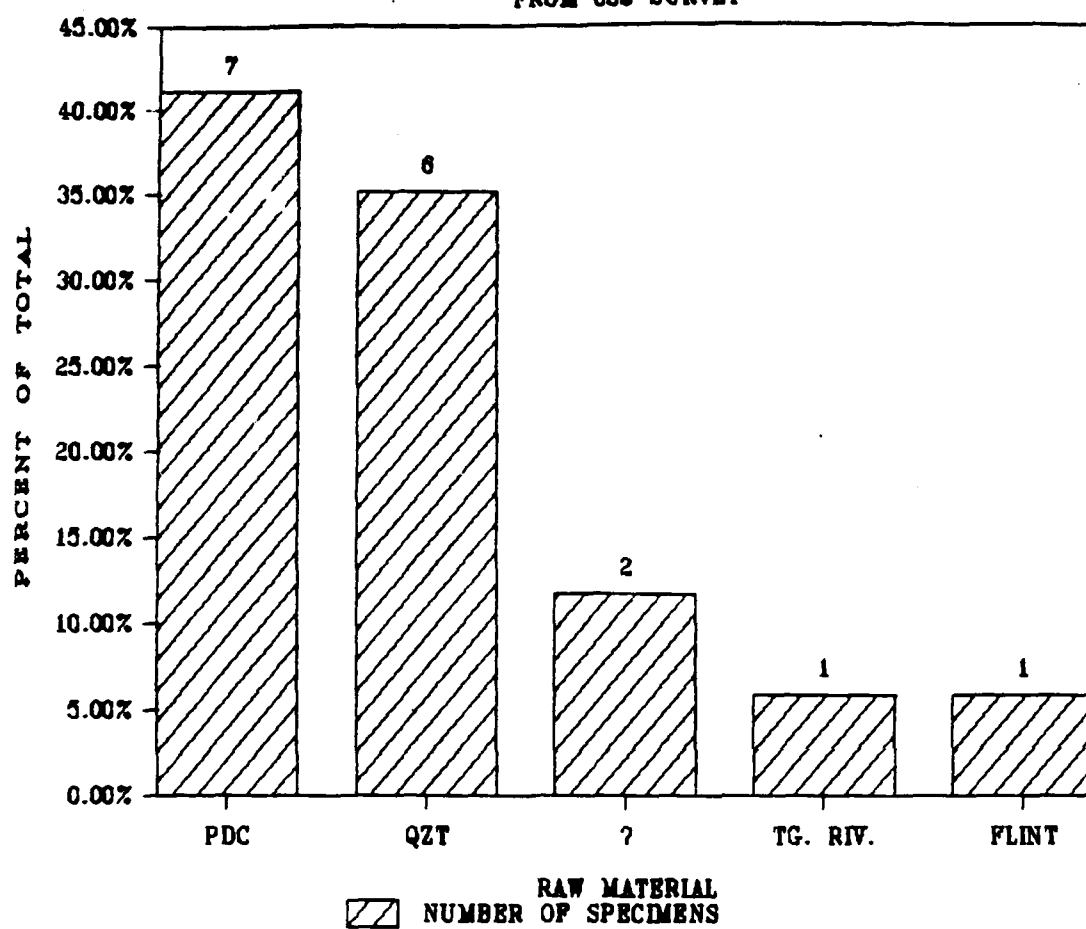


FIGURE 9.

DISTRIBUTION OF ENDSCRAPER LENGTH

SCRAPERS FROM SW 639 SURVEY

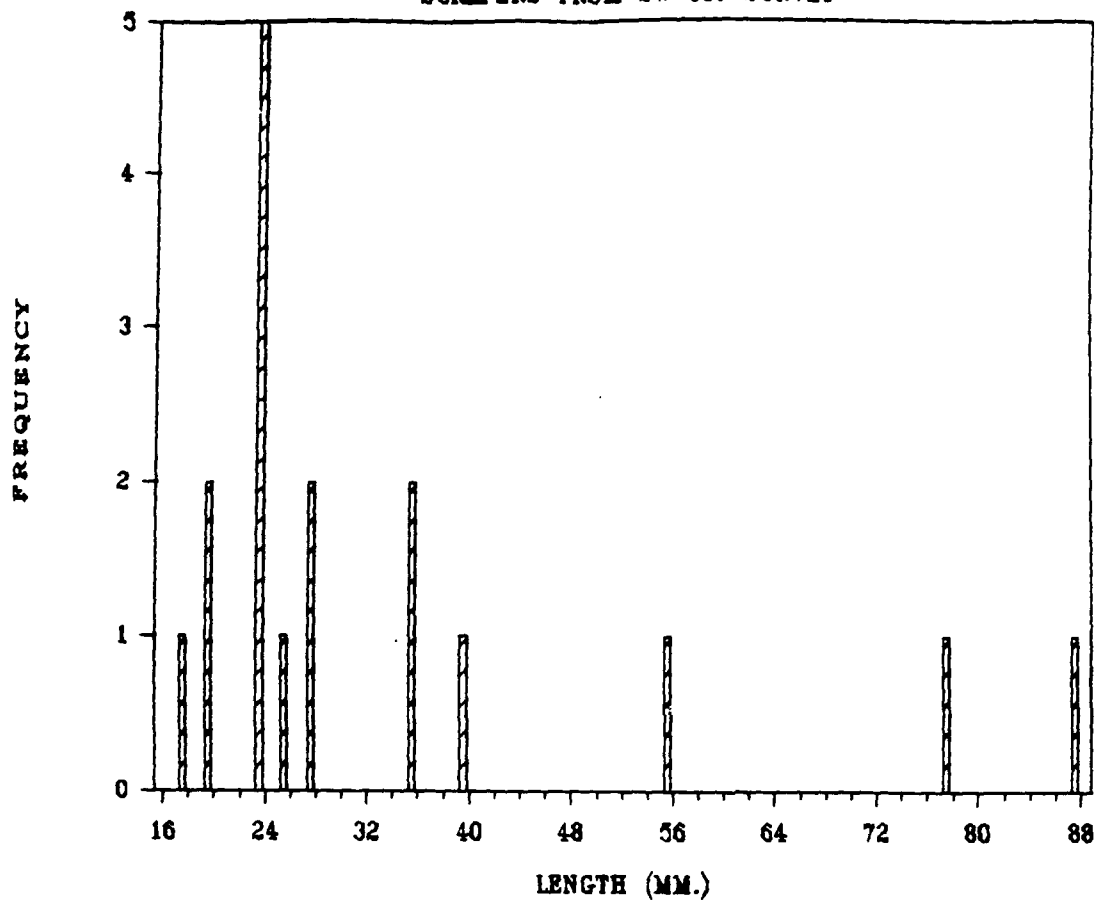


FIGURE 10.

DISTRIBUTION OF ENDSCRAPER WIDTH

SCRAPERS FROM SW639 SURVEY

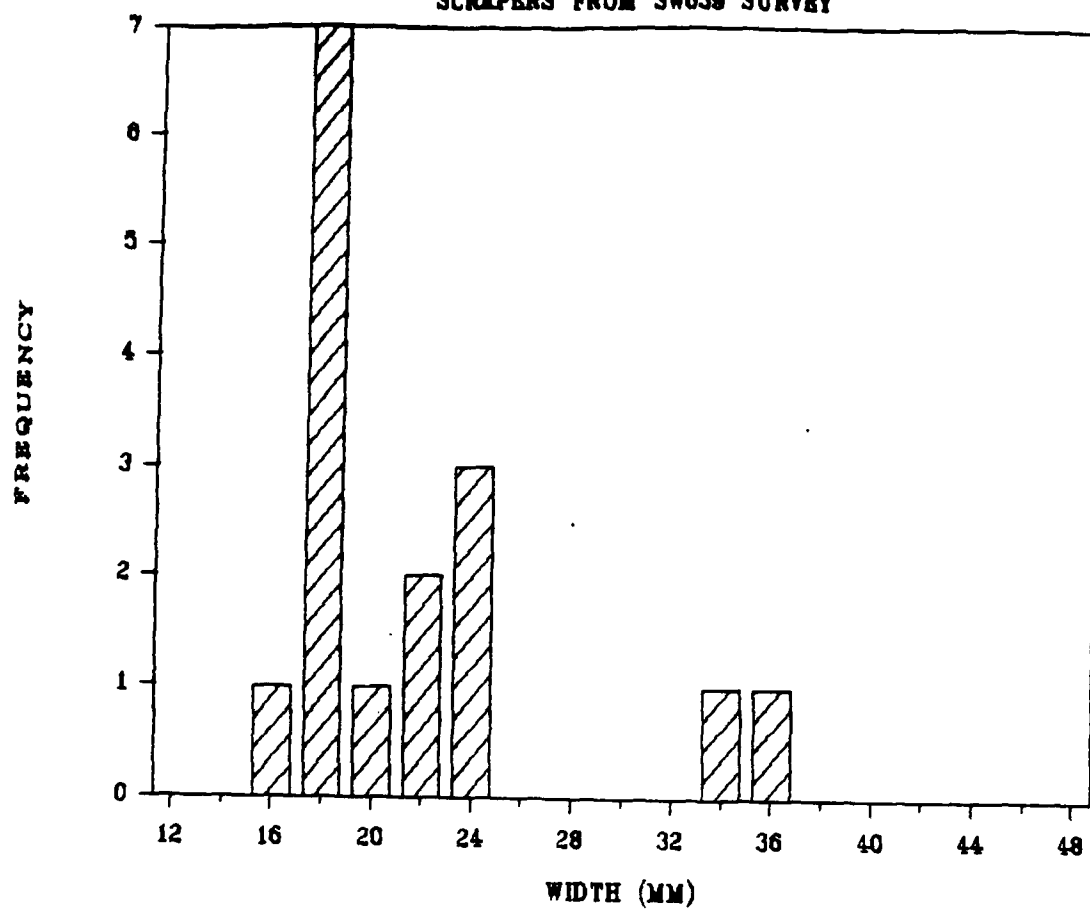


FIGURE 11.

DISTRIBUTION OF ENDSCRAPER THICKNESS

SCRAPERS FROM SW 638 SURVEY

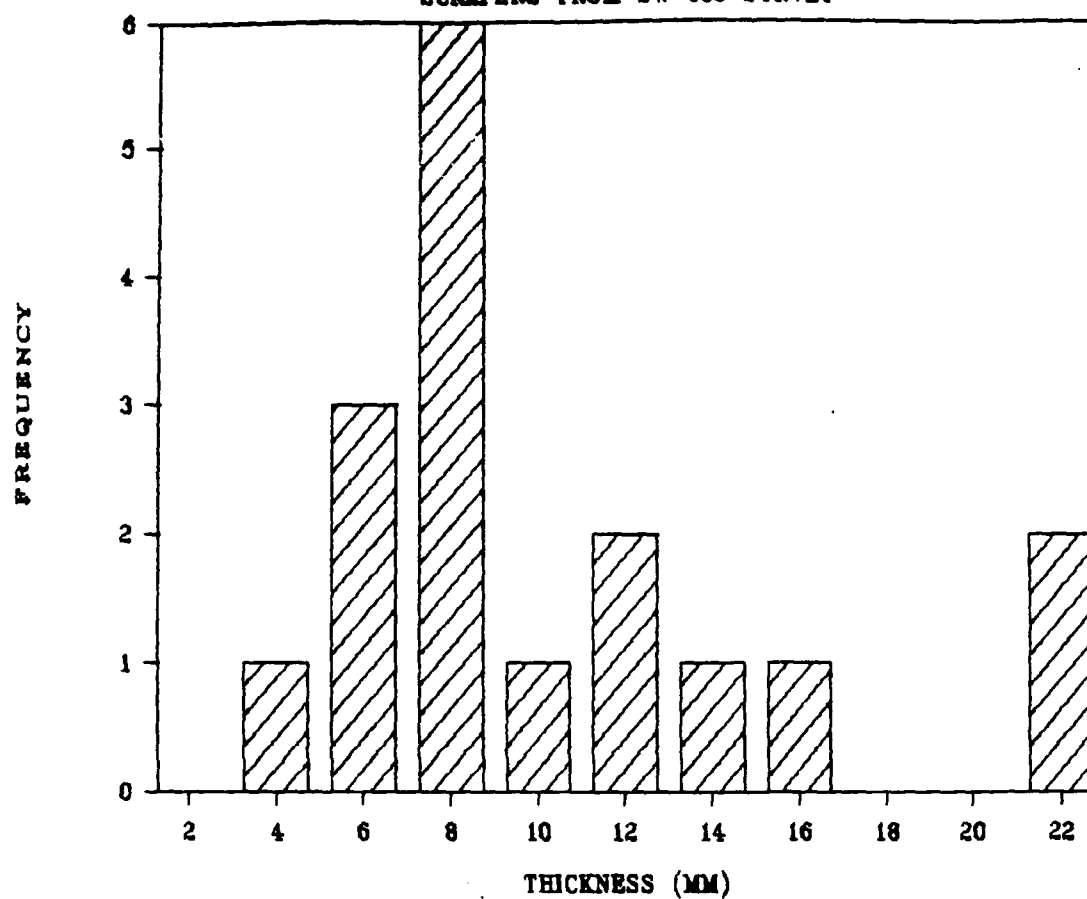


FIGURE 12.

DISTRIBUTION OF ENDSCRAPER L-W RATIO

SCRAPERS FROM SW639 SURVEY

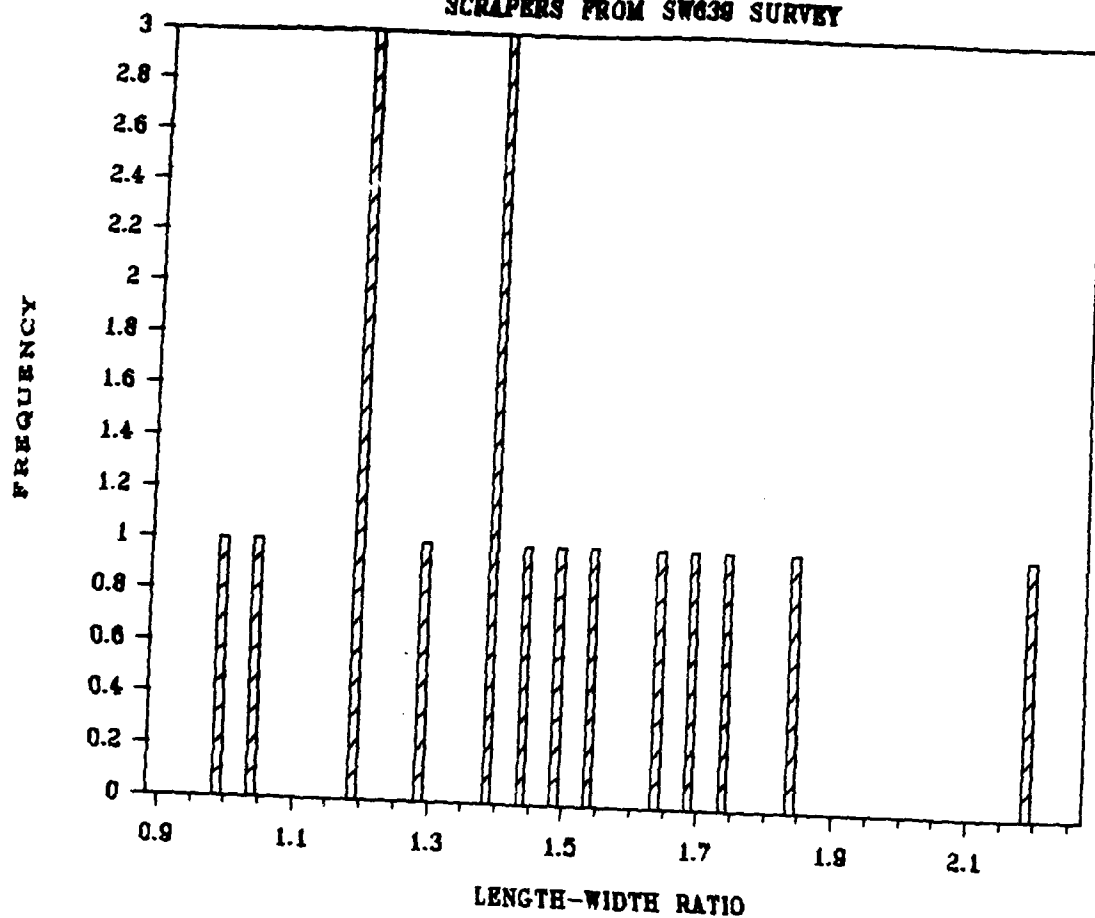


FIGURE 13.

LENGTH-WIDTH RATIO, PLANVIEW, MATERIAL

SORTED BY PLAN (1) AND L-W RATIO (2)

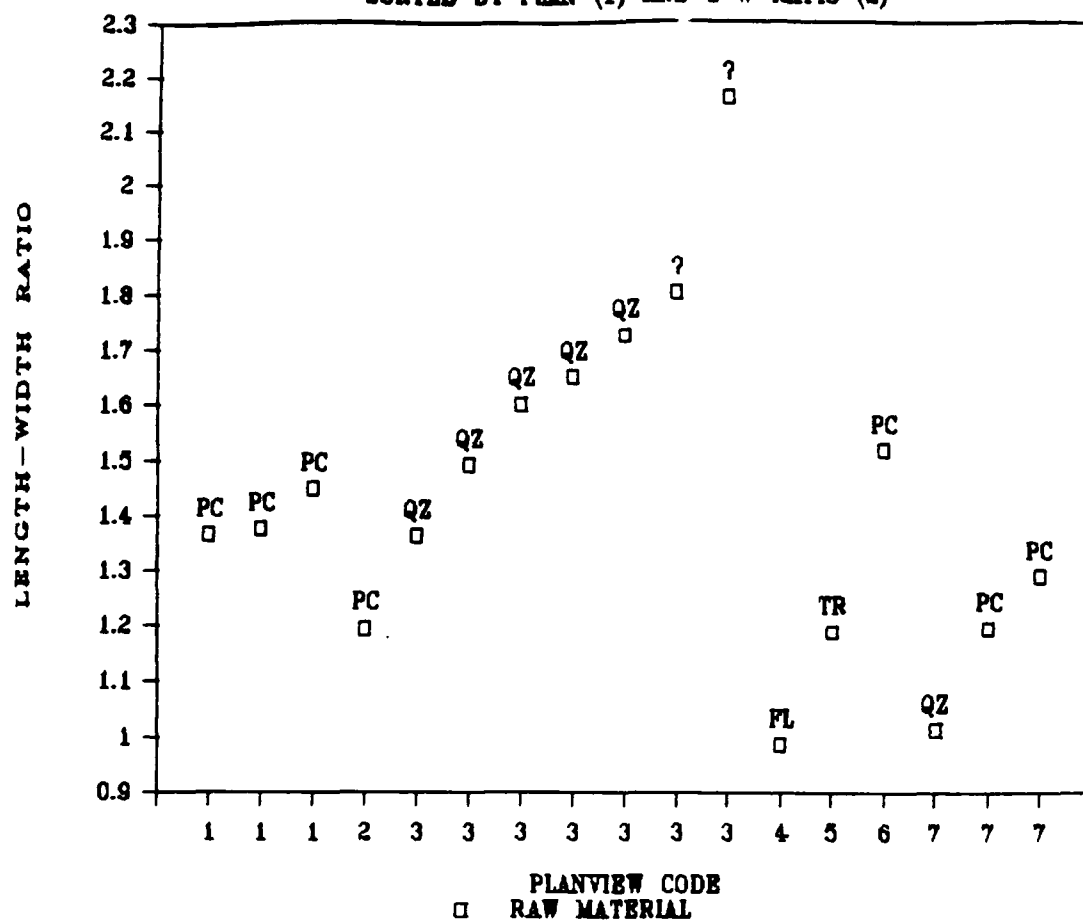


FIGURE 15. Scrapers sorted by planview, L/W ratio with material shown.

TABLE 5: DATA FOR CHIPPED STONE ENDSCRAPERS

ENDSCRAPERS =====													A		B	FLAKE	
ID #	FIELD #	SITE NUMBER	LENGTH (mm)	WIDTH (mm)	THICK. (mm)	WORKING FACE LENGTH (mm)	EDGE ANGLE	WORKING FACE ANGLE	WEIGHT (gm)	L/W RATIO	FL/L RATIO	FL/W RATIO	PLATFORM	CROSS- SECT.	CROSS- SECT.	LAT. RETOUCH	DORSAL SURFACE
10	CWS3	21LY15	22.29	16.31	3.7	16.31	86	55	1.2	1.367	0.7317	1	2	1	2	2	2
4	CWS11	21BW61	23.96	17.4	7.61	17.01	85	29	2.9	1.377	0.7099	0.9776	1	1	4	2	4
9	CWS16	21BW64	34.48	23.8	11.56	20.22	93	14	9.9	1.449	0.5864	0.8496	0	1	2	2	5
8	YMS7	21YM19	17.18	14.38	6.81	14.38	72	44	1.93	1.195	0.837	1	2	2	4	4	4
16	RWS18	21LY35	23.48	17.23	5.24	17.2	82	53	2.1	1.363	0.7325	0.9983	2	3	2	2	3
6	CWS18	21BW66	86.92	58.25	20.88	43.1	49	80	76.95	1.492	0.4959	0.7399	2	3	2	8	1
11	CWS3	21LY15	26.89	16.77	5.78	16.77	85	70	3.15	1.603	0.6237	1	2	3	6	4	1
2	CWS12	21BW62	54.54	32.99	20.88	32.95	83	48	35.55	1.653	0.6041	0.9988	2	3	4	2	1
1	CWS4	21LY16	35.72	20.65	13.46	18.58	66	52	12.05	1.730	0.5202	0.8998	0	3	2	5	1
12	YMS14	21YM42	38.82	21.47	10.28	20.3	94	35	12	1.808	0.5229	0.9455	2	3	3	5	1
3	RWS12	21LY24	76.42	35.31	15.57	34.51	88	38	35.25	2.164	0.4516	0.9773	2	3	4	2	3
7	CWS18	21BW66	23.4	23.7	5.37	23.7	88	50	3.08	0.987	1.013	1	1	4	5	2	4
15	RWS18	21LY35	27.24	22.89	8.12	21.69	88	53	6.5	1.190	0.7963	0.9476	0	5	2	4	5
5	CWS11	21BW61	25.01	16.44	6.8	15.74	65	24	3.2	1.521	0.6293	0.9574	1	6	1	2	4
14	RWS18	21LY35	19.71	19.43	6.82	19.23	88	77	2.75	1.014	0.9756	0.9897	1	7	4	2	3
17	RWS18	21LY35	19.3	16.14	7.69	15.58	73	31	2.85	1.196	0.8073	0.9653	2	7	3	4	4
13	RWS18	21LY35	23.06	17.86	6.31	17.51	80	49	3.15	1.291	0.7593	0.9903	1	7	4	2	4
N			17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00					
MIN			17.18	14.38	5.70	14.38	49.00	14.00	1.20	0.99	0.45	0.74					
MAX			86.92	58.25	20.88	43.10	94.00	80.00	76.95	2.16	1.01	1.00					
RANGE			69.74	43.87	17.18	28.72	45.00	66.00	75.75	1.18	0.56	0.26					
MEAN			34.02	23.00	9.58	21.46	80.29	47.18	12.62	1.44	0.69	0.96					
STD			19.57	10.45	5.09	7.71	11.41	17.36	19.13	0.29	0.16	0.07					

FL/W RATIO (mm)	PLAN- PLATFORM VIEW	A CROSS- SECT.	B CROSS- SECT.	LAT. RETOUCH	FLAKED DORSAL SURFACE	VENTRAL RETOUCH	GROUND LEFT LAT. EDGE	GROUND RT. LAT. EDGE	RAW MATERIAL	LOC. OF VENTRAL RETOUCH	LOCATION OF MAX. THICK.	SHAPE OF WORKING EDGE	SYMMETRY: DORSAL VIEW
1	2	1	2	2	2	1	1		1 PC	0	2	-	2
0.9776	1	1	4	2	4	2	2	1	1 PC	1	2	-	2
0.8496	0	1	2	2	5	1	2	1	1 PC	1,3,2	1	-	2
1	2	2	4	4	4	2	1	1	1 PC	0	1	-	1
0.9983	2	3	2	2	3	2	1	1	1 QZ	0	1	-	2
0.7399	2	3	2	8	1	1	1	1	1 QZ	0	1	-	3
1	2	3	6	4	1	1	1	1	1 QZ	0	2	-	3
0.9988	2	3	4	2	1	1	1	1	1 QZ	0	2	-	1
0.8998	0	3	2	5	1	1	1	1	1 QZ	0	1	-	3
0.9455	2	3	3	5	1	1	1	1	1 QZ	0	3	-	3
0.9773	2	3	4	2	3	1	1	1	1 ?	0	2	-	2
1	1	4	5	2	4	2	2	1	1 ?	0	2	-	1
0.9476	0	5	2	4	5	1	2	1	1 FL	1	1	-	1
0.9574	1	6	1	2	4	2	2	1	1 TR	4	2	-	1
0.9897	1	7	4	2	3	2	1	1	1 PC	3,4	1	-	3
0.9653	2	7	3	4	4	1	1	1	1 QZ	0	1	-	1
0.9903	1	7	4	2	4	2	1	1	1 PC	0	2	-	2
									1 PC	0	2	-	3

17.00
0.74
1.0
0.24
0.96
0.07

TABLE 6: ENDSCRAPER DATA SORTED BY PLANVIEW

TYPE 1 SCRAPERS
=====

ID #	FIELD #	SITE NUMBER	LENGTH	WIDTH	THICK.	FACE LENGTH	EDGE ANGLE	FACE ANGLE	WEIGHT	L/W RATIO	FL/L RATIO	FL/W RATIO	PLATFORM	PLAN- VIEW	CROSS- SECT.	CROSS- SECT.	LAT. RETOUCH	DORSAL SURFACE	VE RE
9	CWS16	21BW64	34.48	23.8	11.56	20.22	93	14	9.9	0.690	0.5864	0.8496	0	1	2	2	5	1	
4	CWS11	21BW61	23.96	17.4	7.61	17.01	85	29	2.9	0.726	0.7099	0.9776	1	1	4	2	4	2	
10	CWS3	21LY15	22.29	16.31	3.7	16.31	86	55	1.2	0.732	0.7317	1	2	1	2	2	2	2	
N			3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00							
MIN			22.29	16.31	3.70	16.31	85.00	14.00	1.20	0.69	0.59	0.85							
MAX			34.48	23.80	11.56	20.22	93.00	55.00	9.90	0.73	0.73	1.00							
RANGE			12.19	7.49	7.86	3.91	8.00	41.00	8.70	0.04	0.15	0.15							
MEAN			26.91	19.17	7.62	17.85	88.00	32.67	4.67	0.72	0.68	0.94							
STD			5.40	3.30	3.21	1.70	3.56	16.94	3.77	0.02	0.06	0.07							

TYPE 2 SCRAPERS
=====

ID #	FIELD #	SITE NUMBER	LENGTH	WIDTH	THICK.	FACE LENGTH	EDGE ANGLE	FACE ANGLE	WEIGHT	L/W RATIO	FL/L RATIO	FL/W RATIO	PLATFORM	PLAN- VIEW	CROSS- SECT.	CROSS- SECT.	LAT. RETOUCH	DORSAL SURFACE	VE RE
8	YMS7	21YM19	17.18	14.38	6.81	14.38	72	44	1.93	0.837	0.837	1	2	2	4	4	4	2	

TYPE 3 SCRAPERS
=====

ID #	FIELD #	SITE NUMBER	LENGTH	WIDTH	THICK.	FACE LENGTH	EDGE ANGLE	FACE ANGLE	WEIGHT	L/W RATIO	FL/L RATIO	FL/W RATIO	PLATFORM	PLAN- VIEW	CROSS- SECT.	CROSS- SECT.	LAT. RETOUCH	DORSAL SURFACE	VE RE
12	YMS14	21YM42	38.82	21.47	10.28	20.3	94	35	12	0.553	0.5229	0.9455	2	3	3	5	1	1	
1	CWS4	21LY16	35.72	20.65	13.46	18.58	66	52	12.05	0.578	0.5202	0.8998	0	3	2	5	1	1	
2	CWS12	21BW62	54.54	32.99	20.88	32.95	83	48	35.55	0.605	0.6041	0.9988	2	3	4	2	1	1	
11	CWS3	21LY15	26.89	16.77	5.78	16.77	85	70	3.15	0.624	0.6237	1	2	3	6	4	1	1	
6	CWS18	21BW66	86.92	58.25	20.88	43.1	49	80	76.95	0.670	0.4959	0.7399	2	3	2	8	1	1	
16	RWS18	21LY35	23.48	17.23	5.24	17.2	82	53	2.1	0.734	0.7325	0.9983	2	3	2	2	3	2	
N			6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00							
MIN			23.48	16.77	5.24	16.77	49.00	35.00	2.10	0.55	0.50	0.74							
MAX			86.92	58.25	20.88	43.10	94.00	80.00	76.95	0.73	0.73	1.00							
RANGE			63.44	41.48	15.64	26.33	45.00	45.00	74.85	0.18	0.24	0.26							
MEAN			44.40	27.89	12.75	24.82	76.50	56.33	23.63	0.63	0.58	0.93							
STD			21.45	14.60	6.37	9.85	14.82	14.73	26.26	0.06	0.08	0.09							

[illegible]

1	FL/W RATIO	PLAN- PLATFORM VIEW	CROSS- SECT.	CROSS- SECT.	LAT. RETOUCH	DORSAL SURFACE	VENTRAL RETOUCH	LEFT LAT. EDGE	RT. LAT. EDGE	RAW MATERIAL	VENTRAL RETOUCH	OF MAX. THICK.	WORKING EDGE	DORSAL VIEW
37	1	2	2	4	4	4	2	1	1	1 PDC	0	1	-	2

	FL/W	PLAN- RATIO PLATFORM VIEW	CROSS- SECT.	CROSS- SECT.	LAT. RETOUCH	DORSAL SURFACE	VENTRAL RETOUCH	LEFT LAT. EDGE	RT. LAT. EDGE	RAW MATERIAL	VENTRAL RETOUCH	OF MAX. THICK.	WORKING EDGE	DORSAL VIEW
100	6.00													
50	0.74													
75	1.00													
24	0.26													
58	0.93													
08	0.09													
20	0.9455	2	3	3	5	1	1	1	1	1 ?	0	2	-	2
02	0.8998	0	3	2	5	1	1	1	1	1 QZT	0	3	-	3
41	0.9988	2	3	4	2	1	1	1	1	1 QZT	0	1	-	3
37	1	2	3	6	4	1	1	1	1	1 QZT	0	2	-	1
59	0.7399	2	3	2	8	1	1	1	1	1 QZT	0	2	-	3
25	0.9983	2	3	2	2	3	2	1	1	1 QZT	0	1	-	3

TYPE 4 SCRAPERS

=====

ID #	FIELD #	SITE NUMBER	LENGTH	WIDTH	THICK.	FACE LENGTH	EDGE ANGLE	FACE ANGLE	WEIGHT	L/W RATIO	FL/L RATIO	FL/W RATIO	PLATFORM	PLAN- VIEW	CROSS- SECT.	CROSS- SECT.	LAT. RETOUCH	DORSAL SURFACE
7	CWS18	21BW66	23.4	23.7	5.37	23.7	88	50	3.08	1.013	1.013	1	1	4	5	2	4	2

TYPE 5 SCRAPERS

=====

ID #	FIELD #	SITE NUMBER	LENGTH	WIDTH	THICK.	FACE LENGTH	EDGE ANGLE	FACE ANGLE	WEIGHT	L/W RATIO	FL/L RATIO	FL/W RATIO	PLATFORM	PLAN- VIEW	CROSS- SECT.	CROSS- SECT.	LAT. RETOUCH	DORSAL SURFACE
15	RWS18	21LY35	27.24	22.89	8.12	21.69	88	53	6.5	0.840	0.7963	0.9476	0	5	2	4	5	1

TYPE 6 SCRAPERS

=====

ID #	FIELD #	SITE NUMBER	LENGTH	WIDTH	THICK.	FACE LENGTH	EDGE ANGLE	FACE ANGLE	WEIGHT	L/W RATIO	FL/L RATIO	FL/W RATIO	PLATFORM	PLAN- VIEW	CROSS- SECT.	CROSS- SECT.	LAT. RETOUCH	DORSAL SURFACE
5	CWS11	21BW61	25.01	16.44	6.8	15.74	65	24	3.2	0.657	0.6293	0.9574	1	6	1	2	4	2

TYPE 7 SCRAPERS

=====

ID #	FIELD #	SITE NUMBER	LENGTH	WIDTH	THICK.	FACE LENGTH	EDGE ANGLE	FACE ANGLE	WEIGHT	L/W RATIO	FL/L RATIO	FL/W RATIO	PLATFORM	PLAN- VIEW	CROSS- SECT.	CROSS- SECT.	LAT. RETOUCH	DORSAL SURFACE
13	RWS18	21LY35	23.06	17.86	6.31	17.51	80	49	3.15	0.775	0.7593	0.9903	1	7	4	2	4	2
17	RWS18	21LY35	19.3	16.14	7.69	15.58	73	31	2.85	0.836	0.8073	0.9653	2	7	3	4	4	1
14	RWS18	21LY35	19.71	19.43	6.82	19.23	88	77	2.75	0.986	0.9756	0.9897	1	7	4	2	3	2

N			3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00						
MIN			19.30	16.14	6.31	15.58	73.00	31.00	2.75	0.77	0.76	0.97						
MAX			23.06	19.43	7.69	19.23	88.00	77.00	3.15	0.99	0.98	0.99						
RANGE			3.76	3.29	1.38	3.65	15.00	46.00	0.40	0.21	0.22	0.02						
MEAN			20.69	17.81	6.94	17.44	80.33	52.33	2.92	0.87	0.85	0.98						
STD			1.68	1.34	0.57	1.49	6.13	18.93	0.17	0.09	0.09	0.01						

TYPE 8 SCRAPERS

=====

3	RWS12	21LY24	76.42	35.31	15.57	34.51	88	38	35.25	0.462	0.4516	0.9773	2	3	4	2	3	1
---	-------	--------	-------	-------	-------	-------	----	----	-------	-------	--------	--------	---	---	---	---	---	---

FL/W RATIO	PLATFORM	PLAN- VIEW	CROSS- SECT.	CROSS- SECT.	LAT. RETOUCH	DORSAL SURFACE	VENTRAL RETOUCH	LEFT EDGE	RT. LAT. EDGE	RAW MATERIAL	VENTRAL RETOUCH	OF MAX. THICK.	WORKING EDGE	DORSAL VIEW
5 1	1	4	5	2	4	2	2	1	1	FLINT	1	1	-	1

FL/W RATIO	PLATFORM	PLAN- VIEW	CROSS- SECT.	CROSS- SECT.	LAT. RETOUCH	DORSAL SURFACE	VENTRAL RETOUCH	LEFT EDGE	RT. LAT. EDGE	RAW MATERIAL	VENTRAL RETOUCH	OF MAX. THICK.	WORKING EDGE	DORSAL VIEW
3 0.9476	0	5	2	4	5	1	2	1	1	TG. RIV.	4	2	-	1

FL/W RATIO	PLATFORM	PLAN- VIEW	CROSS- SECT.	CROSS- SECT.	LAT. RETOUCH	DORSAL SURFACE	VENTRAL RETOUCH	LEFT EDGE	RT. LAT. EDGE	RAW MATERIAL	VENTRAL RETOUCH	OF MAX. THICK.	WORKING EDGE	DORSAL VIEW
3 0.9574	1	6	1	2	4	2	2	1	1	PDC	3,4	1	-	3

FL/W RATIO	PLATFORM	PLAN- VIEW	CROSS- SECT.	CROSS- SECT.	LAT. RETOUCH	DORSAL SURFACE	VENTRAL RETOUCH	LEFT EDGE	RT. LAT. EDGE	RAW MATERIAL	VENTRAL RETOUCH	OF MAX. THICK.	WORKING EDGE	DORSAL VIEW
3 0.9903	1	7	4	2	4	2	1	1	1	PDC	0	2	-	3
3 0.9653	2	7	3	4	4	1	1	1	1	PDC	0	2	-	2
6 0.9897	1	7	4	2	3	2	1	1	1	QZT	0	1	-	1

10 3.00
 6 0.97
 8 0.99
 2 0.02
 5 0.98
 9 0.01

6 0.9773	2	3	4	2	3	1	1	1	1	?	0	2	-	1
----------	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Knives and projectile points

Several chipped stone tools other than endscrapers were recovered during the 639 survey. The numbers of these tools are low and the variability of form in the other chipped stone tools is high. Therefore, no detailed analysis of these materials is presented here.

Two knives were recovered.

One knife from 21LY15 is lanceolate in form and is made of Prairie du Chien chert. The edges of the knife are bilaterally asymmetric and one edge is noticeably more convex than the other. The base of the knife is flat and basally thinned but there is no evidence of basal or side grinding. Dimensions of this knife are: 31 mm in length, 18 mm maximum length, and 3 mm maximum thickness. This artifact is similar to knives and points described at 21YM35 by Dobbs (1979) and the Cherokee Sewer site in northwestern Iowa (Anderson 1980:216). This knife may be Archaic in age.

The second knife is from 21YM42. This knife is long and narrow, pointed on both ends, and made of brown chalcedony. The form of the edges are bilaterally asymmetric and the working edge appears to have been thinned along the entire lengthwise axis of the knife. This artifact is 72 mm long, maximum width is 19 mm, and maximum thickness is 6 mm.

Nineteen projectile points were recovered during the 639 survey. However, only five of the 19 points were complete enough to permit any discussion of their possible temporal/cultural affiliation.

The projectile point from 21LY19 is made of a local chalcedony and is corner-notched. This point is similar to Little Sioux points described by Morrow (1984:61) and may be affiliated with the Early to Middle Archaic traditions.

The small side-notched projectile point from 21LY35 does not fit into any named point type.

The small notched projectile point from 21LY20 is made of quartz and is probably falls within the Late Woodland or Early Plains Village traditions.

Two projectile points were recovered from 21LY26. One of these points is a small, side-notched point made of quartzite. This point does not fit within any named point type. Only the base of the other point is present. However, it appears that this point may be affiliated with the Late Archaic Tradition.

c. Debris profiles and settlement types

Introduction

Thirty-five new archaeological sites were discovered during the 639 survey. The location, survey methods employed, and artifacts from each site have been described above. Most of these sites are small scatters of lithic debris. In only a few instances can the cultural affiliation of the site be determined. However, by developing settlement types based on the debris profile of each site, it is possible to create an initial model of some of the types of sites that are present in the three river drainages that were examined.

Two assumptions underlie the use of settlement types in archaeological research. The first assumption is that the debris remaining at any given site is a product of the particular activity(s) that took place at the site. The second assumption is that different archaeological cultures will leave distinctive suites of debris. Therefore, an examination of the debris profiles of sites within the 639 study area should produce settlement types that are representative of specific functions, specific archaeological cultures, or both.

Obviously, the debris profiles may cross-cut both function and cultural affiliation. Multi-component sites, for example, may have debris profiles that are distinct from sites that have specific functions and/or which are referable to one specific archaeological culture. Furthermore, it is not necessarily apparent at this point what specific function may have created a given set of debris profiles.

The model of prehistoric settlement types presented here is a preliminary formulation. The intent of this analysis is to generate an initial model of settlement types that serve to generate hypotheses and models that may be tested in the future. There are, however, several caveats that the reader should keep in mind when considering these settlement types.

Clustering analysis and cross-tabulation were used to generate and evaluate these types. These statistical methods were used only as discovery techniques and not to formally test or 'prove' hypotheses. The results of the cross-tabulation, in particular, must be taken *cum grano* since there were many empty or sparse cells in the cross-tabulation tables.

Most of the sites used in the analysis were small and contained few artifacts. The total number of sites used in the analysis is also small. The full range of site types in southwestern Minnesota is not represented in this sample. For example, the large Woodland Tradition sites that commonly occur on islands or around the lakeshores of lakes are not included here.

Finally, the cultural affiliation of many of the sites in the sample is unknown. As a result, cultural affiliation probably cross-cuts these settlement types in ways that are not yet apparent. This is not surprising since the debris profiles of certain kinds of activities may not have changed significantly through time. However, one key goal for future research should be attempts to differentiate between sites of different cultural traditions within broader functional categories.

Methods

Six preliminary settlement types are defined for the Yellow Medicine, Cottonwood, and Redwood river drainages. These types were generated by computing a series of indices for each individual site and then clustering the sites using these indices. The number of clusters was determined by an initial examination of the clustering tree and a post-hoc examination of the internal homogeneity of the clusters and the goodness of fit of the clusters with the physiographic setting of each site.

Because the number of artifacts from many sites was small, only six metric indices could be generated. These indices were percent tools, percent tertiary flakes, percent shatter, percent quartz, and percent Tongue River silicified sediment. These indices were computed by dividing the number of each item by the total number of that item for all 35 sites. The tool index, for example, was computed by dividing the total number of tools at a site by the total number of tools found at all of the sites.

In addition to the continuous variables, three presence/absence variables were used for specific artifact categories. These were points, scrapers, and pots. These indices were coded 1 when the artifact type was present at a given site and 0 when the artifact type was absent.

The data were clustered several different ways using both k-means and hierarchical clustering methods. Different distance measures and methods of linkage were tested. The most satisfactory clustering was obtained when a hierarchical clustering method using single linkage and a Euclidean distance measure were employed. In the final clustering, the presence/absence variables were included in the analysis and treated as continuous variables. This resulted in some sorting of the clusters by presence/absence of points, scrapers, and pottery. However, this approach also produced the most intelligible set of clusters.

Settlement types

The clustering diagram used to generate settlement types is shown in Fig. 16. Examination of this diagram resulted in the definition of six settlement types. The basic data and descriptive statistics for each of these types is shown in Table 7.

Settlement type 1 consists of three sites. This settlement type is characterized by very small sites with very few artifacts. All sites of this type contain pottery and are affiliated with the Woodland (probably Late Woodland) Tradition. Only tertiary flakes are found at these sites and chert or quartzite are the dominant raw materials. Projectile points are sometimes found but scrapers are not.

Settlement type 2 consists of four sites. This settlement type appears to represent sites where procurement and processing of resources took place. One of the sites (21BW61) is possibly multi-component but is certainly affiliated with a late-prehistoric culture, probably Oneota. 21LY26 is probably Early or Middle Archaic in age. 21LY19 and 21LY21 are probably Late Woodland in age. The common elements that these sites share include a high relative density of tools, relatively low numbers of tertiary flakes and shatter, the consistent presence of projectile points, the occasional presence of endscrapers, high relative amounts of quartzite and chert, and the presence of Tongue River silicified sediment at two of the sites.

Settlement type 3 consists of 8 sites. The cultural affiliation of these sites is unknown. This settlement type appears to represent small, aceramic processing stations. The common elements shared by these sites include a relative low density of tools, a relatively high proportion of tertiary flakes but variable density of shatter, relatively low amounts of chert but relatively high amounts of quartzite, and variable amounts of Tongue River silicified sediment. No pottery or projectile points are present but all sites contained endscrapers. Several of the endscrapers were quite large and may be Archaic in age.

Settlement type 4 consists of 2 sites. The cultural affiliation of these sites is unknown. These sites are characterized by high relative percentages of tools, tertiary flakes, and shatter. Chert occurs in relatively low amounts but quartzite is relatively high. Tongue River silicified sediment occurs in very high proportions. These sites do not contain pottery, projectile points, or endscrapers.

Settlement type 5 consists of 17 sites. The cultural affiliation of these sites is unknown. These sites are all very small and contain few artifacts. The proportion of all the indices are very low.

Settlement type 6 contains 1 site, 21LY35. This site may be affiliated with the Woodland Tradition and appears to represent either a base camp or a major processing site related to the nearby sloughs and marshes.

FIG. 16: CLUSTERING TREE FOR SETTLEMENT
TYPE ANALYSIS

TREE DIAGRAM		DISTANCES	
	.000		.500
21YM43	— ?		
	— O — ?		
21YM40	? — 3	3	
	— O — Y	3	
21LY31	Y — 3	3	
	— O — ?		
21LY26	— ? — 3	3	3
	— O — ?	3	3
21LY21	— Y — 3	3	3
	— 3	3	3
21LY19	— 3	3	3
	— 4	3	3
21BW61	— 4	3	3
	— 3	3	3
21LY15	— ? — 3	3	3
	— C? — 3	3	3
21YM42	?33 — 3	3	3
	333 — 3	3	3
21LY24	433 — 3	3	3
	— CY3 — 3	3	3
21BW62	4 3 — 3	3	3
	3 3 — 3	3	3
21BW66	4 3 — 3	3	3
	3 3 — 3	3	3
21BW64	4 3 — 3	3	3
	3 3 — 3	3	3
21BW51	Y 3 — 3	3	3
	— O — 4	3	3
21LY16	— Y — 3	3	3
	— O — Y		3
21LY17	— ? — 3	3	3
	— O — Y		3
21LY28	?3 — 3	3	3
	— CY — 3		3
21LY23	4 — 3	3	3
	3 — 3	3	3
21LY20	4 — 3	3	3
	3 — 3	3	3
21YM38	4 — 3	3	3
	3 — 3	3	3
21BW63	4 — 3	3	3
	3 — 3	3	3
21BW65	4 — 3	3	3
	3 — 3	3	3
21YM44	4 — 3	3	3
	3 — 3	3	3
21YM39	4 — 3	3	3
	3 — 3	3	3
21YM41	4 — 3	3	3
	3 — 3	3	3
21LY30	4 — 3	3	3
	3 — 3	3	3
21LY18	4 — 3	3	3
	3 — 3	3	3
21LY33	4 — 3	3	3
	3 — 3	3	3
21LY34	4 — 3	3	3
	3 — 3	3	3
21LY32	4 — 3	3	3
	3 — 3	3	3
21LY29	4 — 3	3	3
	3 — 3	3	3
21LN16	4 — 3	3	3
	3 — 3	3	3
21BW67	4 — 3	3	3
	3 — 3	3	3
21LY22	Y — 3	3	3
	— O —		3
21LY35	— Y		3

TABLE 7: DATA FOR INDIVIDUAL SETTLEMENT TYPES

SETTLEMENT TYPE ONE: DATA AND DESCRIPTIVE STATISTICS

SITE	TOOLS	TERTIARY	SHATTER	CHERT	QUARTZ	TONGRIV	POINTS	SCRAPER	RIVER	PHYS	POTS
21YM40	0.0120	0.0048	0.0000	0.0144	0.0000	0.0000	1	0 YM	F		1
21LY31	0.0060	0.0000	0.0000	0.0000	0.0019	0.0000	1	0 RW	F		1
21YM43	0.0060	0.0000	0.0000	0.0000	0.0000	0.0000	0	0 YM	F		1
N:	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3	3			3
MIN:	0.0060	0.0000	0.0000	0.0000	0.0000	0.0000	0	0			1
MAX:	0.0120	0.0048	0.0000	0.0144	0.0019	0.0000	1	0			1
RANGE:	0.0060	0.0048	0.0000	0.0144	0.0019	0.0000	1	0			0
MEAN:	0.0080	0.0016	0.0000	0.0048	0.0006	0.0000					
ST. DEV.:	0.0028	0.0023	0.0000	0.0068	0.0009	0.0000					

SETTLEMENT TYPE TWO: DATA AND DESCRIPTIVE STATISTICS

SITE	TOOLS	TERTIARY	SHATTER	CHERT	QUARTZ	TONGRIV	POINTS	SCRAPER	RIVER	PHYS	POTS
21BW61	0.0361	0.0216	0.0103	0.0540	0.0115	0.0000	1	1 CW	F		1
21LY26	0.0843	0.0216	0.0412	0.0683	0.0268	0.0000	1	0 RW	UF		0
21LY21	0.0301	0.0120	0.0206	0.0108	0.0134	0.0156	1	0 YM	UF		0
21LY19	0.0482	0.0192	0.0052	0.0180	0.0134	0.0313	1	1 YM	UF		0
N:	4.0000	4.0000	4.0000	4.0000	4.0000	4.0000	4	4			4
MIN:	0.0301	0.0120	0.0052	0.0108	0.0115	0.0000	1	0			0
MAX:	0.0843	0.0216	0.0412	0.0683	0.0268	0.0313	1	1			1
RANGE:	0.0542	0.0096	0.0360	0.0575	0.0153	0.0313	0	1			1
MEAN:	0.0497	0.0186	0.0193	0.0378	0.0163	0.0117					
ST. DEV.:	0.0210	0.0039	0.0138	0.0241	0.0061	0.0130					

SETTLEMENT TYPE THREE: DATA AND DESCRIPTIVE STATISTICS

SITE	TOOLS	TERTIARY	SHATTER	CHERT	QUARTZ	TONGRIV	POINTS	SCRAPER	RIVER	PHYS	POTS
21BW62	0.0181	0.0264	0.0052	0.0108	0.0402	0.0000	0	1 CW	F		0
21YM42	0.0120	0.0072	0.0000	0.0000	0.0076	0.0156	0	1 YM	F		0
21BW66	0.0361	0.0120	0.0258	0.0180	0.0306	0.0000	0	1 CW	F		0
21LY15	0.0422	0.0456	0.0000	0.0504	0.0229	0.0000	0	1 CW	F		0
21BW64	0.0301	0.0120	0.0206	0.0252	0.0229	0.0000	0	1 CW	F		0
21LY24	0.0181	0.0144	0.0000	0.0180	0.0096	0.0469	0	1 RW	UF		0
21LY16	0.0663	0.0624	0.1186	0.0468	0.0746	0.1094	0	1 CW	UF		0
21RW51	0.0241	0.0192	0.0206	0.0036	0.0325	0.0000	0	1 RW	UF		0
N:	8.0000	8.0000	8.0000	8.0000	8.0000	8.0000	8	8			8
MIN:	0.0120	0.0072	0.0000	0.0000	0.0076	0.0000	0	1			0
MAX:	0.0663	0.0624	0.1186	0.0504	0.0746	0.1094	0	1			0
RANGE:	0.0543	0.0552	0.1186	0.0504	0.0670	0.1094	0	0			0
MEAN:	0.0309	0.0249	0.0239	0.0216	0.0301	0.0215					
ST. DEV.:	0.0164	0.0181	0.0372	0.0174	0.0197	0.0366					

SETTLEMENT TYPE FOUR: DATA AND DESCRIPTIVE STATISTICS

SITE	TOOLS	TERTIARY	SHATTER	CHERT	QUARTZ	TONGRIV	POINTS	SCRAPER	RIVER	PHYS	POTS
21LY28	0.0301	0.0168	0.0412	0.0036	0.0325	0.0625	0	0 YN	U		0
21LY17	0.0602	0.0504	0.0412	0.0216	0.0516	0.1406	0	0 CW	U		0
N:	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2	2			2
MIN:	0.0301	0.0168	0.0412	0.0036	0.0325	0.0625	0	0			0
MAX:	0.0602	0.0504	0.0412	0.0216	0.0516	0.1406	0	0			0
RANGE:	0.0301	0.0336	0.0000	0.0180	0.0191	0.0781	0	0			0
MEAN:	0.0452	0.0336	0.0412	0.0126	0.0421	0.1016					
ST. DEV.:	0.0150	0.0168	.0000	0.0090	0.0095	0.0391					

SETTLEMENT TYPE FIVE: DATA AND DESCRIPTIVE STATISTICS

SITE	TOOLS	TERTIARY	SHATTER	CHERT	QUARTZ	TONGRIV	POINTS	SCRAPER	RIVER	PHYS	POTS
21BW63	0.0181	0.0048	0.0000	0.0180	0.0038	0.0000	0	0 CW	F		0
21YM41	0.0000	0.0000	0.0000	0.0000	0.0019	0.0000	0	0 YN	F		0
21LY32	0.0060	0.0000	0.0000	0.0036	0.0000	0.0000	0	0 RW	F		0
21LY18	0.0000	0.0024	0.0000	0.0000	0.0019	0.0000	0	0 CW	F		0
21BW67	0.0000	0.0000	0.0000	0.0000	0.0019	0.0156	0	0 CW	F		0
21YM44	0.0000	0.0072	0.0000	0.0036	0.0076	0.0000	0	0 YN	F		0
21BW65	0.0000	0.0096	0.0000	0.0108	0.0076	0.0000	0	0 CW	F		0
21LY20	0.0181	0.0288	0.0052	0.0324	0.0134	0.0313	0	0 CW	F		0
21YM38	0.0241	0.0072	0.0000	0.0108	0.0096	0.0000	0	0 YN	L		0
21LY33	0.0000	0.0048	0.0000	0.0000	0.0000	0.0000	0	0 RW	U		0
21LY34	0.0060	0.0000	0.0000	0.0036	0.0000	0.0000	0	0 RW	U		0
21YM39	0.0000	0.0072	0.0000	0.0000	0.0076	0.0000	0	0 YN	U		0
21LY29	0.0060	0.0000	0.0000	0.0036	0.0000	0.0000	0	0 YN	U		0
21LN16	0.0060	0.0000	0.0000	0.0000	0.0019	0.0000	0	0 YN	U		0
21LY30	0.0000	0.0000	0.0000	0.0000	0.0019	0.0000	0	0 RW	UF		0
21LY22	0.0060	0.0216	0.0000	0.0000	0.0210	0.0156	0	0 CW	UF		0
21LY23	0.0181	0.0240	0.0206	0.0252	0.0191	0.0156	0	0 RW	UF		0
N:	17.0000	17.0000	17.0000	17.0000	17.0000	17.0000	17	17			17
MIN:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0			0
MAX:	0.0241	0.0288	0.0206	0.0324	0.0210	0.0313	0	0			0
RANGE:	0.0241	0.0288	0.0206	0.0324	0.0210	0.0313	0	0			0
MEAN:	0.0064	0.0069	0.0015	0.0066	0.0058	0.0046					
ST. DEV.:	0.0079	0.0089	0.0049	0.0096	0.0064	0.0089					

SETTLEMENT TYPE SIX: DATA (NO STATISTICS COMPUTED)

21LY35	0.3434	0.5420	0.6237	0.5396	0.5086	0.5000	1	1 RW	UF		1
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Cross-tabulation

Cross-tabulation was used to explore the relationship between settlement type and other variables.

Figure 17 shows the cross-tabulation of settlement type (CLUSNUM) and physiographic zone (PHYS). Three distinct physiographic zones were identified: floodplain (F), bluffs or terraces immediately adjacent to the floodplain (UF), and uplands away from the floodplain (U). Although the statistical results must be interpreted with caution, it appears that there is a strong relationship between settlement type and physiographic zone.

Settlement type 1 sites are found exclusively in the floodplain. Settlement type 2 sites are generally found in the areas adjacent to the floodplain. The Archaic and Woodland Type 2 sites are found adjacent to the floodplain while the Oneota site (21BW61) is situated within the floodplain. Five of the settlement type 3 sites are located in the floodplain while three are in areas adjacent to the floodplain. Both settlement type 4 sites are within the uplands. Settlement type 5 sites are distributed relatively evenly across all three physiographic zones.

Figure 18 contains the cross-tabulation of the presence/absence of scrapers with physiographic zone. Although the statistical results must be interpreted with caution, there appears to be a relationship between physiographic zone and the presence of endscrapers. Only 30% of the sites in the floodplain contained scrapers, whereas 50% of the sites immediately adjacent to the floodplain yielded endscrapers. No endscrapers were found in upland settings.

Analysis of the endscrapers indicated that there may be several distinct types of endscrapers present within the survey area. Figure 19 contains a cross-tabulation of endscraper type based on planview (SCTYPE) and settlement type (CLUSNUM). Although scrapers were present only in settlement types 2, 3 and 6, there appears to be a relationship between the type of endscraper and settlement type.

Cross-tabulation was also conducted for the following pairs of variables: presence/absence of points and scrapers, points and pottery, pottery and scrapers, points and physiographic zone, points and river subbasin, scraper and river subbasin, settlement type and river subbasin, scraper type and site, scraper type and points, scraper type and pottery, and scraper type and river subbasin. None of these analyses produced results that suggested a relationship between the two variables tabulated.

FIG. 19: SCRAPER TYPE AND SETTLEMENT TYPE

TABLE OF SCTYPE (ROWS) BY CLUSNUM (COLUMNS)
FREQUENCIES

	2	3	6	TOTAL
1	1	2	0	3
2	1	0	0	1
3	0	5	1	6
4	0	1	0	1
5	0	0	1	1
6	1	0	0	1
7	0	0	3	3
8	0	1	0	1
TOTAL	3	9	5	17

MODEL WAS FIT AFTER 2 ITERATIONS.

WARNING: MORE THAN ONE-FIFTH OF FITTED CELLS ARE SPARSE (FREQUENCY < 5)
FOLLOWING SIGNIFICANCE TESTS ARE SUSPECT.

TEST OF FIT OF MODEL

DEGREES OF FREEDOM : 14
PEARSON CHI-SQUARE : 24.56 PROBABILITY = .039

2. MODELING SITE LOCATION IN THE 639 STUDY AREA

One of the principal objectives of the 639 survey was to produce a model of the location of prehistoric archaeological sites in this portion of southwestern Minnesota. It would be possible to construct a very lengthy and complex model of settlement for the 639 area. Unfortunately, the available data do not support such an approach. Instead, models of site location will be presented in tabular form indicating the chance of an archaeological site occurring in a given type of setting.

Two different models are presented. The first uses the existing information from the Minnesota State site files. Site types and environmental zones are drawn from descriptions on the site forms. The second model uses only data obtained during the 639 survey.

Model 1: using existing site location data

Table 8 contains the results of Model One. This model was generated using only the information contained in the Minnesota state site files. Settlement types and physiographic zone were derived from comments and information on the site forms and as a result are not rigorously or quantitatively defined.

Physiographic zones include uplands, floodplain, lakeshore, island, and lakebeds. Settlement types include dugouts, mounds, scatters, bison kills, habitation sites, burial sites, find spots, camp, work shops, pit houses, villages, and buried sites.

TABLE 8: PREDICTIVE MODEL OF SITE LOCATION - MODEL 1

UPLAND	SITE TYPE/TOTAL NUMBER SITES IN STRATA
DUGOUT	0.0089 i.e. (.89% of all sites in uplands are dugouts)
MOUND	0.3036
SCATTER	0.4554
BISON KILL	0.0089
HABITATION	0.0982
BURIAL	0.0268
FIND SPOT	0.0636
CAMP	0.0268
WORK SHOP	0.0089
PIT HOUSE	0.0089
UPLAND	SITE TYPE/TOTAL ALL KNOWN SITES OF THIS TYPE FOR ALL STRATA
DUGOUT	0.5000 (i.e. 50% of all mounds are found in uplands)
MOUND	0.9444
SCATTER	0.5204
BISON KILL	1.0000
HABITATION	0.3233
BURIAL	1.0000
FIND SPOT	0.6000
CAMP	1.0000
WORK SHOP	1.0000
PIT HOUSE	1.0000
FLOODPLAIN	SITE TYPE/TOTAL NUMBER OF SITES IN STRATA
DUGOUT	0.0204
SCATTER	0.4694
HABITATION	0.3265
MOUNDS	0.0408
FIND SPOT	0.0816
BURIED	0.0408
VILLAGE	0.0204
FLOODPLAIN	SITE TYPE/TOTAL ALL KNOWN SITES OF THIS TYPE FOR ALL STRATA
DUGOUT	0.5000
SCATTER	0.2347
HABITATION	0.4706
MOUNDS	0.0556
FIND SPOT	0.4000
BURIED	1.0000
VILLAGE	1.0000

LAKE SHORE SITE TYPE/TOTAL NUMBER SITES IN STRATA

COMPLEX	0.0645
SCATTER	0.7097
HABITATION	0.1935
UNKNOWN	0.0323

LAKE SHORE SITE TYPE/TOTAL ALL KNOWN SITES OF THIS TYPE FOR ALL STRATA

COMPLEX	1.0000
SCATTER	0.2245
HABITATION	0.1766
UNKNOWN	1.0000

ISLAND SITE TYPE/TOTAL NUMBER SITES IN STRATA

SCATTER	0.5
HABITATION	0.5

ISLAND SITE TYPE/TOTAL ALL KNOWN SITES OF THIS TYPE FOR ALL STRATA

SCATTER	0.0102
HABITATION	0.0294

LAKEBED SITE TYPE/TOTAL NUMBER SITES IN STRATA

SCATTER	1.0000
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LAKEBED SITE TYPE/TOTAL ALL KNOWN SITES OF THIS TYPE FOR ALL STRATA

SCATTER	0.0102
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Model 2: using only 639 survey data

Model Two is derived solely from the data gathered during the 639 survey. This model presents information on the frequency with which sites occur within the geomorphological strata used during the survey.

Model Two is presented in Table 9. Estimates of the frequency of site occurrence in the floodplain, confluence, terrace, and reservoir strata are given for the entire survey universe (Yellow Medicine, Redwood, and Cottonwood subbasins) and for each individual subbasin. The estimates for the entire survey universe may be accepted at a 90% level of confidence. Within the entire universe, estimates may be accepted at a 90% level of confidence for the floodplain and confluence strata and at a 95% level of confidence for the reservoir and terrace strata. Sample size for each of the individual subbasins and their constituent strata is too small for the estimates to be evaluated in a statistically meaningful way. They are presented here for comparison with the entire survey universe and as tentative models for future investigations.

TABLE 9: PREDICTIVE MODEL OF SITE LOCATION - MODEL 2

FOR TOTAL SAMPLE UNIVERSE

STRATUM	TOTAL SAMPLE UNITS	TOTAL SITES	SITE FREQUENCY	D	CONFIDENCE INTERVAL	
					MIN	MAX
Floodplain	14	9	0.64	0.032	0.611	0.675
Confluence	14	3	0.21	0.032	0.182	0.246
Terrace	30	3	0.10	0.090	0.010	0.190
Reservoir	7	5	0.71	0.187	0.528	0.901
Total:	65	20				

FOR YELLOW MEDICINE SUBBASIN

STRATUM	TOTAL SAMPLE UNITS	TOTAL SITES	SITE FREQUENCY	D	CONFIDENCE INTERVAL	
					MIN	MAX
Floodplain	6	6	1.00	0.201	0.799	1.201
Confluence	5	0	0.00	0.221	-0.221	0.221
Terrace	10	2	0.20	0.156	0.044	0.356
Reservoir	2	3	1.50	0.349	1.151	1.849
Total:	23	11				

FOR REDWOOD SUBBASIN

STRATUM	TOTAL SAMPLE UNITS	TOTAL SITES	SITE FREQUENCY	D	CONFIDENCE INTERVAL	
					MIN	MAX
Floodplain	5	2	0.40	0.221	0.179	0.621
Confluence	5	3	0.60	0.221	0.379	0.821
Terrace	11	1	0.09	0.149	-0.058	0.240
Reservoir	3	2	0.67	0.285	0.382	0.952
Total:	24	8				

FOR COTTONWOOD SUBBASIN

STRATUM	TOTAL SAMPLE UNITS	TOTAL SITES	SITE FREQUENCY	D	CONFIDENCE INTERVAL	
					MIN	MAX
Floodplain	3	1	0.33	0.285	0.048	0.618
Confluence	4	0	0.00	0.247	-0.247	0.247
Terrace	9	0	0.00	0.165	-0.165	0.165
Reservoir	2	0	0.00	0.349	-0.349	0.349
Total:	18	1				

TABLE 10: DERIVATION OF 'D' FOR MODEL 2

TOTAL UNIVERSE	YELLOW MEDICINE	REDWOOD	COTTONWOOD
Floodplain			
d 0.13189	d 0.20147	d 0.22069	d 0.284922
z 1.645	z 1.645	z 1.645	z 1.645
p 0.9	p 0.9	p 0.9	p 0.9
q 0.1	q 0.1	q 0.1	q 0.1
n 14	n 6	n 5	n 3
Confluence			
d 0.13189	d 0.22069	d 0.22069	d 0.24675
z 1.645	z 1.645	z 1.645	z 1.645
p 0.9	p 0.9	p 0.9	p 0.9
q 0.1	q 0.1	q 0.1	q 0.1
n 14	n 5	n 5	n 4
Terrace			
d 0.09010	d 0.15605	d 0.14879	d 0.1645
z 1.645	z 1.645	z 1.645	z 1.645
p 0.9	p 0.9	p 0.9	p 0.9
q 0.1	q 0.1	q 0.1	q 0.1
n 30	n 10	n 11	n 9
Reservoir			
d 0.18652	d 0.34895	d 0.28492	d 0.348957
z 1.645	z 1.645	z 1.645	z 1.645
p 0.9	p 0.9	p 0.9	p 0.9
q 0.1	q 0.1	q 0.1	q 0.1
n 7	n 2	n 3	n 2

NOTE: The value 'd' is required to compute the confidence intervals used in Model 2. The formula for 'd' is given below and is derived from Dixon and Massey (1969:240).

$$d = \sqrt{\frac{z^2 \times p \times q}{n}}$$

IV. CONCLUSIONS AND RECOMMENDATIONS

1. CONCLUSIONS

Prehistoric settlement and culture history is still poorly known in most of southern Minnesota. Settlement pattern studies and/or archaeological surveys using probabilistic sampling techniques have been conducted in only a few areas, including the Rock River drainage (Gibbon and Hruby 1983; MHS 1981:49-51), portions of Brown and Redwood Counties (MHS 1981:22-26), and the Blue Earth River Valley (Dobbs and Shane 1982; Dobbs 1984).

This survey is the first archaeological reconnaissance to employ probabilistic sampling strategies in the Yellow Medicine, Redwood, and Cottonwood drainages. Thirty-five previously unrecorded archaeological sites were located during the fieldwork for this project. Preliminary models for endscraper typology, settlement types and patterns, and an initial predictive model of site location within the study area have been generated.

The strengths of this study include the quantitative approach employed in both sampling and analysis; the thorough coverage of the survey area; and the attention that was given small sites that are commonly ignored or overlooked. The weaknesses of the study include the relatively small sample size, particularly for the individual river subbasins; the examination of only the floodplain, upland, and river bluff strata within the survey area; the relative lack of synthesis between geomorphological and archaeological data; and the lack of diagnostic material for many of the prehistoric sites. Several of these weaknesses were beyond the control of the project staff and, on balance, this Phase I survey has provided useful information for future investigations in southwestern Minnesota.

Several research questions to be considered during the project were specified in the Scope of Work (Section 6.03). To conclude this report, these questions will be reviewed in light of the new data presented in this report.

1.) Is there a correlation between specific geomorphic features and sites of a specific period?

Only 10 of the 35 sites located during the survey contained diagnostic artifacts and only one site (21BW61) can be securely assigned to a specific archaeological culture. The results of the settlement type analysis suggests that sites from a specific period are probably not tightly related to specific geomorphic features. Settlement type 2 contains sites from the Archaic, Woodland, and Oneota Traditions. Although groups from different time periods undoubtedly utilized the landscape in different ways, there is no evidence to suggest that there is a significant correlation between geomorphological unit and sites of a particular time period.

2.) Is there a correlation between sites and glacial/fluviol sources of lithic material?

The lithic raw materials used in southwestern Minnesota include both low-quality local stone obtained from the glacial till and imported raw material (e.g. Tongue River Silicified Sediment, Hixton Silicified Sandstone). There was no evidence of major lithic procurement activity at any of the sites discovered during this survey.

3.) Do certain geomorphic environments show higher probability of sites?

The floodplains of the major streams in the study area have the highest probability of containing prehistoric archaeological sites. The floodplains of secondary streams also may have a relative high probability of containing sites. Bluffs and terraces which are either within or overlook stream floodplains have a somewhat high probability of containing sites. Terraces and uplands more than 200 meters away from the bluff edge have a very low probability of containing sites. The margins of both ancient and modern lakes have a very high probability of containing archaeological sites. Areas that contain free-flowing springs that continue throughout the year also have a relatively high probability of containing prehistoric sites.

4.) Are site locations correlative with cultural trends (migratory vs. sedentary (e.g., seasonal changes in sites - bison wintering areas and winter cultural sites)?

The location of sites of a particular time period and function are undoubtedly correlated with cultural trends. Numerous Woodland sites are situated on lake margins while horticultural sites associated with the Plains Village and Oneota archaeological cultures are rare within the study area. However, the data from this survey is inadequate to address this question.

5.) Do certain geomorphic environments contain sites which have been deeply buried?

In the upper midwestern United States, archaeological sites may be buried by alluvial, colluvial, or a mixture of alluvial and colluvial deposits. It is unlikely that sites would have been buried by aeolian deposits in southwestern Minnesota. Buried archaeological sites should be located in floodplains and at the base of slopes.

One buried site was discovered during this survey on the inside meander loop of the Cottonwood River. Another possible site was located on an alluvial fan at the outlet of a small intermittent stream into the Cottonwood River floodplain. Other buried sites have been reported west of New Ulm in coulee's entering the Cottonwood River.

It is possible that buried sites will exist within the floodplains and along the tributary streams and ravines of all three of the river subbasins. The most probable area for buried sites is along the Cottonwood River. The Cottonwood is longer and has a significantly greater sediment load than either the Yellow Medicine or Redwood. It is also probable that the lower reaches of the Yellow Medicine and Redwood contain buried sites.

6.) Are there climatological influences on site distribution?

Climate obviously plays a significant role in site location and settlement type, particularly over long periods of time. However, this Phase I survey did not produce data that can be used to address this question?

7.) What techniques are necessary to locate deeply buried sites in various environments?

Deeply buried sites are particularly difficult to locate. It may not be possible to locate certain classes of buried sites that have low artifact density. Shovel testing is an impractical technique to use since it is effectively limited to about one meter below the ground surface. Small soil probes are also ineffective in the 639 survey area because of the high concentrations of gravel and/or clay sediments contained in the glacial till and floodplain deposits. Review of cut-bank profiles can be helpful but limits the examination to only the portion of the floodplain exposed at a particular point.

The most effective techniques presently available for locating buried sites include careful review of the 7.5' U.S.G.S. topographic maps for an area, the use of a bucket auger, the use of soil probes, and the use of power-driven augers. All of these techniques are time-intensive and costly. Further, buried sites can often exist in areas of the floodplain where there is no obvious surficial evidence for their presence.

8. Is there a correlation between different geomorphic environments and certain types of sites?

The analysis of settlement types and the cross-tabulation of settlement type with physiographic zones suggests that there is a correlation between site type and geomorphic zone. Moreover, it appears that the distribution of sites in particular physiographic zones may be different in each of the river subbasins. Figure 20 is a cross-tabulation of the river (RIVER) subbasin with physiographic zone (F=floodplain, UF=bluff overlooking floodplain or high terrace within floodplain, U=upland). The distribution of sites for each river appears to be significantly different. The higher concentration of floodplain sites in the Cottonwood River may be influenced by the higher number of intuitive areas examined in the Cottonwood floodplain. However, the distribution

of sites in the Redwood and Yellow Medicine subbasins are also different from one another.

9.) Do the probabilities of site locations within a specific geomorphic environment change as a result of its proximity to other controlling factors such as terraces and tributary streams?

It is very likely that site location within a given geomorphic environment will vary depending on the proximity of other controlling factors. Although the data from this survey are inadequate to answer this question with certainty, it appears that there are fewer sites in the headwaters of the three streams than in the middle and lower reaches of the rivers. Further, the sites in the headwaters areas appear to be smaller.

Studies in other areas of southern Minnesota (e.g. Dobbs and Shane 1982; Dobbs 1984) suggest that some of the controlling factors will include the location of springs for fresh drinking water, large expanses of arable land for horticulture, routes of migratory animals (e.g. bison), concentrated productive sources of freshwater fish (e.g. certain lakes and portions of streams), and protection from major storms and prairie fires.

Non-environmental factors may include the location of the major sustaining hinterland for any given archaeological culture and the presence of 'buffer zones' between competing groups.

2. RECOMMENDATIONS

a. Site-specific recommendations

All archaeological sites, no matter how small, are an integral part of the material record and contain valuable information about the entire gamut of human behavior and experience in the past. The significance of this information and the integrity of the cultural deposits at any given site dictate the treatment of individual archaeological sites. We recommend the following guidelines for the future treatment of the prehistoric sites discovered during the 639 survey. Specific comments are also included in the individual site descriptions in Section II(c)3 of this report.

Settlement type 1 and settlement type 5 sites:

These sites are very small scatters of material. It is unlikely that they contain intact deposits of cultural material. However, they do contain some information about short-term human activities in the study area. If any of these sites are to be destroyed, we suggest that an additional controlled surface collection should be obtained after the site surface has been cultivated and allowed to weather through several rainstorms.

Settlement type 2 sites:

These sites are relatively dense and may represent semi-permanent habitation sites, procurement sites, or base camps. Sites of this type may be eligible for the National Register of Historic Places. We recommend that Phase 2 surveys be conducted at these sites if they are to be disturbed. The Phase 2 survey should include a tightly controlled surface collection using collection units no larger than 5 meters on a side and the excavation of formal 1x1 meter excavation units to determine whether there are any intact subsurface deposits of cultural material present.

Settlement type 3 and 4 sites:

These sites are aceramic scatters of debris. If these sites are to be disturbed we recommend that a controlled surface collection using collection units no larger than 5 meters on a side be obtained from the site. When the sites are located in upland areas, it is unlikely that they will contain intact deposits of cultural materials. Sites located in the floodplain have a higher probability of containing intact materials. Excavation of formal 1x1 meter excavation units at these sites should be considered.

Settlement type 6 (21LY35):

21LY35 is a relatively dense site affiliated with the Woodland Tradition. It is currently in pasture and possibly may never have been plowed. It is likely that this site is eligible for the National Register of Historic Places. We recommend the excavation of the minimum number of 1x1 meter units necessary to determine whether or not there are intact deposits of cultural material at the site. If necessary, a series of transects containing shovel tests spaced at 5 meter intervals could be excavated to delineate the limits of the site and provide some data on the internal settlement plan of 21LY35.

Archaeological site 21LY18:

This is a buried site situated on the inside of a small meander loop in the Cottonwood River. Additional shovel testing and the excavation of several 1x1 meter excavation units is required to determine the limits, cultural affiliation, and integrity of the cultural deposits at the site.

b. Project-specific recommendations

The predictive model of prehistoric site location in this report has several implications for the 639 flood control project.

Archaeological sites occur with high frequency in the floodplains of the major streams within the study area. Channelization projects and other earth-moving activities have a significant chance of disturbing unreported archaeological sites. Therefore, we recommend that Phase I surveys be conducted for each specific project area within the floodplain.

There is a relatively high probability that archaeological sites may be located within the reservoir areas. This high probability is somewhat surprising. This probability may in reality be inflated somewhat because of the relatively small sample size in this particular strata.

All of the sites found in the reservoir strata were situated in the uplands overlooking the intermittent streams within the reservoir area. These upland areas have been extensively disturbed by modern cultivation and erosion. We recommend that a Phase I survey be conducted of all reservoirs that are considered for construction. These Phase I surveys would include surface reconnaissance within 100 meters of the bluff edge overlooking the coulee within which the reservoir is to be constructed. We would not recommend reconnaissance more than 100 meters from the bluff edge. Buried sites may be located in the floodplains, along the talus slopes, and at the mouth of the coulee's in which the reservoirs are to be constructed. We would recommend limited deep testing of selected areas that appear to have the potential to contain buried sites within the reservoir areas. Although in general we feel that the probability of such sites are low within the reservoir strata, it is

possible that small wintering camps or bison kill sites may be found. The most probable areas for such sites are near the confluence of the coulee areas with the main tributary stream.

c. Future directions

Like most archaeological research projects, this initial survey of the Yellow Medicine, Redwood, and Cottonwood drainages poses far more questions than it answers. However, the study provides a framework for future investigations within the area and several models that can be tested.

The southwestern portion of Minnesota is a particularly fruitful area for investigating the responses of human ecosystems to changing environmental conditions. During certain periods of time, it appears that the drainage basins we have studied were occupied on a relatively permanent basis by different groups of people. During other time periods, most notably the mid-continental dry period and the period after about A.D. 1300, it seems that the area was utilized principally for short periods of time by groups seeking bison or travelling overland from the Upper Mississippi to the Missouri River basins.

A long-term program of research in southwestern Minnesota could begin to examine and explain the changes we observe and explore the nature of human response to changing climate in a relatively inhospitable area of the eastern prairies. Such a program would combine extensive settlement pattern studies with paleo-ecological investigations and a systematic program of site excavations. Such an open-ended program of research is most ambitious, but there are several specific projects that could be undertaken in the near future.

1.) Between 1977 and 1980, the Statewide Archaeological Survey conducted a number of regional archaeological studies using probabilistic sampling techniques. Although a brief summary of the SAS project is available (MHS 1981) the detailed data for each survey have never been published. Analysis of the data from the Rock River and Brown/Redwood surveys in southwestern Minnesota would be useful. These data could then be combined with those from the 639 survey to generate a more expansive (and perhaps more precise) predictive model of site location.

2.) Collections from a number of archaeological sites throughout southwestern Minnesota are curated at the Minnesota Historical Society, the University of Minnesota, the Science Museum of Minnesota, and at various private archaeological contracting firms. Although not all of these collections were obtained in any systematic fashion, analysis of these collections using IMA protocols could be used to generate expanded and hopefully more accurate models of prehistoric settlement types and patterns.

3.) Detailed geomorphological studies of the floodplains of major streams in Minnesota could provide valuable information on areas that may contain deeply buried sites. If such studies are conducted in conjunction with archaeological field research, the geomorphological constructs could be tested by actual field investigations. We would stress that such geomorphological studies should be detailed and fine-grained. Ideally, the geomorphologists and archaeologists would work together from the beginning of the project in defining the problems to be investigated and the specific portions of the river floodplains to be studied in detail.

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APPENDIX I: SCOPE OF WORK

Scope of Work
Archeological Reconnaissance Survey of
the Yellow Medicine, Redwood, and Cottonwood
Subbasins, Minnesota

1. Introduction

1.01 The contractor will undertake a reconnaissance survey of cultural resources within the Yellow Medicine, Redwood, and Cottonwood Subbasins of the Upper Minnesota River basin for the 639 project. The archeological survey will be conducted in conjunction with a geomorphological survey and mapping study of the same area.

1.02 The cultural resources investigation shall focus on the study area as described in paragraph 3.01. The study shall consist of the following tasks:

a. Development of a research design to include the design of a probability sample.

b. Reconnaissance survey based on sampling design.

c. Development of a predictive model for site location (see also section 9.03.1.).

d. Preparation of a detailed technical report.

1.03 The objective of the reconnaissance survey will be the development of a predictive model which can be used by the professional archeological community and the St. Paul District in planning research and flood control projects (see also section 9.03.1.). The model developed by the Contractor will be used to determine the needs for further survey, the adequacy of future survey methods and techniques and the impacts on resources from a variety of actions.

1.04 The cultural resources investigation reports serve several functions. The technical report is a planning tool which aids in the preservation and protection of our cultural heritage. It is also a comprehensive, scholarly document that not only fulfills federally-mandated legal requirements but also serves as a scientific reference for future professional studies. As such, the reports contents should be both descriptive and analytic in nature.

1.05 The investigation and reports represent partial fulfillment of the obligations of the St. Paul District toward cultural resources as required by the National Environmental Policy Act of 1969 (PL 91-190); National Historic Preservation Act of 1966 (PL 89-665), as amended; Protection and Enhancement of the Cultural Environment (EO 11593); Advisory Councils Procedures for the Protection of Historic and Cultural Properties (36 CFR Part 800); Preservation of Historic and Archeological Data 1974 (PL 93-291); and Corps of Engineers Identification and Evaluation of Cultural Resources (ER 1105-2-50).

2.00 639 Study Background

2.01 The entire 639 study area includes the drainage areas of Yellow Bank, Lac qui Parle, Yellow Medicine, Redwood, and Cottonwood Rivers (figure 1). These rivers are principal tributaries for drainage from the southwest to the Minnesota River. All or part of nine counties in Minnesota and four counties in South Dakota are included in the entire study area. Only the Yellow Medicine, Redwood, and Cottonwood subbasins will be included in this contract.

2.02 In 1972, the Upper Minnesota River Comprehensive Basin Study was completed. This report recommended further study of water quality, flood and sediment damage, water supply, commercial navigation, recreation opportunity, and environmental preservation in the Minnesota River basin.

2.03 In response to the 1972 study's recommendation, the Southern Minnesota Rivers Basin Board (SMRBB), in conjunction with the SCS, conducted a river basin Type IV study under the authority of Section 6 of PL 83-566. The Minnesota River Basin Study Report (1977) included a recommendation for joint Corps-SCS study under the authority of PL 87-639.

2.04 In September 1978, the joint study produced a reconnaissance stage report (plan of study). This report reviews the available data for each alternative identified during the public involvement program in fiscal year 1979. The alternatives were screened for their effectiveness in reducing flood damage and achieving other planning objectives, and for the impacts that their implementation would cause. The reconnaissance stage report concluded stage 1 of the study.

2.05 A citizen's participation committee conducted a public workshop in March 1979 to identify and to rank problems and needs and to indicate the social acceptability of various alternative measures. This workshop identified 22 problems and needs plus 22 alternatives. In April 1979, the committee met to screen the problems, needs, and alternatives. Nine problems and needs, and fourteen alternatives were considered sufficiently significant for future analysis.

2.06 Since 1979 the Corps of Engineers and SCS have been jointly studying flood control alternatives in all subbasins. Currently 1 reservoir is being considered in the Redwood subbasin, 2 reservoirs in the Yellow Medicine subbasin, and none in the Cottonwood subbasin. Channel work alternatives are being studied in all three subbasins.

3.00 Study Area

3.01 The study area for the reconnaissance survey will be the Yellow Medicine, Redwood, and Cottonwood subbasins of the Upper Minnesota River basin (see enclosed maps of each subbasin).

3.02 WES will be doing geomorphic mapping of specific areas of the subbasins. The Contractor will maintain close contact with WES to find out which areas are being researched and mapped in detail (see appendix A).

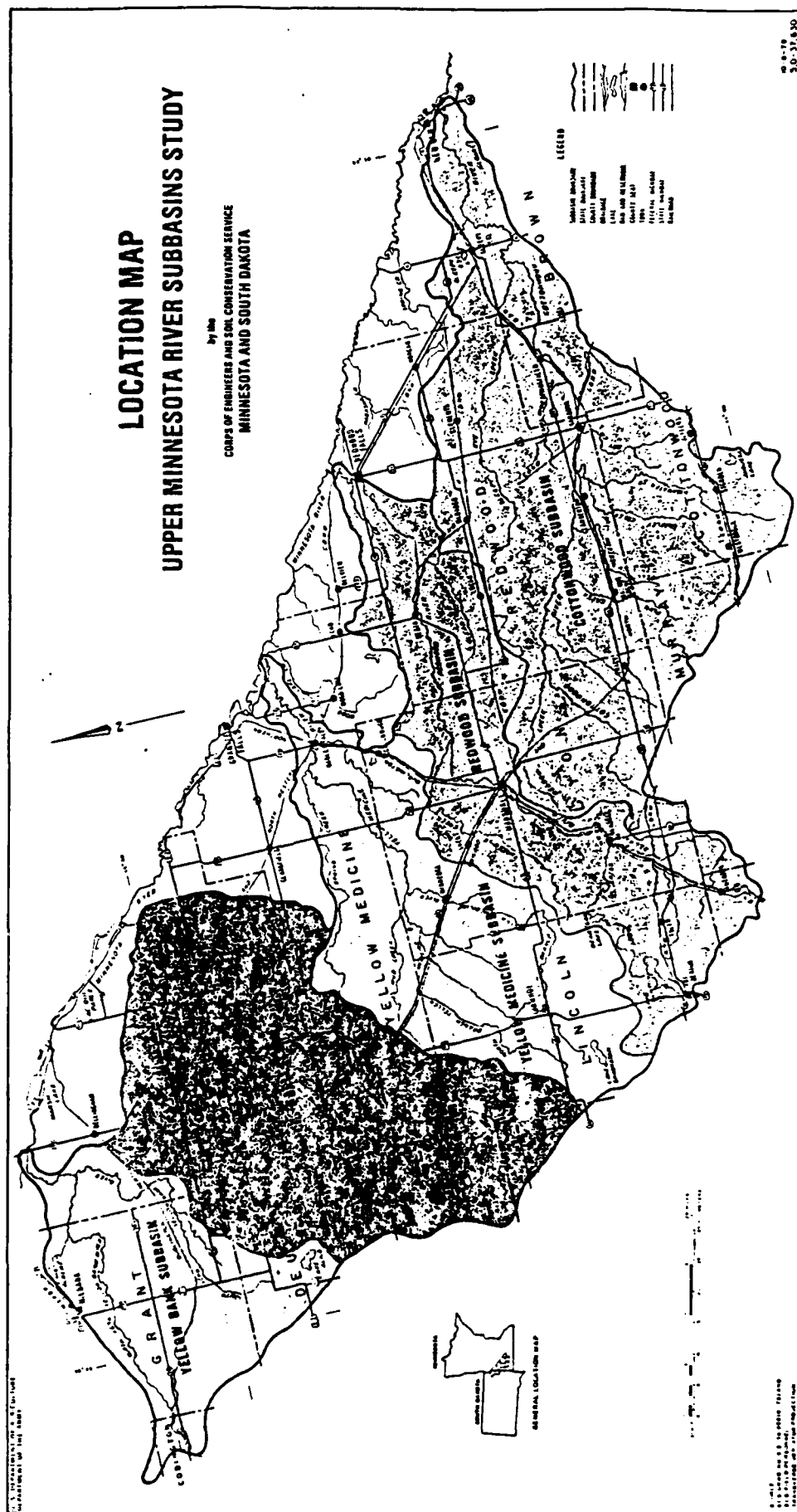


FIGURE 1

4.00 Previous Corps of Engineers Cultural Resources Work in the Area

4.01 A cultural resources literature search and records review for all five subbasins was completed in May 1980 by Archeological Field Services, Inc. (Corps of Engineers Contract Number DACW37-79-C-0199). This two volume report, entitled Cultural Resources Literature Search and Records Review of the Upper Mississippi River Subbasin, Southwestern Minnesota and Northeastern South Dakota, includes an overview of the area's environmental setting, regional prehistory and history, and descriptions of all the recorded sites in the subbasins.

4.02 A cultural resources reconnaissance survey and limited testing was conducted on a number of reservoir and channel work alternatives in the Lac qui Parle and Yellow Bank subbasins. The report entitled Cultural Resources Investigations of the Upper Minnesota River (639) Project, Devel and Grant Counties, South Dakota, and Lac qui Parle and Yellow Medicine Counties, Minnesota. The report was completed in September 1984 by the University of South Dakota Archeological Laboratory. The contract number is DACW37-82-M-1508.

4.03 Other cultural resources contracts within the surrounding area include:

a. Archeological Survey in the Big Stone Refuge Area, Minnesota, National Park Service Contract CX-4000-3-0033, by Christy A.H. Caine, May 1974.

b. Archeological Survey and Testing for the Upstream Work, Big Stone Lake - Whetstone River Project Area, by Elden Johnson, Corps of Engineers Contract DACW37-75-C-0198, September 1975.

c. An Archeological Reconnaissance Survey of the Proposed Channel Realignment Area at Big Stone - Whetstone Flood Control Project, Big Stone and Lac qui Parle Counties, Minnesota, Kathleen A. Roetzel, Principal Investigator, Corps of Engineers Contract DACW37-80-M-1545, August 1980.

d. Cultural Resources Investigations at the Lake Traverse - Bois de Sioux Project, Roberts County, South Dakota, Traverse County, Minnesota, University of South Dakota Archeological Laboratory, Contract DACW37-82-M-2193, September 1984.

5.00 Geomorphology

5.01 The St. Paul District has initiated a geomorphological survey of the Yellow Medicine, Redwood, and Cottonwood subbasins. The work will be conducted by the Army Corps of Engineers Waterway Experiment Station (WES). WES has conducted numerous studies which focus on the geomorphic development of an area, and the relationships of that development to cultural resources. The goals of this study are twofold: (1) to describe the geomorphic development of the subbasins, and (2) to determine the relationship between the geomorphic development and the location of cultural resources within the subbasins, including the potential for buried sites.

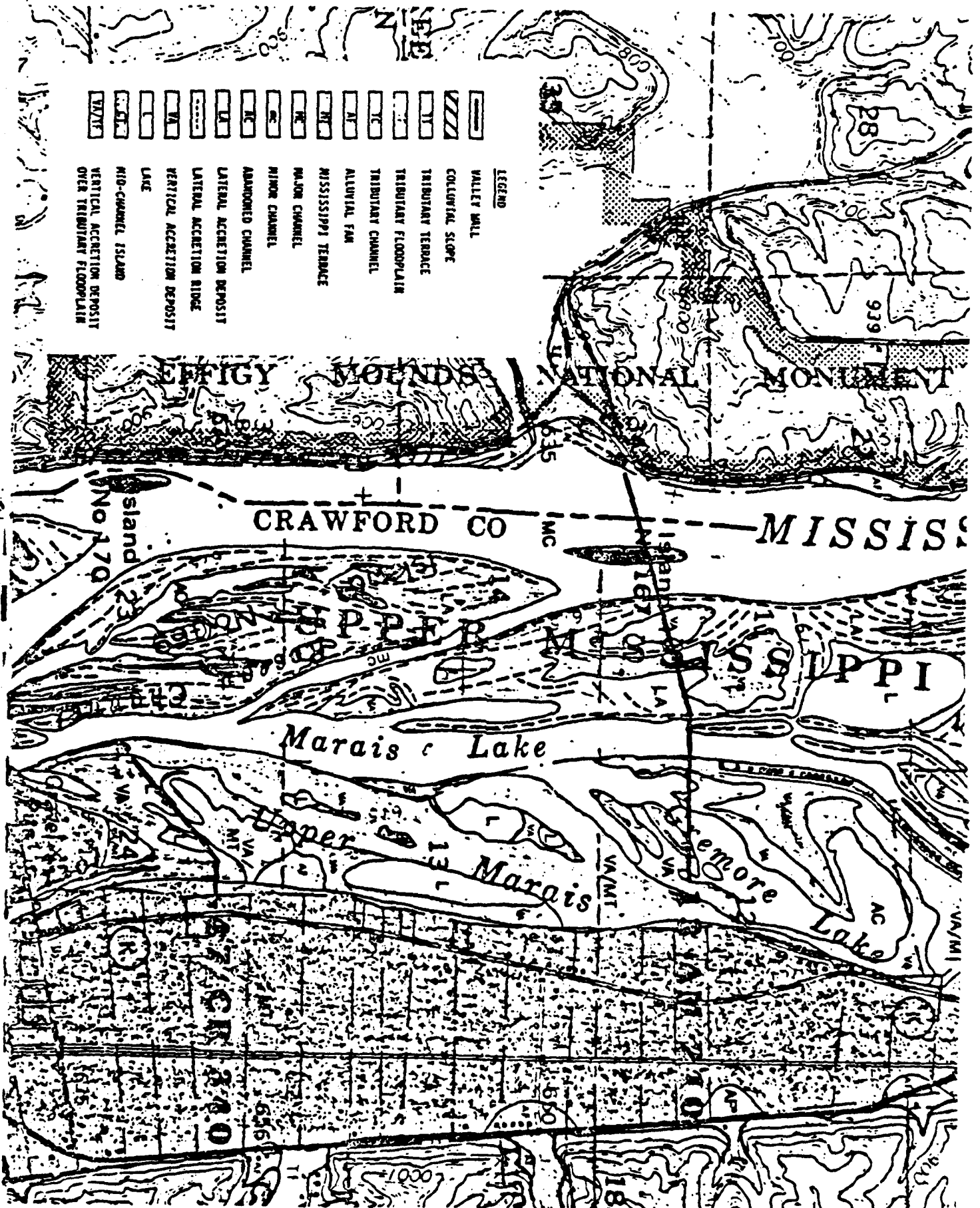


FIGURE 2

5.02 The geomorphology study will utilize various types of data. The results of the study will be a regional synopsis of the geomorphic development of the area. A series of 1:24,000 or larger scale maps will show the geomorphology of some specific areas. An example is given in figure 2 which shows the geomorphology of pool 10.

5.03 The archeological contractor will be present during some of the geomorphology fieldwork so the research of both disciplines will be coordinated, and development of the survey research design will be enhanced by information exchanged during the geomorphology fieldwork.

6.00 Probability Sample

6.01 While the geomorphic survey will provide some preliminary data on the need for further survey work in the subbasins, the development of a predictive model for site location and the methods and techniques necessary for acquiring this data will depend upon the results of a probability sample of the subbasins.

6.02 The Contractor will design a sample strategy which will incorporate the results of the geomorphic survey into the sample design. A stratified random sample is recommended (but not required), using the geomorphic environments as sampling definition.

6.03 The following questions should be considered in the design of a sampling strategy (where there is insufficient data to answer a question this should be stated and discussed in the report):

a. Is there a correlation between specific geomorphic features and sites of a specific period?

b. Is there a correlation between sites and glacial/fluviat sources of lithic material?

c. Do certain geomorphic environments show higher probability of sites?

d. Are site locations correlative with cultural trends (migratory vs. sedentary)? (e.g., seasonal changes in sites - bison wintering areas and winter cultural sites.)

e. Do certain geomorphic environments contain sites which have been deeply buried?

f. Are there climatological influences on site distribution?

g. What techniques are necessary to locate deeply buried sites in various environments?

h. Is there a correlation between different geomorphic environments and certain types of sites?

i. Do the probabilities of site locations within a specific geomorphic environment change as a result of its proximity to other controlling factors such as terraces and tributary streams?

6.04 The Contracting Officer shall review and approve the sample design prior to its implementation.

7.00 Survey Methods

7.01 The geomorphic landscape will require survey methods not typical to upland archeological investigations. While normal shovel testing may be warranted for certain areas, cut bank profiles, coring, boring, backhoe trenching, and other forms of deep testing may be necessary for some areas. The nature of this survey will require the Contractor to be extremely flexible in the methods selected and will present a challenge to developing innovative approaches to data extraction.

7.02 Justification of survey methods shall be presented in detail in the technical report. The survey strategy shall be coordinated with the Contracting Officer prior to entering the field.

7.03 Analysis of each survey method or technique shall be made and presented in the technical report. This analysis will show the limitations and benefits of each and the costs associated with their implementation.

8.00 General Requirements

8.01 The Contractor will utilize a systematic, interdisciplinary approach in conducting the study. The Contractor will provide specialized knowledge and skills during the course of the study, to include expertise in archeology and other social and natural sciences as required.

8.02 The extent and character of the work to be accomplished will be subject to the general supervision, direction, control, and approval of the Contracting Officer.

8.03 Techniques and methodologies used during the investigation shall, at a minimum, be representative of the current state of knowledge for their respective disciplines.

8.04 The Contractor shall keep standard records which shall include, but not be limited to, research notes, site survey forms, maps, and photographs. The original, or a copy, shall be made available to the Contracting Officer upon request.

8.05 The Contractor shall provide all materials and equipment as may be necessary to expeditiously perform those services required of the study.

8.06 The surveyed areas will be returned as closely as practical to presurvey conditions by the Contractor.

8.07 The recommended professional treatment of recovered materials is curation and storage of the artifacts at an institution that can properly insure their preservation and that will make them available for research and public view. If such materials are not in Federal ownership, the Contractor must obtain consent of the owner, in accordance with applicable law, concerning the disposition of the materials after completion of the report. The Contractor will be responsible for making curatorial arrangements for any collections which are obtained. Such arrangements must be coordinated with the appropriate officials of Minnesota and approved by the Contracting Officer.

8.08 If it becomes necessary in the performance of the work and services, the Contractor shall, at no cost to the Government, secure the rights of ingress and egress on properties not owned or controlled by the Government. The Contractor shall secure the consent of the owner, his representative, or agent, in writing, prior to effecting entry on such property.

9.00 General Report Requirements

9.01 The Contractor will submit two types of reports: monthly progress reports and draft and final technical reports.

9.02 The monthly progress report will be a brief report submitted with each monthly invoice. Information provided in these reports will describe the status of the study, the work accomplished during the billing period and any noteworthy information such as problems which may have developed.

9.03 The Contractor's technical report will include, but shall not necessarily be limited to, the following information:

a. Title page: Note the type of investigation undertaken, the cultural resources assessed (archeological, historical, and architectural), the project name and location (county and State); the date of the report; the Contractor's name; the contract number; the name of the author(s) and/or Principal Investigator; the signature of the Principal Investigator; and the agency for which the report is being prepared.

b. Abstract: An abstract of findings, conclusions, and recommendations. This should not be an annotation.

c. Management summary: Concisely summarize the study, which will contain all essential data for using the document in the Corps management of the project. This information will minimally include who the sponsor is and why the work was undertaken, a summary of the study, study limitation, study results, significance, recommendations, and identification of the repository of all pertinent records and artifacts.

d. Table of contents

e. List of figures

f. List of plates

g. Introduction: Identify the sponsor and the sponsor's reason for the study; provide an overview of the project, define the location and boundaries of the study area (with regional or State and area-specific maps); reference the scope of work (to be included in the appendix to the Contractor's report); identify the institution that did the work, the number of people involved in the study, and the number of person-days/hours spent during the study; identify the dates when the various types of work were conducted; and identify the repository of records and artifacts.

h. Theoretical and methodological overview: Describe or state the goals of the Corps and the study researcher, the theoretical and methodological orientation of the study, and the research strategies applied to achieve the stated goals.

i. Field methods: Describe the specific archeological activities undertaken to achieve the stated theoretical and methodological goals. Include all field methods, techniques, strategies, and rationale or justification for specific methods or decisions. The description of the field methods will minimally include: a description of the areas surveyed, survey conditions, geomorphic environments, vegetation conditions, soil types, stratigraphy, informal testing, stratigraphy results, survey limitations, survey testing results, degree of surface visibility, whether or not the survey resulted in the location of any cultural resources, the methods used to survey the area (pedestrian reconnaissance, subsurface test, etc.), the justification and rationale for eliminating uninvestigated areas, and the grid or transect interval used. Testing methods shall include descriptions of test units (size, intervals, stratigraphy, depth) and the rationale behind their placement. Additionally, each method or technique used in the study shall be analyzed to show its limitations, benefits and implementation costs so that future studies can be conducted in the most efficient, expeditious and cost saving manner.

j. Survey results: Describe all the archeological resources encountered during the study, and any other data pertinent to a complete understanding of the resources within the study area. Include enough empirical data that the survey results can be independently assessed. The description of the data shall minimally include: a description of the site; amounts and type of material remains recovered; relation of the site or sites to the geomorphic environment; vegetation and soil types; analysis of the site/sites and date (e.g., site(s) type, density, distribution, cultural historical components, environmental, cultural/behavioral inferences or patterns); site condition; and location and size information (elevation, complete quad map source, legal description, and site site, density, depth, and extent) if possible. The information shall be presented in a manner that can be used easily and efficiently.

k. Data analysis: Describe and provide the rationale for the specific analytic methods and techniques used, and describe and discuss the qualitative and quantitative manipulation of the data. Limitations or problems with the analysis based on the data collection results will also be discussed. This

section shall also contain references to accession numbers used for all collections, photographs, and field notes obtained during the study, and the location where they are permanently housed. All diagnostic artifacts will be illustrated or photographed and included in the report.

1. Predictive model: The development of the predictive model will be based on the following:

- (1) The initial archeological reconnaissance survey.
- (2) The geomorphic data.
- (3) Integration of the survey and geomorphic data.
- (4) Testing the model (e.g., prediction of site locations ~~with~~ followup field work to test if sites are there).
- (5) Consideration of the use of the model to extrapolate to other physical environments and cultural data. How far reaching is the use of the model? What are factors influencing the applicability of the model? How far can we extrapolate into the past or into the future with the model?

Based upon the results of the survey, describe the predictive model which was developed to correlate site locational data with the geomorphic environments of the Yellow Medicine, Redwood, and Cottonwood subbasins. The predictive model may include information relating to site size, site density, site types, cultural affiliation, cultural/behavioral patterns, etc. Discuss the limitations and reliability of the predictive model for its use in future surveys of the area. The predictive model should attempt to make specific statements on cultural-environmental correlations. Gross generalizations should be avoided. The predictive model should also address the probability of buried archeological sites and the total number of sites which may exist within the research area.

m. Conclusions and recommendations: Summarize and draw conclusions about the data base for the subbasins, the results, the study results, and the predictive model. Describe how the study helped to fill data gaps and outline new research topics which have come to light during the study. Recommendations should focus on the utility of the predictive model and methods and techniques which will be necessary to acquire future data.

n. References: Provide standard bibliographic references (American Antiquity format) for every publication cited in the report.

o. Appendix: Include the Scope of Work, resumes of all personnel involved, and any other pertinent report information.

9.04 Failure to fulfill these report requirements will result in the rejection of the report by the Contracting Officer.

10.00 Format Specifications

10.01 All text materials will be typed, single-spaced (the draft reports should be space-and-one-half or double-spaced), on good quality bond paper, 8.5 inches by 11.0 inches with 1.5-inch binding and bottom margins and 1-inch margins on the top and other margin, and will be printed on both sides of the paper.

10.02 Information will be presented in textual, tabular, and graphic forms, whichever are most appropriate, effective, or advantageous to communicate the necessary information.

10.03 All maps will be labelled with a typed or drafted caption/description, a north arrow, a scale bar, township, range map size, and dates, and the map source (e.g., the USGS quad name, project map title, or published source) and will have proper margins. Maps that are too large to be incorporated in the report may be folded and enclosed at the back of the report or submitted separate from the report. Fold-out maps within the report text are acceptable.

10.04 All figures and maps must be clear, legible, self-explanatory, and of sufficiently high quality to be readily reproducible by standard xerographic equipment.

10.05 The final report cover letter shall include a budget of the project.

10.06 The draft and final reports will be divided into easily discernible chapters, with appropriate page separation and heading.

11.00 Materials Provided

11.01 The Contracting Officer will furnish the Contractor with the following materials:

a. Access to any publications, records, maps, or photographs that are on file at the St. Paul District, Corps of Engineers, and loan copies, if available.

b. Two sets of maps. One set will be used as field maps and one set will be returned with the appropriate information (see section 9.03j).

12.00 Submittals

12.01 The Contractor will submit reports according to the following schedules:

a. Progress reports: On the first of each month, the Contractor will submit a brief progress report outlining the work accomplished that month and any problems or needs that require the attention of the Corps.

b. Draft contract report: Fifteen copies of the draft contract report will be submitted on or before August 1, 1986. The draft contract report will

be reviewed by the Corps of Engineers, the State Historic Preservation Officer, the State Archeologist, and the National Park Service. The draft contract report will be submitted according to the report and contract specifications outlined in this Scope of Work.

c. Final contract report: The original and 15 copies of the final contract report will be submitted within 30 days after the Corps of Engineers comments on the draft contract report are received by the Contractor. The final contract report will incorporate or discuss all the comments made on the draft contract report.

12.02 Each discovered or relocated site will be plotted on a set of USGS maps referenced in 11.01(b) above. Additionally, these maps will show the location of each sample unit which was surveyed.

12.03 All sites will be recorded on the appropriate State site forms (to be included in the appendix). Inventoried sites will include a site number. However, if temporary site numbers will be used in either the draft or final reports, they will be substantially different from the official sites designated to avoid confusion or duplication of site numbers. Known sites will have their State site forms and other forms (e.g., National Register) updated, and included in the appendix.

12.04 The Contractor will submit upon request of the Contracting Officer all notes, documents, photographs, records, maps, correspondence, and any other materials of any nature obtained under this contract.

12.05 The Contractor will submit the photographic negatives for all black and white photographs which appear in the final report.

12.06 The Contractor will not release any sketch, photograph, report, or other materials of any nature obtained or prepared under this contract without specific written approval of the Contracting Officer prior to the acceptance of the final report by the Government.

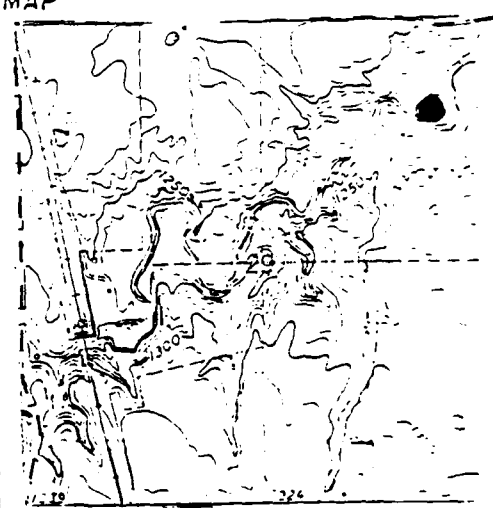
13.00 Method of Payment

13.01 Requests for partial payment under this fixed price contract will be made monthly by invoice. A 10-percent retained percentage will be withheld from each partial payment. Upon approval of the final reports by the Contracting Officer, final payment, including previously retained percentage, shall be made.

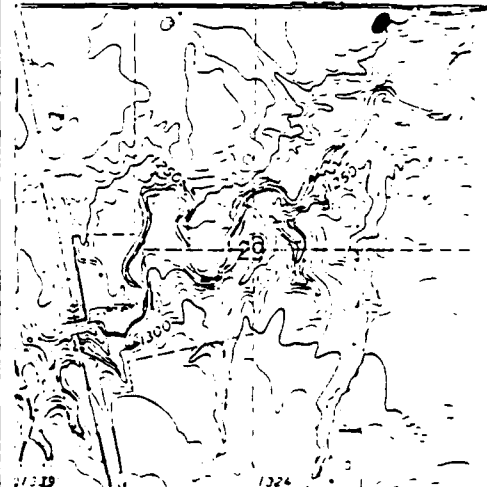
APPENDIX II: MINNESOTA STATE SITE FORMS"

(For release only to professional archaeologists)

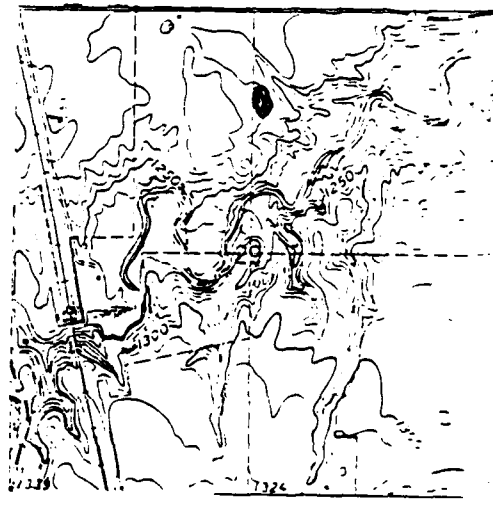
MINNESOTA ARCHAEOLOGICAL SITE FORM

COUNTY LYON	SITE NAME	FIELD NUMBER 86CWS3	STATE NUMBER 2124 15
OWNER MELVIN H. MONSEN RR 1 AMIRET, MN 56112		U.S.G.S. QUAD AMIRET	
SITE LOCATION 7/8 MILE EAST OF AMIRET ON CO 2; SITE IS SOUTH OF ROAD TO LOOP IN RIVER		LEGAL DESCRIPTION NE, SW, NE, NE & CENTER, SE, NE, NE SEC 28 T. 110 N. R. 40W twnbsp: AMIRET	
SITE TYPE SMALL SCATTER OF TOOLS AND DEBITAGE		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING IN FLOODPLAIN IMMEDIATELY ADJACENT TO COTTONWOOD RIVER, "INSIDE" MEANDER LOOP			
SITE CONDITION UNDER CULTIVATION	CURRENT LAND USE AGRICULTURAL	SITE AREA 1.5 ACRES	
NATURE OF NEAREST WATER COTTONWOOD RIVER	DISTANCE TO WATER LESS THAN 100 FT	DIRECTION OF SITE FROM WATER NORTH AND WEST	
ELEVATION OF SITE: 1210 FT		ELEVATION OF NEAREST WATER: 1200 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION AND AUGER TESTING			
ARTIFACTS OBSERVED, RECOVERED: 2 SCRAPERS, 2 BIFACES, 4 UTILIZED/RETOUCHED FLAKES, AND 19 FLAKES			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE: 1:24,000	
WRITTEN REFERENCES NONE		MAP 	
COMMENTS: NONE			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA	INVESTIGATORS: JMB
		PROJECT: SW632	DATE: 8/86

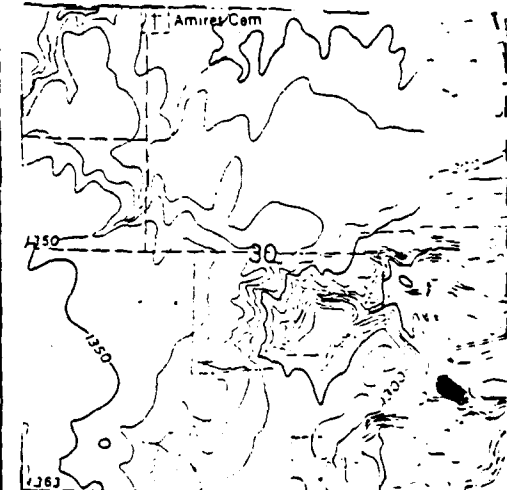
MINNESOTA ARCHAEOLOGICAL SITE FORM

COUNTY LYON	SITE NAME	FIELD NUMBER 86CWS4	STATE NUMBER 2144/6
OWNER MELVIN H. MONSEN RR1 AMIRET, MN 56112		U.S.G.S. QUAD AMIRET	
SITE LOCATION 3/4 MILE EAST OF AMIRET, MN ON CO 2; SITE IS IMMEDIATELY SOUTH OF ROAD.		LEGAL DESCRIPTION NW, NW, NE, NE SEC 29 T. 110N R. 40W twnbsp: AMIRET	
SITE TYPE SMALL SCATTER OF TOOLS AND DEBITAGE		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING ON EDGE OF UPLANDS OVERLOOKING FLOODPLAIN ADJACENT TO RIVER			
SITE CONDITION UNDER CULTIVATION	CURRENT LAND USE AGRICULTURAL	SITE AREA c. 1 ACPE	
NATURE OF NEAREST WATER COTTONWOOD RIVER	DISTANCE TO WATER 500 FT	DIRECTION OF SITE FROM MAP NORTH	
ELEVATION OF SITE: 1260 FT		ELEVATION OF NEAREST WATER: 1200 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION			
ARTIFACTS OBSERVED, RECOVERED: 3 BIFACES, 1 SCRAPER, 5 UTILIZED/RETOUCHED FLAKES, 1 CORE, 52 FLAKES AND 1 GROUNDSTONE TOOL			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE 1:24,000 MAP 	
WRITTEN REFERENCES NONE			
COMMENTS: NONE			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA	INVESTIGATORS: DOBBE
		PROJECT: SW639	DATE: 5/86

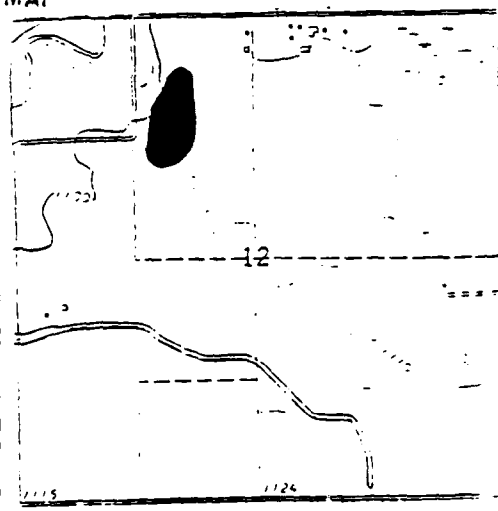
MINNESOTA ARCHAEOLOGICAL SITE FORM

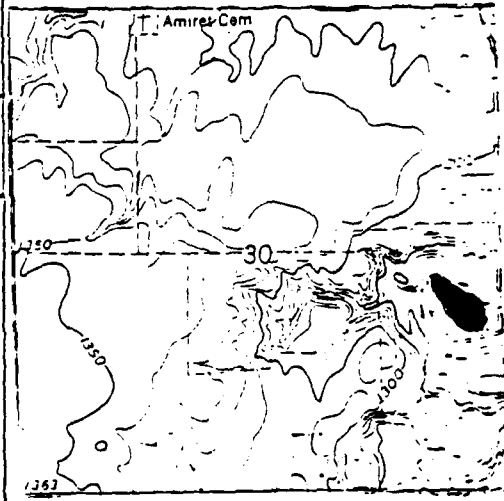
COUNTY LYON	SITE NAME	FIELD NUMBER 86CWS5	STATE NUMBER 2147 17
NER MELVIN H. MONSEN RR 1 AMIRET, MN 56112		U.S.G.S. QUAD AMIRET	
SITE LOCATION 1/2 MILE EAST OF AMIRET ON CO 2; SITE IS 900 FT SOUTH OF ROAD		LEGAL DESCRIPTION W $\frac{1}{2}$, SW, NW, NE SEC 29 T 110N R. 40W twmsp: AMIRET	
SITE TYPE SMALL SCATTER OF TOOLS AND DEBITAGE		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING ON UPLANDS OVERLOOKING SERIES OF TERRACES TO FLOODPLAIN ADJACENT TO RIVER			
SITE CONDITION UNDER CULTIVATION		CURRENT LAND USE AGRICULTURAL	SITE AREA c. 1 ACRE
NATURE OF NEAREST WATER COTTONWOOD RIVER		DISTANCE TO WATER 800 FT	DIRECTION OF SITE FROM WATER NORTH
ELEVATION OF SITE: 1270 FT		ELEVATION OF NEAREST WATER: 1200 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION			
ARTIFACTS OBSERVED, RECOVERED: 3 BIFACES, 7 UTILIZED/RETOUCHED FLAKES, 7 CORES AND 32 FLAKES			
LOCAL COLLECTIONS, INFORMANTS: LARRY HALVORSON MARSHALL, MN		MAP SCALE: 1:24,000 MAP 	
WRITTEN REFERENCES NONE			
COMMENTS: NONE			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA PROJECT: SW639	INVESTIGATORS: DOBBS DATE: 5/88

MINNESOTA ARCHAEOLOGICAL SITE FORM

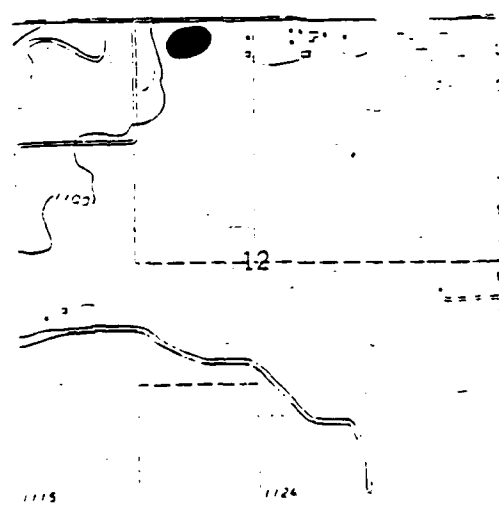
COUNTY LYON	SITE NAME	FIELD NUMBER 86CWS6	STATE NUMBER 2147 18
OWNER RICHARD FILKINS RR 1 AMIRET, MN 56112		U.S.G.S. QUAD AMIRET	
SITE LOCATION 3/4 MILE SOUTH OF AMIRET, MN ON CO 9; 1/8 MILE WEST OF ROAD (SOUTH OF FILKINS RESIDENCE)		LEGAL DESCRIPTION NW, NE, SE, SE SEC 30 T. 110N R. 40W twnbsp: AMIRET	
SITE TYPE INDETERMINATE		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING IN FIRST TERRACE ON FLOODPLAIN ADJACENT TO RIVER			
SITE CONDITION UNDISTURBED	CURRENT LAND USE PASTURE		SITE AREA ?
NATURE OF NEAREST WATER COTTONWOOD RIVER	DISTANCE TO WATER c. 20 FT	DIRECTION OF SITE FROM WATER NORTH	
ELEVATION OF SITE: 1250 FT		ELEVATION OF NEAREST WATER: 1250 FT	
NATURE, EXTENT OF INVESTIGATION: SUBSURFACE AUGER TESTING			
ARTIFACTS OBSERVED, RECOVERED: 1 BURNED BONE, 4 BONE FRAGMENTS, 1 FLAKE, OXIDIZED ROCK AND SHELL			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE: 1:24,000 MAP 	
WRITTEN REFERENCES NONE			
COMMENTS: NONE			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA	INVESTIGATORS: DOE
		PROJECT: SW639	DATE: 5/86

MINNESOTA ARCHAEOLOGICAL SITE FORM

COUNTY LYON	SITE NAME	FIELD NUMBER 86YMS7	STATE NUMBER 21 4-j 19
OWNER KEN THOMPSON RT 1 COTTONWOOD, MN 56229		U.S.G.S. QUAD GREEN VALLEY	
SITE LOCATION 8½ MILES WEST OF COTTONWOOD, MN ON CO 10; SITE IS 1/8 MILE SOUTH OF ROAD.		LEGAL DESCRIPTION SW, NE, NW AND NE, NW, SE, NW SEC 12 T. 113N R. 42W twnbsp: WESTERHEIM	
SITE TYPE SMALL SCATTER OF TOOLS AND DEBITAGE		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING UPLANDS OVERLOOKING FLOODPLAIN ADJACENT TO RIVER			
SITE CONDITION UNDER CULTIVATION	CURRENT LAND USE AGRICULTURAL	SITE AREA c. 8 ACRES	
NATURE OF NEAREST WATER YELLOW MEDICINE RIVER	DISTANCE TO WATER 800 FT	DIRECTION OF SITE FROM WATER EAST	
ELEVATION OF SITE: 1110 FT		ELEVATION OF NEAREST WATER: 1090 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION			
ARTIFACTS OBSERVED, RECOVERED: 2 PROJECTILE POINTS, 1 SCRAPER, 5 UTILIZED/RETOUCHED FLAKES, 1 CORE, AND 10 FLAKES			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE: 1:24,000 MAP 	
WRITTEN REFERENCES NONE			
COMMENTS: IN RANDOM SAMPLE UNIT			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA PROJECT: SW639	INVESTIGATORS: DOBBS DATE: 5/86

MINNESOTA ARCHAEOLOGICAL SITE FORM				137
COUNTY LYON	SITE NAME	FIELD NUMBER 86CWS7	STATE NUMBER 214y 20	
OWNER RICHARD FILKINS RR 1 AMIRET, MN 56112			U.S.G.S. QUAD AMIRET	
SITE LOCATION 5/8 MILE SOUTH OF AMIRET, MN ON CO 9; SITE IS WEST OF ROAD			LEGAL DESCRIPTION N $\frac{1}{2}$, SE, NE, SE AND S $\frac{1}{2}$, NE, NE, SE SEC 30 T. 110N R. 40W twmsp: AMIRET	
SITE TYPE SMALL SCATTER OF TOOLS AND DEBITAGE		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC		
SITE DESCRIPTION / ENVIRONMENTAL SETTING ON FLOODPLAIN AND FIRST TERRACE INSIDE MEANDER LOOP OF RIVER				
SITE CONDITION UNDER CULTIVATION		CURRENT LAND USE AGRICULTURAL		SITE AREA c. 4.5 ACRES
NATURE OF NEAREST WATER COTTONWOOD RIVER		DISTANCE TO WATER c. 20 FT	DIRECTION OF SITE FROM WATER SOUTH AND WEST	
ELEVATION OF SITE: 1240-1250 FT		ELEVATION OF NEAREST WATER: 1250 FT		
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION AND SOIL PROBING				
ARTIFACTS OBSERVED, RECOVERED: 2 BIFACES, 1 UTILIZED/RETOUCHED FLAKE, 1 CORE AND 15 FLAKES				
LOCAL COLLECTIONS, INFORMANTS: NONE			MAP SCALE: 1:24,000 MAP 	
WRITTEN REFERENCES NONE				
COMMENTS: NONE				
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA	INVESTIGATORS: DOBBE	
		PROJECT: SW639	DATE: 5/96	

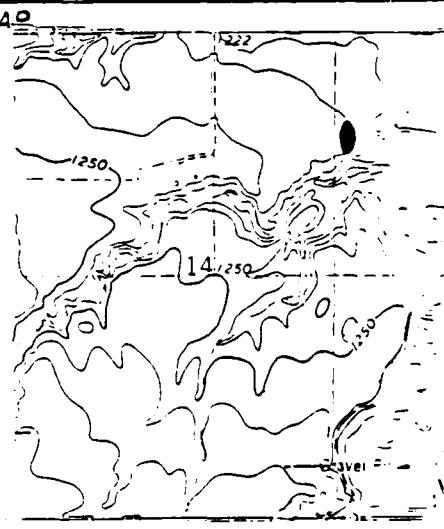
MINNESOTA ARCHAEOLOGICAL SITE FORM

COUNTY LYON	SITE NAME	FIELD NUMBER 86YMS8	STATE NUMBER 21 LY 21
OWNER KEN THOMPSON RT 1 COTTONWOOD, MN 56229		U.S.G.S. QUAD GREEN VALLEY	
SITE LOCATION 8½ MILES WEST OF COTTONWOOD, MN ON CO 10; SITE IS JUST SOUTH OF ROAD.		LEGAL DESCRIPTION NE, NW, NE, NW & NW, NE, NE, NW SEC 12 T. 113N R. 42W twsp: WESTERHEIM	
SITE TYPE SMALL SCATTER OF TOOLS AND DEBITAGE		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING UPLANDS OVERLOOKING FLOODPLAIN ADJACENT TO RIVER			
SITE CONDITION UNDER CULTIVATION	CURRENT LAND USE AGRICULTURAL	SITE AREA c. 2½ ACRES	
NATURE OF NEAREST WATER YELLOW MEDICINE RIVER	DISTANCE TO WATER 700 FT	DIRECTION OF SITE FROM WATER East	
ELEVATION OF SITE: 1110 FT		ELEVATION OF NEAREST WATER: 1090 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION			
ARTIFACTS OBSERVED, RECOVERED: 1 PROJECTILE POINT, 1 BIFACE, 3 UTILIZED/RETOUCHED FLAKES, AND 10 FLAKES			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE: 1:24,000	
WRITTEN REFERENCES NONE		MAP 	
COMMENTS: IN RANDOM SAMPLE UNIT			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA PROJECT: SW639	INVESTIGATORS: DOBBS DATE: 5/86

MINNESOTA ARCHAEOLOGICAL SITE FORM

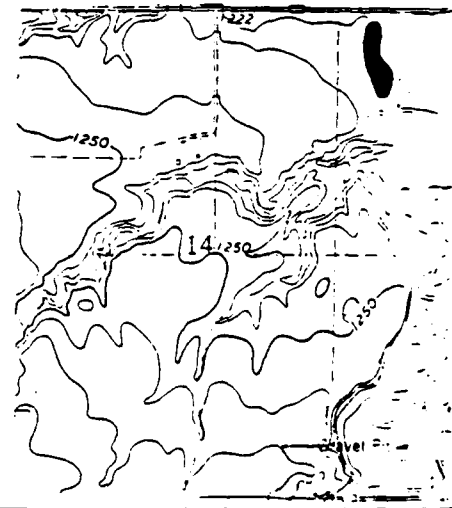
COUNTY LYON	SITE NAME	FIELD NUMBER 86CWS9	STATE NUMBER 214 22
OWNER MICHAEL LAMFERS RR 1 AMIRET, MN 56112		U.S.G.S. QUAD AMIRET	
SITE LOCATION 1 1/4 MILE EAST OF AMIRET, MN ON CO 2; 1/8 MILE NORTH TO RIVER		LEGAL DESCRIPTION CENTER, NW, SE, SW SEC 21 T. 110N R. 40W twnbsp: AMIRET	
SITE TYPE SMALL SCATTER OF TOOLS AND DEBITAGE		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING ON BLUFFTOP OVERLOOKING RIVER			
SITE CONDITION UNDER CULTIVATION		CURRENT LAND USE AGRICULTURAL	SITE AREA c. 2 ACRES
NATURE OF NEAREST WATER COTTONWOOD RIVER		DISTANCE TO WATER 150 FT	DIRECTION OF SITE FROM WATER SOUTH
ELEVATION OF SITE: 1240 FT		ELEVATION OF NEAREST WATER: 1190 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION			
ARTIFACTS OBSERVED, RECOVERED: 1 UTILIZED/RETOUCHED FLAKE, 2 CORES AND 9 FLAKES			
LOCAL COLLECTIONS, INFORMANTS: MICHAEL LAMFERS		MAP SCALE: 1:24,000 MAP	
WRITTEN REFERENCES NONE			
COMMENTS: REMAINDER OF REPORTED "INDIAN CAMP" DESTROYED DURING BRIDGE CONSTRUCTION			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA PROJECT: SW639	INVESTIGATORS: CDEE DATE: 6/86

MINNESOTA ARCHAEOLOGICAL SITE FORM

COUNTY LYON	SITE NAME	FIELD NUMBER 86RWS11	STATE NUMBER 2147 23
OWNER MRS. ANTON CARLSON 400 JEWETT ST #324 MARSHALL, MN 56258		U.S.G.S. QUAD MARSHALL	
SITE LOCATION FROM MARSHALL, MN, 1 MILE WEST ON HWY 23; ½ MILE WEST ON GRAVEL ROAD; ½ MILE NORTH; ½ MILE WEST; ½ MILE SOUTH; ¼ MILE WEST; SITE IS ABOUT ¼ MILE SOUTH OF GRAVEL ROAD		LEGAL DESCRIPTION SW,SW,NE,NE SEC 14 T.111N R.42W twmsp: LYND	
SITE TYPE SMALL TOOL AND DEBITAGE SCATTER		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING ON UPLANDS OVERLOOKING FLOODPLAIN OF RIVER			
SITE CONDITION UNDER CULTIVATION	CURRENT LAND USE AGRICULTURAL	SITE AREA c. 1 ACRE	
NATURE OF NEAREST WATER INTERMITTENT STREAM / REDWOOD RIVER	DISTANCE TO WATER 100 FT / 1200 FT	DIRECTION OF SITE FROM WA NORTH / WEST	
ELEVATION OF SITE: 1230 FT		ELEVATION OF NEAREST WATER: 1210 FT / 1210 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION			
ARTIFACTS OBSERVED, RECOVERED: 3 UTILIZED/RETOUCHED FLAKES, 1 CORE, and 15 FLAKES			
LOCAL COLLECTIONS, INFORMANTS: MRS. ANTON CARLSON		MAP SCALE: 1:24,000 MAP 	
WRITTEN REFERENCES NONE			
COMMENTS: MRS CARLSON SPOKE OF INDIAN CAMPS REPORTED IN AREA IN 1800s IN RANDOM SAMPLE UNIT			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA PROJECT: SW639	INVESTIGATORS: DOEHL DATE: 5/86

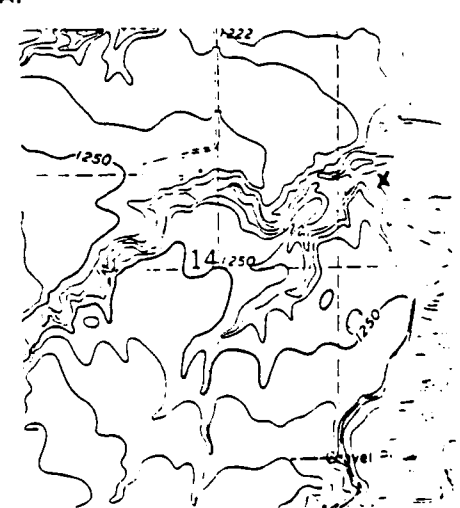
MINNESOTA ARCHAEOLOGICAL SITE FORM

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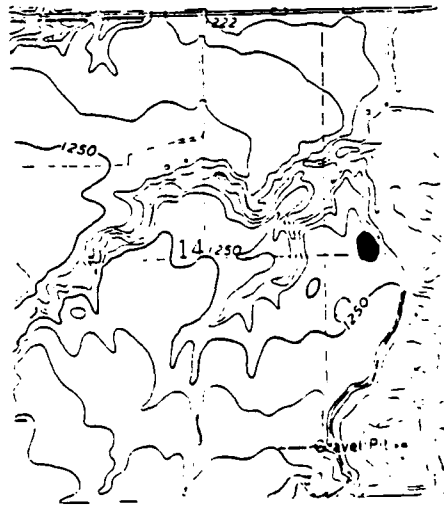
COUNTY LYON	SITE NAME	FIELD NUMBER 86RWS12	STATE NUMBER 2147 24
OWNER MRS ANTON CARLSON 400 JEWETT ST #324 MARSHALL, MN 56258		U.S.G.S. QUAD MARSHALL	
SITE LOCATION FROM MARSHALL, MN 1 MILE WEST ON HWY 23; ½ MILE WEST ON GRAVEL ROAD; ½ MILE NORTH; ½ MILE WEST; ½ MILE SOUTH; ABOUT 1/8 MILE WEST; SITE RUNS FROM SOUTH OF ROAD ABOUT 1/8 MILE.		LEGAL DESCRIPTION W½, NW, NE, NE SEC 14 T 111N R. 42W twosp: LYND	
SITE TYPE SMALL SCATTER OF TOOLS AND DEBITAGE		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING ON UPLANDS OVERLOOKING FLOODPLAIN OF RIVER			
SITE CONDITION UNDER CULTIVATION	CURRENT LAND USE AGRICULTURAL		SITE AREA c. 2.5 ACRES
NATURE OF NEAREST WATER INTERMITTENT STREAM // REDWOOD RIVER	DISTANCE TO WATER 300 FT / 1000 FT	DIRECTION OF SITE FROM WA NORTH AND WEST	
ELEVATION OF SITE: 1220 FT		ELEVATION OF NEAREST WATER: 1210 FT / 1210 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION			
ARTIFACTS OBSERVED, RECOVERED: 1 SCRAPER, 1 BIFACE, 1 UTILIZED/RETOUCHED FLAKE, 1 CORE AND 9 FLAKES			
LOCAL COLLECTIONS, INFORMANTS: MRS. ANTON CARLSON		MAP SCALE: 1:24,000 MAP 	
WRITTEN REFERENCES NONE			
COMMENTS: MRS CARLSON SPOKE OF INDIAN CAMPS REPORTED IN THE AREA IN THE MID 1800's IN RANDOM SAMPLE UNIT			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA	INVESTIGATORS: DOBEI
		PROJECT: SW639	DATE: 5/96

MINNESOTA ARCHAEOLOGICAL SITE FORM

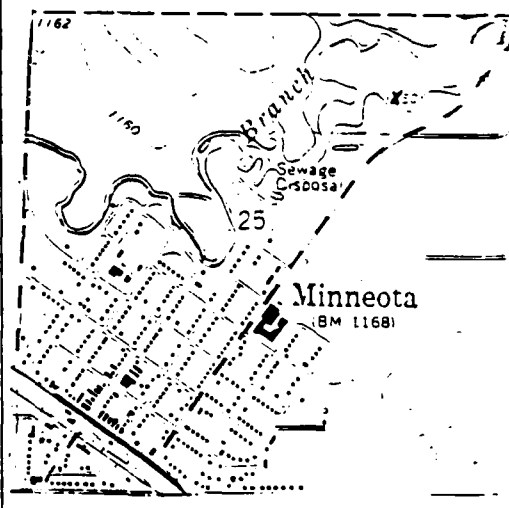
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COUNTY LYON	SITE NAME	FIELD NUMBER 86RWS15	STATE NUMBER 21 LY 251
OWNER MRS. ANTON CARLSON 400 JEWETT ST #324 MARSHALL, MN 56258		U.S.G.S. QUAD MARSHALL LEGAL DESCRIPTION NE, NE, NE, NE SEC 14 T. 111N R. 42W twns: LYND	
SITE LOCATION FROM MARSHALL, MN 1 MILE WEST ON HWY 23; ½ MILE WEST ON GRAVEL ROAD; ½ MILE NORTH; ½ MILE WEST; ½ MILE SOUTH; APPROXIMATELY 1/8 MILE WEST; SITE IS JUST OVER ¼ MILE SOUTH OF GRAVEL ROAD.			
SITE TYPE DUGOUT		PROBABLE CULTURAL COMPONENTS: HISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING IN TERRACE ADJACENT TO RIVER FLOODPLAIN			
SITE CONDITION UNDISTURBED	CURRENT LAND USE GRASSLAND	SITE AREA 10 x 10 METERS	
NATURE OF NEAREST WATER INTERMITTENT STREAM / REDWOOD RIVER	DISTANCE TO WATER 200 FT / 800 FT	DIRECTION OF SITE FROM WAT WEST	
ELEVATION OF SITE: 1210 FT		ELEVATION OF NEAREST WATER: 1210 FT / 1210 FT	
NATURE, EXTENT OF INVESTIGATION: SURFACE INVESTIGATION			
ARTIFACTS OBSERVED, RECOVERED: NONE			
LOCAL COLLECTIONS, INFORMANTS: MRS. ANTON CARLSON		MAP SCALE: 1:24,000 MAP 	
WRITTEN REFERENCES NONE			
COMMENTS: MRS CARLSON REPORTS THAT DUGOUT WAS OCCUPIED BY FAMILY OF OLE LARSON WHEN HE WAS A BOY. PROPERTY AT THIS TIME WAS HOMESTEADED BY "NELSON" FAMILY IN RANDOM SAMPLE UNIT			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA PROJECT: SW639	INVESTIGATORS: DORRIS DATE: 5/86

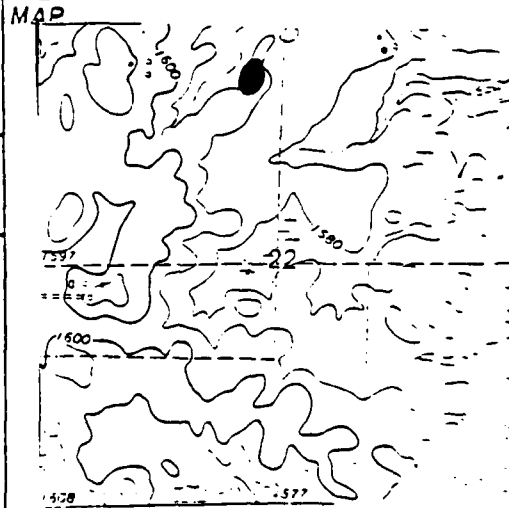
MINNESOTA ARCHAEOLOGICAL SITE FORM

COUNTY LYON	SITE NAME	FIELD NUMBER 86RWS16	STATE NUMBER 2127 26
OWNER MRS. ANTON CARLSON 400 JEWETT ST #324 MARSHALL, MN 56248		U.S.G.S. QUAD MARSHALL	
SITE LOCATION FROM MARSHALL, MN 1 MILE WEST ON HWY23; ½ MILE WEST ON GRAVEL ROAD; ½ MILE NORTH; ½ MILE WEST; ½ MILE SOUTH; APPROXIMATELY 1/8 MILE WEST; SITE IS APPROXIMATELY ½ MILE SOUTH OF GRAVEL ROAD		LEGAL DESCRIPTION SE,SW,SE,NE SEC 14 T. 111N R. 42W twntp: LYND	
SITE TYPE SMALL SCATTER OF TOOLS AND DEBITAGE		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING ON UPLANDS OVERLOOKING FLOODPLAIN OF RIVER			
SITE CONDITION UNDER CULTIVATION	CURRENT LAND USE AGRICULTURAL		SITE AREA c. 1.5 ACRE
NATURE OF NEAREST WATER REDWOOD RIVER	DISTANCE TO WATER 600 FT	DIRECTION OF SITE FROM WA WEST	
ELEVATION OF SITE: 1240 FT	ELEVATION OF NEAREST WATER: 1210 FT		
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION			
ARTIFACTS OBSERVED, RECOVERED: 2 PROJECTILE POINTS, 1 BIFACE, 11 UTILIZED/RETOUCHED FLAKES, 3 CORES, AND 18 FLAKES			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE: 1:24,000 MAP 	
WRITTEN REFERENCES NONE			
COMMENTS: IN RANDOM SAMPLE UNIT			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA	INVESTIGATORS: DCBEE
		PROJECT: SW639	DATE: 5/86

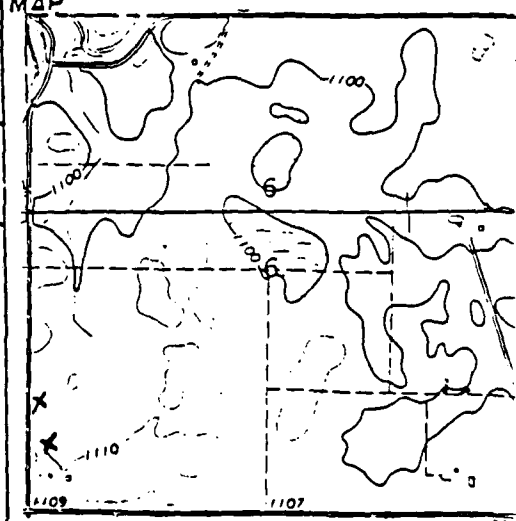
MINNESOTA ARCHAEOLOGICAL SITE FORM

COUNTY LYON	SITE NAME	FIELD NUMBER 86YMS12	STATE NUMBER 2147 27
OWNER PETER S. GUDMUNDSON MINNEOTA, MN 56264		U.S.G.S. QUAD MINNEOTA	
SITE LOCATION FROM MINNEOTA, MN APPROXIMATELY 5/8 MILE NORTHEAST ON CO 10; SITE IS ON NORTHWEST SIDE OF ROAD.		LEGAL DESCRIPTION NW, SW, NE, NE SEC 25 T 113N R. 43 W twntp: EIDSVOLD	
SITE TYPE DUGOUT		PROBABLE CULTURAL COMPONENTS: HISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING ON TERRACE IN RIVER FLOODPLAIN			
SITE CONDITION UNDISTURBED		CURRENT LAND USE GRASSLAND	SITE AREA 9 x 7 METERS
NATURE OF NEAREST WATER SOUTH BRANCH YELLOW MEDICINE RIVER		DISTANCE TO WATER 400 FT	DIRECTION OF SITE FROM PLAT SOUTHWEST
ELEVATION OF SITE: 1150 FT		ELEVATION OF NEAREST WATER: 1140 FT	
NATURE, EXTENT OF INVESTIGATION: SURFACE INSPECTION			
ARTIFACTS OBSERVED, RECOVERED: NONE			
LOCAL COLLECTIONS, INFORMANTS: LUCILLE GUDMUNDSON		MAP SCALE: 1:24,000 MAP	
WRITTEN REFERENCES NONE			
COMMENTS: GUDMUNDSON FAMILY OBTAINED PROPERTY IN 1903 - "BEFORE THIS A MAN LIVED IN THE DUGOUT FOR A SHORT TIME"			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA PROJECT: SW639	INVESTIGATORS: DOBBE DATE: 6/36

MINNESOTA ARCHAEOLOGICAL SITE FORM

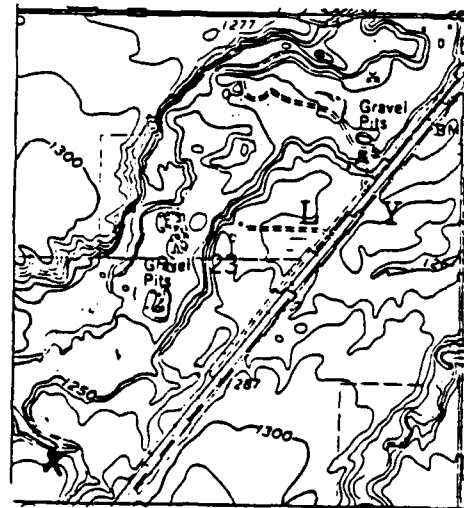
COUNTY LYON	SITE NAME	FIELD NUMBER 86YMS2	STATE NUMBER 2147 28
OWNER WALTER AND VALERIA LIPINSKI RT 1, BOX 195 CANBY, MN 56220		U.S.G.S. QUAD CANBY SE	
SITE LOCATION FROM IVANHOE, MN 9 MILES NORTH ON HWY 75; WEST $\frac{1}{4}$ MILE ON CO 19; SITE IS SOUTH OF ROAD APPROXIMATELY $\frac{1}{8}$ MILE.		LEGAL DESCRIPTION NE, NE, NW SEC 22 T. 113N R. 45W twnbsp: MARBLE	
SITE TYPE SMALL SCATTER OF TOOLS AND DEBITAGE		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING UPLAND MORaine			
SITE CONDITION UNDER CULTIVATION	CURRENT LAND USE AGRICULTURAL	SITE AREA 1 ACRE	
NATURE OF NEAREST WATER INTERMITTENT STREAM	DISTANCE TO WATER 200 FT	DIRECTION OF SITE FROM WATER EAST	
ELEVATION OF SITE: 1590 FT		ELEVATION OF NEAREST WATER: 1590 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION			
ARTIFACTS OBSERVED, RECOVERED: 5 UTILIZED/RETOUCHED FLAKES, 1 CORE, AND 16 FLAKES			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE: 1:24,000	
WRITTEN REFERENCES NONE			
COMMENTS: IN RANDOM SAMPLE UNIT			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA	INVESTIGATORS: DCBBS
		PROJECT: SW639	DATE: 5/86

MINNESOTA ARCHAEOLOGICAL SITE FORM

COUNTY LYON	SITE NAME	FIELD NUMBER 86YMS1	STATE NUMBER 214/29
OWNER INA BROUGHTON RT 1 COTTONWOOD, MN 56229		U.S.G.S. QUAD GREEN VALLEY	
SITE LOCATION 11 MILES NORTH ON HWY 59 FROM MARSHALL, MN; WEST ON CO 10 2 MILES; EAST ON CO 19 1/8 MILE; SITE IS EAST OF ROAD.		LEGAL DESCRIPTION W $\frac{1}{2}$, NW, SW, SW SEC 6 T. 113N R. 41W twosp: VALLERS	
SITE TYPE FIND SPOT		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING UPLAND MORaine			
SITE CONDITION UNDER CULTIVATION	CURRENT LAND USE AGRICULTURAL		SITE AREA c. 2.5 ACRES
NATURE OF NEAREST WATER YELLOW MEDICINE RIVER	DISTANCE TO WATER 2500 FT	DIRECTION OF SITE FROM WA EAST	
ELEVATION OF SITE: 1110 FT		ELEVATION OF NEAREST WATER: 1080 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION			
ARTIFACTS OBSERVED, RECOVERED: 1 UTILIZED/RETOUCHED FLAKE			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE: 1:24,000 MAP 	
WRITTEN REFERENCES NONE			
COMMENTS: IN RANDOM SAMPLE UNIT			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA PROJECT: SW639	INVESTIGATORS: DOBBS DATE: 4/86

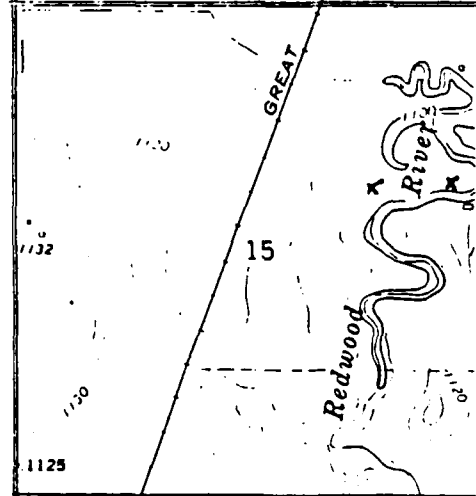
MINNESOTA ARCHAEOLOGICAL SITE FORM

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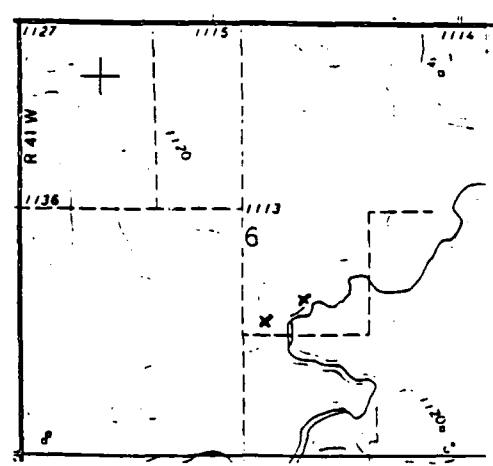
COUNTY LYON	SITE NAME	FIELD NUMBER 86RWS9	STATE NUMBER 214/30
OWNER TED ANDERSON 703 SOUTH BEND AVE MARSHALL, MN 56250		U.S.G.S. QUAD MARSHALL	
SITE LOCATION APPROXIMATELY 4 MILES SOUTHWEST OF MARSHALL ON HWY 23; SITE IS 1/4 MILE WEST OF HIGHWAY		LEGAL DESCRIPTION NW, SE, SW, SW SEC 23 T.111N R.42W twnbsp:LYND	
SITE TYPE FIND SPOT		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING ON UPLANDS OVERLOOKING FLOODPLAIN ADJACENT TO RIVER			
SITE CONDITION UNDER CULTIVATION	CURRENT LAND USE AGRICULTURAL		SITE AREA
NATURE OF NEAREST WATER REDWOOD RIVER	DISTANCE TO WATER 1400 FT	DIRECTION OF SITE FROM W SOUTH	
ELEVATION OF SITE: 1270 FT		ELEVATION OF NEAREST WATER: 1240 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION			
ARTIFACTS OBSERVED, RECOVERED: 1 CORE			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE: 1:24,000	
WRITTEN REFERENCES NONE		MAP 	
COMMENTS: IN RANDOM SAMPLE UNIT			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA	INVESTIGATORS: DOBBS
PROJECT: SW639		DATE: 5/86	

MINNESOTA ARCHAEOLOGICAL SITE FORM

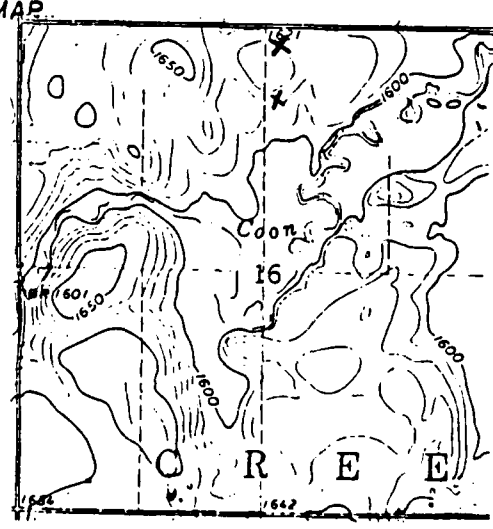
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COUNTY LYON	SITE NAME	FIELD NUMBER 86RWS10	STATE NUMBER 214 31
OWNER THEODORE TODNEM 103 SO WHITNEY MARCHALL, MN 56258		U.S.G.S. QUAD GREEN VALLEY	
SITE LOCATION 3/4 MILE SOUTH OF GREEN VALLEY, MN ON HWY 29; WEST 1/4 MILE ON GRAVEL ROAD; SITE IS APPROXIMATELY 1/2 MILE SOUTH OF GRAVEL ROAD.		LEGAL DESCRIPTION SHERD - NE, NE, SW, NE POINT - CENTER, SE, NE SEC 15 T 112N R. 41W twsp: FAIRVIEW	
SITE TYPE FIND SPOT		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING ON LOW TERRACES IN FLOODPLAIN ADJACENT TO REDWOOD RIVER			
SITE CONDITION UNDER CULTIVATION	CURRENT LAND USE AGRICULTURAL		SITE AREA
NATURE OF NEAREST WATER REDWOOD RIVER	DISTANCE TO WATER 700 FT/ 20 FT	DIRECTION OF SITE FROM W NORTH	
ELEVATION OF SITE: 1100 FT	ELEVATION OF NEAREST WATER: 1100 FT		
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION AND SOIL PROBING			
ARTIFACTS OBSERVED, RECOVERED: 1 GRIT TEMPERED RIM SHERD AND 1 NOTCHED PROJECTIVE POINT			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE: 1:24,000	
WRITTEN REFERENCES NONE		MAP	
COMMENTS: IN RANDOM SAMPLE UNIT			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA PROJECT: SW639	INVESTIGATORS: DOBBS DATE: 5/86

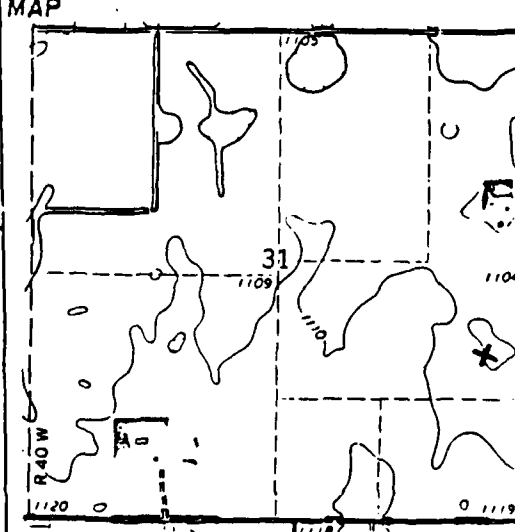
MINNESOTA ARCHAEOLOGICAL SITE FORM

COUNTY LYON	SITE NAME	FIELD NUMBER 86RWS6	STATE NUMBER 2141 32
OWNER SAM BOERBOOM RT 3 MARSHALL, MN 56258		U.S.G.S. QUAD GREEN VALLEY	
SITE LOCATION FROM MARSHALL, MN 4 MILES NORTH ON HWY 59 TO CO 8; 1 MILE WEST; 3/4 MILE NORTH ON GRAVEL ROAD; SITE IS ABOUT 1/2 MILE WEST OF ROAD ON NORTH SIDE OF CREEK		LEGAL DESCRIPTION SW,NW,SE SEC 6 T 112N R 41W twmsp: FAIRVIEW	
SITE TYPE FIND SPOT		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING ON LOW TERRACE IN FLOODPLAIN ADJACENT TO COON CREEK			
SITE CONDITION UNDER CULTIVATION	CURRENT LAND USE AGRICULTURAL		SITE AREA
NATURE OF NEAREST WATER THREEMILE CREEK	DISTANCE TO WATER 200 FT	DIRECTION OF SITE FROM WATER NORTH	
ELEVATION OF SITE: 1120 FT		ELEVATION OF NEAREST WATER: 1110 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION			
ARTIFACTS OBSERVED, RECOVERED: 1 UTILIZED/RETOUCHED FLAKE			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE: 1:24,000 MAP 	
WRITTEN REFERENCES NONE			
COMMENTS: IN RANDOM SAMPLE UNIT			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA	INVESTIGATORS: DOBBS
		PROJECT: SW639	DATE: 5/86

MINNESOTA ARCHAEOLOGICAL SITE FORM

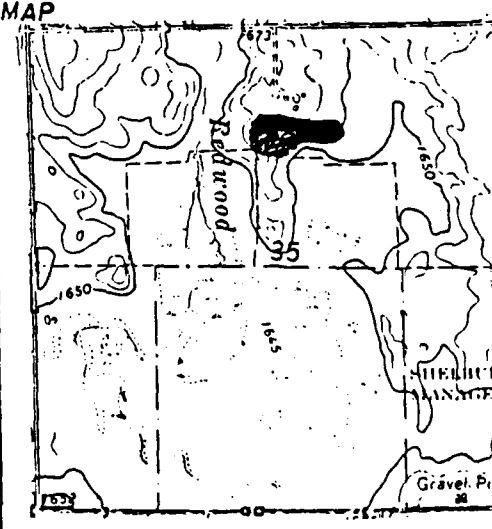
COUNTY LYON	SITE NAME	FIELD NUMBER 86RWS5	STATE NUMBER 2141 · 33
OWNER FLOYD AND EDNA WILMES RT 1, BOX 9 LYND, MN		U.S.G.S. QUAD DEAD COON LAKE	
SITE LOCATION FROM RUSSELL, MN 3 MILES WEST ON CO 66; 3 MILE NORTH ON CO 13; NEARLY ½ MILE WEST ON GRAVEL ROAD; SITE EXTENDS ¼ MILE SOUTH ON SOUTH SIDE OF ROAD		LEGAL DESCRIPTION W½, NW, NW, NE AND W½, SW, NW, NE SEC 16 T110N R.43W twnbsp: COON CREEK	
SITE TYPE FIND SPOT		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING ROLLING GLACIAL MORaine IN AREA OF MANY INTERMITTENT STREAM DRAINAGES			
SITE CONDITION UNDER CULTIVATION	CURRENT LAND USE AGRICULTURAL	SITE AREA c. 2.5 ACRES	
NATURE OF NEAREST WATER COON CREEK	DISTANCE TO WATER 800 FT	DIRECTION OF SITE FROM WA WEST	
ELEVATION OF SITE: 1630 FT		ELEVATION OF NEAREST WATER: 1590 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION			
ARTIFACTS OBSERVED, RECOVERED: 2 FLAKES			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE: 1:24,000 MAP 	
WRITTEN REFERENCES NONE			
COMMENTS: IN RANDOM SAMPLE UNIT			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA PROJECT: SW639	INVESTIGATORS: DOBBS DATE: 5/86

MINNESOTA ARCHAEOLOGICAL SITE FORM

COUNTY LYON	SITE NAME	FIELD NUMBER 86RWS2	STATE NUMBER 214 · 34
OWNER RACHEL MINNEHAN 109 THOMAS AVE MARSHALL, MN 56258		U.S.G.S. QUAD COTTONWOOD	
SITE LOCATION 3½ MILES SOUTH OF COTTONWOOD, MN ON CO 9; 1½ MILE WEST; ½ MILE SOUTH; SITE IS ON KNOLL ABOUT 400 FT WEST OF GRAVEL ROAD		LEGAL DESCRIPTION NW, SE, NE, SE SEC 31 T 113N R. 40W twntp: LUCAS	
SITE TYPE FIND SPOT		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING ON SOUTHWEST SIDE OF KNOLL IN GLACIAL MORaine			
SITE CONDITION UNDER CULTIVATION		CURRENT LAND USE AGRICULTURAL	SITE AREA
NATURE OF NEAREST WATER THREEMILE CREEK		DISTANCE TO WATER 9400 FT	DIRECTION OF SITE FROM WATER NORTH
ELEVATION OF SITE: 1100 FT		ELEVATION OF NEAREST WATER: 1080 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION			
ARTIFACTS OBSERVED, RECOVERED: 1 FLAKE			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE: 1:24,000 MAP 	
WRITTEN REFERENCES NONE			
COMMENTS: IN RANDOM SAMPLE UNIT			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA	INVESTIGATORS: DOBBS
		PROJECT: SW639	DATE: 4/86

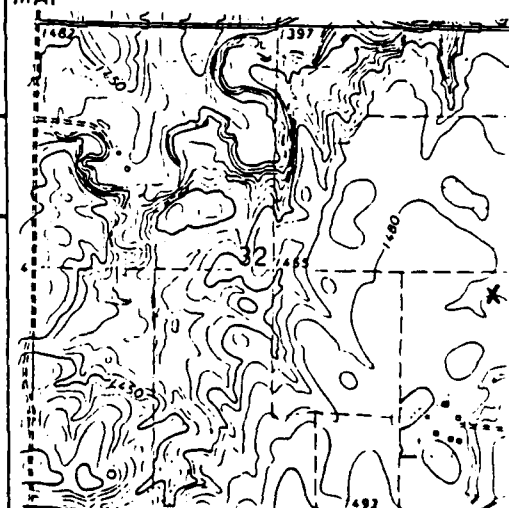
MINNESOTA ARCHAEOLOGICAL SITE FORM

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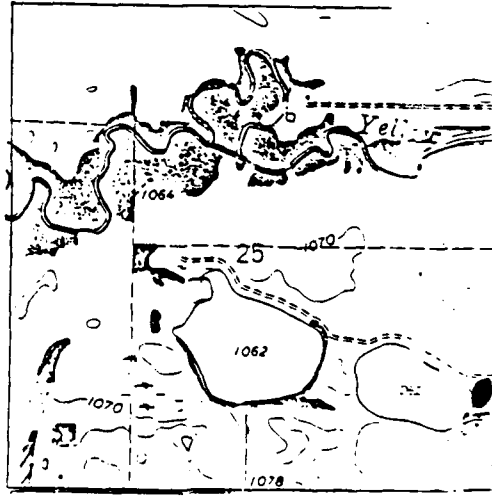
COUNTY LYON	SITE NAME	FIELD NUMBER 86RWS18	STATE NUMBER 21LY35
OWNER LEE DOERING 109 S 4TH ST MARSHALL, MN 56258		U.S.G.S. QUAD -- CURRENT LAKE	
SITE LOCATION 7 MILES SOUTH OF RUSSELL, MN ON MINNESOTA HIGHWAY 91, 1½ MILES WEST ON TOWNSHIP ROAD, ABOUT ¼ MILE SOUTH		LEGAL DESCRIPTION SE, SE, NE, NW S½, SW, NW, NE SEC. 35 T. 109. N. R. 43W twsp: SHELBURNE	
SITE TYPE EXTENSIVE LITHIC SCATTER		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING UPLANDS ADJACENT TO REDWOOD RIVER FLOODPLAIN			
SITE CONDITION UNDER CULTIVATION	CURRENT LAND USE AGRICULTURAL	SITE AREA 10 ACRES	
NATURE OF NEAREST WATER REDWOOD RIVER	DISTANCE TO WATER 500 FEET	DIRECTION OF SITE FROM W EAST	
ELEVATION OF SITE: 1670 FEET		ELEVATION OF NEAREST WATER: 1640 FEET	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION			
ARTIFACTS OBSERVED, RECOVERED: PROJECTILE POINTS, BIFACES, SCRAPERS, UTILIZED RETOUCHE FLAKES			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE: 1:24,000 MAP 	
WRITTEN REFERENCES NONE			
COMMENTS: JUST NORTH OF ORIGINAL SAMPLE UNIT			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: PROJECT: SW 639	INVESTIGATORS: DOBBS DATE: 6/86

MINNESOTA ARCHAEOLOGICAL SITE FORM

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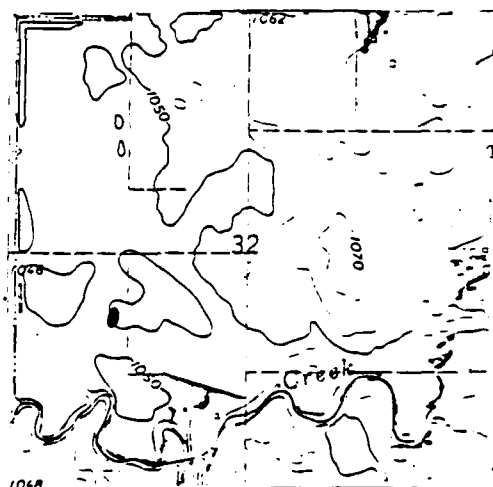
COUNTY LINCOLN	SITE NAME	FIELD NUMBER 86YMS3	STATE NUMBER 21LN-16
OWNER DALE RICHMOND RT 1, BOX 138 TAUNTON, MN 56291		U.S.G.S. QUAD PORTER SW	
SITE LOCATION FROM IVANHOE, MN 4 MILES EAST ON HWY 19; 6 7/8 MILE NORTH ON CO 7; SITE IS 200 FT WEST OF CO 9.		LEGAL DESCRIPTION NW, NE, NE, SE SEC 32 T 113N R. 44W twnbsp: ALTA VIST	
SITE TYPE FIND SPOT		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING UPLAND MORaine			
SITE CONDITION UNDER CULTIVATION	CURRENT LAND USE AGRICULTURAL		SITE AREA
NATURE OF NEAREST WATER INTERMITTENT STREAM	DISTANCE TO WATER 900 FT	DIRECTION OF SITE FROM WA NORTHWEST	
ELEVATION OF SITE: 1480 ft		ELEVATION OF NEAREST WATER: 1460 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION			
ARTIFACTS OBSERVED, RECOVERED: 1 UTILIZED/RETOUCHED FLAKE			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE: 1:24,000 MAP 	
WRITTEN REFERENCES NONE			
COMMENTS: IN RANDOM SAMPLE UNIT			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA PROJECT: SW 639	INVESTIGATORS: DOBBS DATE: 5/86

MINNESOTA ARCHAEOLOGICAL SITE FORM

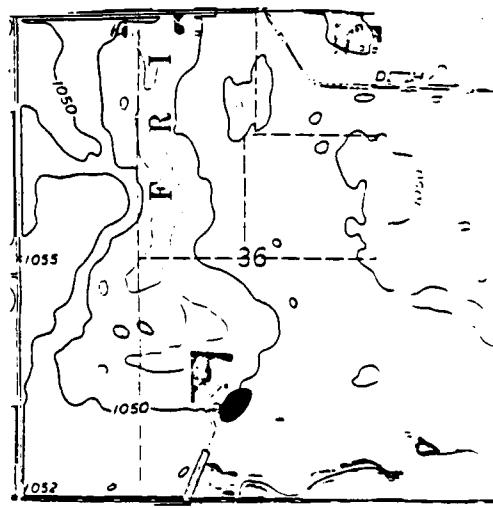
COUNTY YELLOW MEDICINE	SITE NAME	FIELD NUMBER 86YMS4	STATE NUMBER 214438
OWNER ANDREW H. ANDERSON RT 2 COTTONWOOD, MN 56229		U.S.G.S. QUAD WOOD LAKE NW	
SITE LOCATION FROM HANLEY FALLS, MN 2 MILES WEST ON CO 18; 3 MILES SOUTH ON CO ROAD 2; 3 MILES WEST ON CO HWY 2; ¼ MILE NORTH; SITE IS ADJACENT TO WEST SIDE OF ROAD.		LEGAL DESCRIPTION NE, NE, SE, SE SEC 25 T. 114N R. 41W twnbsp: NORMANIA	
SITE TYPE SMALL SCATTER OF TOOLS AND DEBITAGE		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING GLACIAL MORaine ADJACENT TO LAKE			
SITE CONDITION UNDER CULTIVATION	CURRENT LAND USE AGRICULTURAL	SITE AREA 1 ACRE	
NATURE OF NEAREST WATER UNNAMED LAKE	DISTANCE TO WATER ADJACENT	DIRECTION OF SITE FROM WATER EAST	
ELEVATION OF SITE: 1070 FT		ELEVATION OF NEAREST WATER: 1070 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION			
ARTIFACTS OBSERVED, RECOVERED: 4 UTILIZED/RETOUCHED FLAKES, 1 CORE, AND 3 FLAKES			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE: 1:24,000 MAP 	
WRITTEN REFERENCES NONE			
COMMENTS: NONE			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA PROJECT: SW639	INVESTIGATORS: D0385 DATE: 5. 1

MINNESOTA ARCHAEOLOGICAL SITE FORM

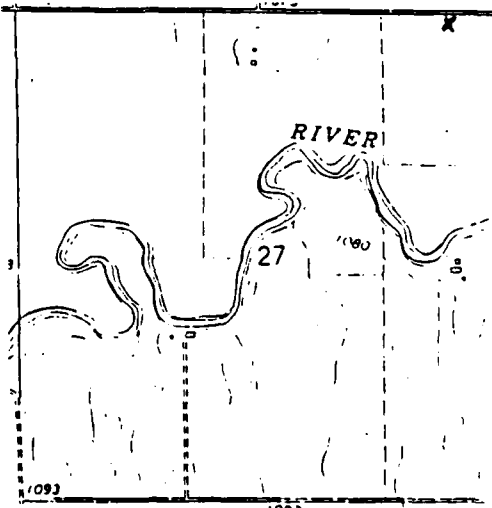
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COUNTY YELLOW MEDICINE	SITE NAME	FIELD NUMBER 86YMS5	STATE NUMBER 214439
OWNER DUANE JACOBSON RT 2, BOX 205 CLARKFIELD, MN 56223		U.S.G.S. QUAD WOOD LAKE NW	
SITE LOCATION 1½ MILES NORTH OF HANLEY FALLS ON CO ROAD 1; WEST 4 MILES ON CO HWY 3; ¼ MILE NORTH; SITE IS ADJACENT TO EAST SIDE OF ROAD.		LEGAL DESCRIPTION NE, SE, NW, SW SEC 32 T 115N R. 40 W twps:HAZEL RUN	
SITE TYPE SMALL DEBITAGE SCATTER		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING GLACIAL MORaine UPLAND			
SITE CONDITION UNDER CULTIVATION		CURRENT LAND USE AGRICULTURAL	SITE AREA C. 1 ACRE
NATURE OF NEAREST WATER SPRING CREEK		DISTANCE TO WATER 800 FT	DIRECTION OF SITE FROM WATER NORTH
ELEVATION OF SITE: 1050 FT		ELEVATION OF NEAREST WATER: 1040 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION			
ARTIFACTS OBSERVED, RECOVERED: 1 CORE and 4 FLAKES			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE: 1:24,000 MAP 	
WRITTEN REFERENCES NONE			
COMMENTS: NONE			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA PROJECT: SW639	INVESTIGATORS: DO3BS DATE: 5/96

MINNESOTA ARCHAEOLOGICAL SITE FORM

COUNTY YELLOW MEDICINE	SITE NAME	FIELD NUMBER 86YMS6	STATE NUMBER 214440
OWNER DOUGLAS ALBIN RR2, BOX 211 CLARKFIELD, MN 56223		U.S.G.S. QUAD WOOD LAKE NW	
SITE LOCATION TWO MILES NORTH OF HANLEY FALLS, MN ON CO 43; 5½ MILES WEST ON CO #; SITE IS ¼ MILE NORTH OF ROAD		LEGAL DESCRIPTION NE, SE, SW SEC 36 T. 115N R. 41W twnsPERSPECTIVE	
SITE TYPE SMALL POTTERY, TOOL AND DEBITAGE SCATTER		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING OUTER EDGE OF FLOODPLAIN OF RIVER			
SITE CONDITION UNDER CULTIVATION	CURRENT LAND USE AGRICULTURAL	SITE AREA 2.5 ACRES	
NATURE OF NEAREST WATER SPRING CREEK	DISTANCE TO WATER 700 FT	DIRECTION OF SITE FROM WATER NORTH	
ELEVATION OF SITE: 1050 FT		ELEVATION OF NEAREST WATER: 1040 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION AND AUGER TESTING			
ARTIFACTS OBSERVED, RECOVERED: 1 BIFACE, 1 PROJECTILE POINT, 2 FLAKES, AND 1 POTSHERD			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE: 1:24,000 MAP 	
WRITTEN REFERENCES NONE			
COMMENTS: IN RANDOM SAMPLE UNIT			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA	INVESTIGATORS: DDB
		PROJECT: SW639	DATE: 5/36

MINNESOTA ARCHAEOLOGICAL SITE FORM

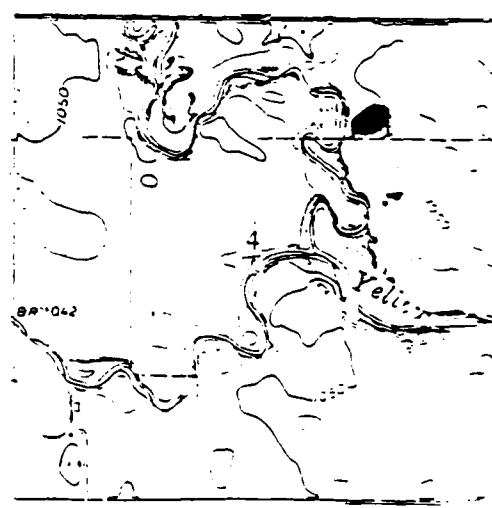
COUNTY YELLOW MEDICINE	SITE NAME	FIELD NUMBER 86YMS11	STATE NUMBER 214.441
OWNER KURT AND VIVIAN WENDSCHUH RT 1 COTTONWOOD, MN 56229		U.S.G.S. QUAD NORMANIA	
SITE LOCATION FROM HANLEY FALLS, MN 2 MILES SOUTHWEST ON HWY 23 TO CO ROAD 2; 6 MILES WEST TO CO ROAD 8; 3/4 MILE NORTH; SITE IS WEST OF ROAD.		LEGAL DESCRIPTION NE, NE, NE SEC 27 T. 114N R. 41W twosp: NORMANIA	
SITE TYPE FIND SPOT		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING FLOODPLAIN EXTENDING BACK FROM RIVER			
SITE CONDITION UNDER CULTIVATION		CURRENT LAND USE AGRICULTURAL	SITE AREA
NATURE OF NEAREST WATER YELLOW MEDICINE RIVER		DISTANCE TO WATER 1200 FT	DIRECTION OF SITE FROM WA NORTH
ELEVATION OF SITE: 1080 FT		ELEVATION OF NEAREST WATER: 1070 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION AND SOIL PROBING			
ARTIFACTS OBSERVED, RECOVERED: 1 CORE			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE: 1:24,000 MAP 	
WRITTEN REFERENCES NONE			
COMMENTS: IN RANDOM SAMPLE UNIT			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA PROJECT: SW639	INVESTIGATORS: DOBBS- DATE: 5/86

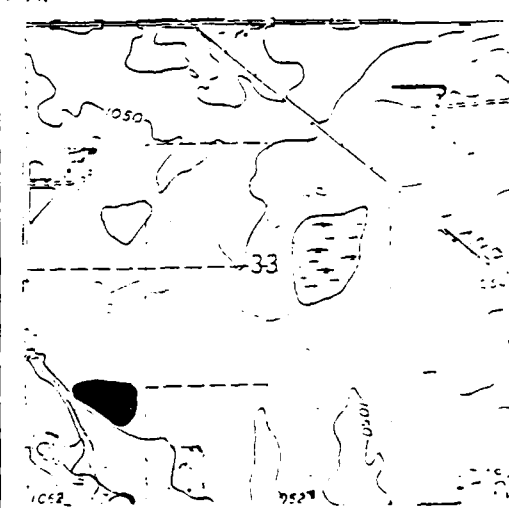
MINNESOTA ARCHAEOLOGICAL SITE FORM

COUNTY YELLOW MEDICINE	SITE NAME	FIELD NUMBER 86YMS14	STATE NUMBER 21YM 42
OWNER VIRGINIA HALVORSON (EXECUTOR) HANLEY FALLS, MN 56245		U.S.G.S. QUAD WOOD LAKE NW	
SITE LOCATION TWO MILES NORTH OF HANLEY FALLS, MN ON CO HWY 43; 2½ MILES WEST ON CO RD 3; SITE IS ADJACENT TO SOUTH SIDE OF ROAD		LEGAL DESCRIPTION S½, NE, NW, NE AND N½, SE, NW, NE SEC 4 T 114N R. 40W twnbsp: SANBES	
SITE TYPE SMALL SCATTER OF TOOLS AND DEBITAGE		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING ON TERRACES ADJACENT TO FLOODPLAIN OF CREEK			
SITE CONDITION UNDER CULTIVATION	CURRENT LAND USE AGRICULTURAL	SITE AREA 6 ACRES	
NATURE OF NEAREST WATER SPRING CREEK	DISTANCE TO WATER LESS THAN 10 FT	DIRECTION OF SITE FROM WATER NORTHEAST	
ELEVATION OF SITE: 1050 FT	ELEVATION OF NEAREST WATER: 1030 FT		
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION			
ARTIFACTS OBSERVED, RECOVERED: 1 SCRAPER, 1 BIFACE, 1 CORE AND 3 FLAKES			
LOCAL COLLECTIONS, INFORMANTS: OLE GAUTEFALD (COLLECTION IN POSSESSION OF VIRGINIA HALVORSON)		MAP SCALE: 1:24,000 MAP	
WRITTEN REFERENCES WILFORD, L.A., GAUTEFALD HOFF SITE EXCAVATIONS REPORT, UNIVERSITY OF MINNESOTA 1948			
COMMENTS: AREA IS JUST NORTH OF 21YM1 (GAUTEFALD SITE) AS DEFINED BY WILFORD (1948)			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA	INVESTIGATORS: DOBBE
		PROJECT: SW639	DATE: 6/86

MINNESOTA ARCHAEOLOGICAL SITE FORM

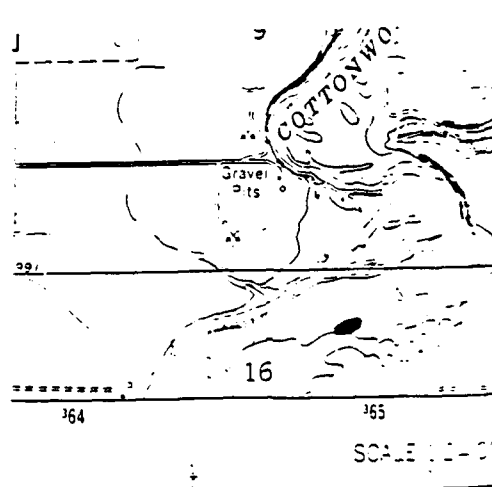
159

COUNTY YELLOW MEDICINE	SITE NAME	FIELD NUMBER 86YMS15	STATE NUMBER 21Y-143
OWNER VIRGINIA HALVORSON (EXECUTOR) HANLEY FALLS, MN 56245		U.S.G.S. QUAD WOOD LAKE NW	
SITE LOCATION TWO MILES NORTH OF HANLEY FALLS, MN ON HWY 43; 2 1/4 MILES WEST ON CO RD 3; SITE IS ABOUT 1/4 MILE SOUTH OF ROAD		LEGAL DESCRIPTION SE, SE, NW, NE AND SW, SW, NE, NE SEC 4 T. 114N R. 40W twntp SANDNES	
SITE TYPE SMALL SCATTER OF ARTIFACTS		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING IN TERRACES ADJACENT TO FLOODPLAIN OF CREEK			
SITE CONDITION UNDER CULTIVATION	CURRENT LAND USE AGRICULTURAL		SITE AREA 5.5 ACRES
NATURE OF NEAREST WATER SPRING CREEK	DISTANCE TO WATER ADJACENT	DIRECTION OF SITE FROM WATER EAST	
ELEVATION OF SITE: 1040 FT		ELEVATION OF NEAREST WATER: 1030 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION AND SOIL PROBING			
ARTIFACTS OBSERVED, RECOVERED: 1 UTILIZED/RETOUCHED FLAKE, 1 BONE, 1 SHELL AND TWO CERAMIC FRAGMENTS			
LOCAL COLLECTIONS, INFORMANTS: OLE GAUTEFALD (COLLECTION IN POSSESSION OF VIRGINIA HALVORSON)		MAP SCALE: 1:24,000	
WRITTEN REFERENCES WILFORD, L.A., GAUTEFALD HOFF SITE EXCAVATIONS REPORT, UNIVERSITY OF MINNESOTA 1948		MAP 	
COMMENTS: AREA IS JUST NORTH OF 21YMS1 (GAUTEFALD SITE) AS DEFINED BY WILFORD (1948)			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: INM PROJECT: SW639	INVESTIGATORS: 00333 DATE: 6 86

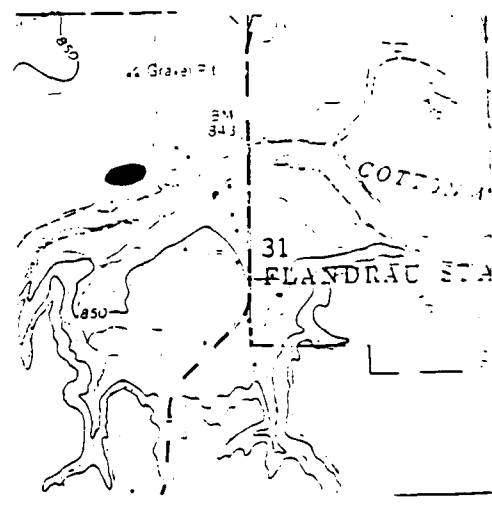
COUNTY YELLOW MEDICINE	SITE NAME	FIELD NUMBER 86YMS16	STATE NUMBER 214.4 44
OWNER VIRGINIA HALVORSON (EXECUTOR) HANLEY FALLS, MN 56245		U.S.G.S. QUAD WOOD LAKE NW	
SITE LOCATION TWO MILES NORTH OF HANLEY FALLS, MN ON CO 43; 2-3/4 MILE WEST ON CO 3; SITE IS 1/4 MILE NORTH OF ROAD		LEGAL DESCRIPTION NE, SW, SW SEC 33 T. 115N R. 40W twmsp: HAZEL RIVER	
SITE TYPE SMALL TOOL AND DEBITAGE SCATTER		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING TERRACE ADJACENT TO FLOODPLAIN OF RIVER			
SITE CONDITION UNDER CULTIVATION		CURRENT LAND USE AGRICULTURAL	SITE AREA 5 ACRES
NATURE OF NEAREST WATER SPRING CREEK		DISTANCE TO WATER 300 FT	DIRECTION OF SITE FROM WATER EAST
ELEVATION OF SITE: 1050 FT		ELEVATION OF NEAREST WATER: 1040 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION			
ARTIFACTS OBSERVED, RECOVERED: 1 UTILIZED/RETOUCHED FLAKE AND 4 FLAKES			
LOCAL COLLECTIONS, INFORMANTS: THOMAS MUSSER		MAP SCALE: 1:25,000 MAP 	
WRITTEN REFERENCES NONE			
COMMENTS: MR. MUSSER HAS COLLECTED AREA. CONDITIONS WERE POOR WHEN AREA WAS INVESTIGATED BY SW639 CREW. IN RANDOM SAMPLE UNIT			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA	INVESTIGATORS: DORR
		PROJECT: SW639	DATE: 3/1/88

MINNESOTA ARCHAEOLOGICAL SITE FORM

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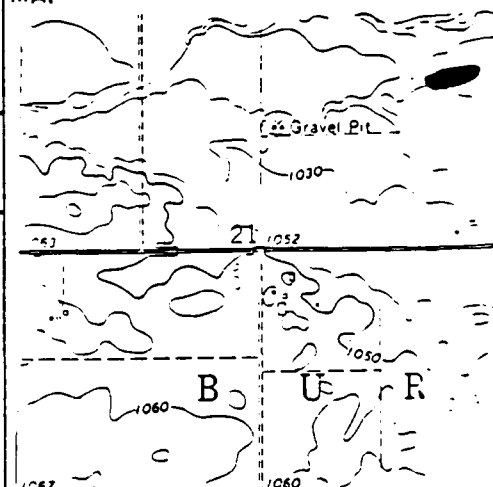
COUNTY BROWN	SITE NAME	FIELD NUMBER 86CWS11	STATE NUMBER 21 Bw 61
OWNER CHARLES LENDT RR 1, BOX 89 SLEEPY EYE, MN 56085		U.S.G.S. QUAD SLEEPY EYE	
SITE LOCATION THREE MILES SOUTH OF SLEEPY EYE ON CO 4; ONE MILE WEST (PAST AIRPORT); ABOUT ONE MILE SOUTH AND SOUTHEAST; 1/2 MILE EAST; ONE MILE NORTH ON CO 10; SITE IS 1/4 MI WEST OF ROAD.		LEGAL DESCRIPTION S 1/2, NE, NW, NE SEC 16 T 109N R. 32W twnbsp: STARK	
SITE TYPE TOOLS, DEBITAGE, POTTERY AND BONE IN PLOWZONE		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING SECOND TERRACE ABOVE FLOODPLAIN OF RIVER			
SITE CONDITION UNDER CULTIVATION		CURRENT LAND USE AGRICULTURAL	SITE AREA 1 ACRE
NATURE OF NEAREST WATER COTTONWOOD RIVER		DISTANCE TO WATER 500 FT	DIRECTION OF SITE FROM WA SOUTH
ELEVATION OF SITE: 950 FT		ELEVATION OF NEAREST WATER: 920 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION, SOIL PROBING, 1 x 2 M EXCAVATION UNIT			
ARTIFACTS OBSERVED, RECOVERED: 1 PROJECTILE POINT, 2 SCRAPERS, 1 BIFACE, 2 UTILIZED/RETOUCHED FLAKES, 1 CORE, 18 FLAKES, 1 RIM SHERD, 4 BODY SHERDS, BURNED AND UNBURNED BONE, AND CHARCOAL			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE: 1:24,000 MAP 	
WRITTEN REFERENCES NONE			
COMMENTS: IN RANDOM SAMPLE UNIT			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA	INVESTIGATORS: DORRIS
		PROJECT: SW632	DATE: 1966

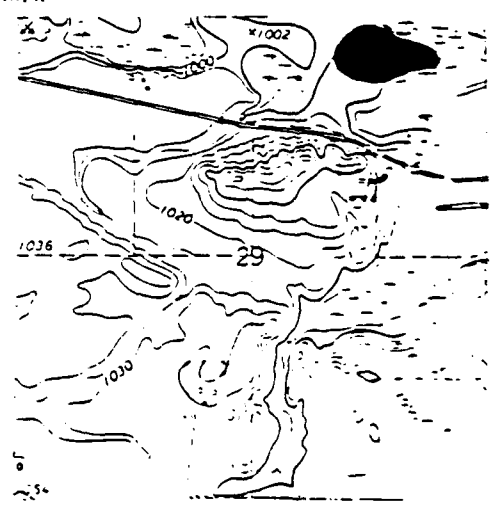
MINNESOTA ARCHAEOLOGICAL SITE FORM

COUNTY BROWN	SITE NAME	FIELD NUMBER 86CWS12	STATE NUMBER 21BW 62
OWNER WILBERT SPRENGER RR 2 NEW ULM, MN 56073		U.S.G.S. QUAD NEW ULM	
SITE LOCATION ABOUT ONE MILE SOUTHWEST OF NEW ULM, MN ON CO 13; SITE IS 1/4 MILE WEST OF ROAD		LEGAL DESCRIPTION SE,NE,SW,NW AND SW,NW,SE,NW SEC 31 T 110N R. 30W twosp:	
SITE TYPE SMALL SCATTER OF TOOLS AND DEBITAGE		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING ON TERRACE IN FLOODPLAIN OF RIVER			
SITE CONDITION UNDER CULTIVATION	CURRENT LAND USE AGRICULTURAL	SITE AREA 1.5 ACRES	
NATURE OF NEAREST WATER COTTONWOOD RIVER	DISTANCE TO WATER 200 FT	DIRECTION OF SITE FROM WA NORTH	
ELEVATION OF SITE: 820 FT		ELEVATION OF NEAREST WATER: 820 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION AND SOIL PROBING			
ARTIFACTS OBSERVED, RECOVERED: 1 SCRAPER AND 26 FLAKES			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE: 1:24,000	
WRITTEN REFERENCES NONE		MAP	
COMMENTS: NONE			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IWA	INVESTIGATORS: TOSCI
		PROJECT: SW600	DATE: 8/86

MINNESOTA ARCHAEOLOGICAL SITE FORM

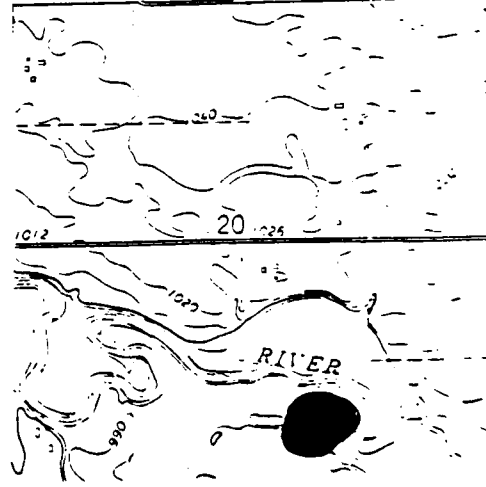
153

COUNTY BROWN	SITE NAME	FIELD NUMBER 86CWS13	STATE NUMBER 218W 63
OWNER DON ANDERSON RR 2 SPRINGFIELD, MN 56087		U.S.G.S. QUAD SPRINGFIELD	
SITE LOCATION ½ MILE SOUTH OF SPRINGFIELD ON CO 5; TWO MILES EAST ON CO 24; SITE IS ½ MILE NORTH OF ROAD		LEGAL DESCRIPTION N½, SE, NE, NE SEC 21 T 109N R 34W twmsp: BURNSTOWN	
SITE TYPE SMALL SCATTER OF TOOLS AND DEBITAGE		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING ON TERRACE ABOVE FLOODPLAIN OF RIVER			
SITE CONDITION UNDER CULTIVATION	CURRENT LAND USE AGRICULTURAL	SITE AREA 2 ACRES	
NATURE OF NEAREST WATER COTTONWOOD RIVER	DISTANCE TO WATER 600 FT	DIRECTION OF SITE FROM WA SOUTH	
ELEVATION OF SITE: 1020 FT		ELEVATION OF NEAREST WATER: 1000 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION AND AUGER TESTING			
ARTIFACTS OBSERVED, RECOVERED: 1 BIFACE, 2 UTILIZED/RETOUCHED FLAKES, AND 4 FLAKES			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE: 1:24,000 MAP 	
WRITTEN REFERENCES NONE			
COMMENTS: NONE			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA	INVESTIGATORS: DIBB
		PROJECT: SW639	DATE: 6/86

MINNESOTA ARCHAEOLOGICAL SITE FORM			
COUNTY BROWN	SITE NAME	FIELD NUMBER 86CWS16	STATE NUMBER 213W64
OWNER MELVIN LENDT RR SLEEPY EYE, MN 56238		U.S.G.S. QUAD LEAVENWORTH	
SITE LOCATION 1 1/4 MILE WEST OF LEAVENWORTH ON CO 24; SITE IS 1/2 MILE NORTH OF ROAD		LEGAL DESCRIPTION NW, NE, NE AND E 1/2, NW, NE SEC 29 T 109N R. 33W twsp. LEAVENWORTH	
SITE TYPE SMALL ARTIFACT SCATTER		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING ON TERRACE IN RIVER FLOODPLAIN			
SITE CONDITION UNDER CULTIVATION		CURRENT LAND USE AGRICULTURAL	SITE AREA 10 ACRES
NATURE OF NEAREST WATER COTTONWOOD RIVER		DISTANCE TO WATER 200 FT	DIRECTION OF SITE FROM WATER SOUTH
ELEVATION OF SITE: 1000 FT		ELEVATION OF NEAREST WATER: 980 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION AND SOIL PROBING			
ARTIFACTS OBSERVED, RECOVERED: 1 BONE, 2 GROUNDSTONE, FCR, 1 BIFACE, 1 ACRAPER, 3 UTILIZED/RETouched FLAKES AND 16 FLAKES			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE: 1:24,000 MAP 	
WRITTEN REFERENCES NONE			
COMMENTS: NONE			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA	INVESTIGATORS: DOBBE
		PROJECT: SW633	DATE: 6/86

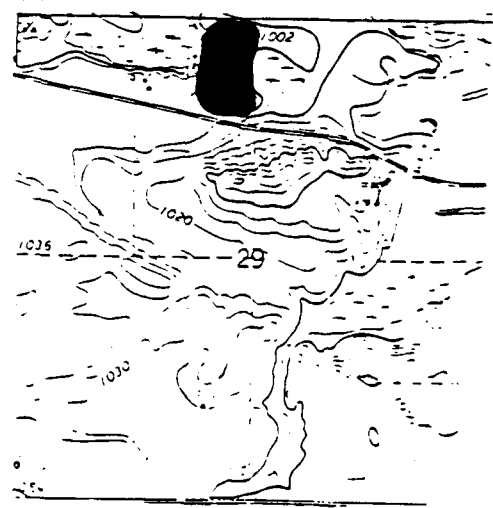
MINNESOTA ARCHAEOLOGICAL SITE FORM

165

COUNTY BROWN	SITE NAME	FIELD NUMBER 86CWS17	STATE NUMBER 218W 65
OWNER MELVIN LENDT RR SLEEY EYE, MN 56238		U.S.G.S. QUAD LEAVENWORTH	
SITE LOCATION 1 1/4 MILE WEST OF LEAVENWORTH ON CO 24; SITE IS ABOUT 1/2 MILE NORTH OF ROAD		LEGAL DESCRIPTION SE, SE, NE, SW SW, SW, NW, SE SEC 20 NW, NW, SW, SE NE, NE, SE, SW T109N R33W T. R. twsp: LEAVENWORTH	
SITE TYPE SMALL ARTIFACT SCATTER		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING FLOODPLAIN ADJACENT TO THE RIVER			
SITE CONDITION UNDER CULTIVATION		CURRENT LAND USE AGRICULTURAL	SITE AREA 12 ACRES
NATURE OF NEAREST WATER COTTONWOOD RIVER		DISTANCE TO WATER 100 FT	DIRECTION OF SITE FROM WA SOUTH
ELEVATION OF SITE: 990 FT		ELEVATION OF NEAREST WATER: 980 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION AND SOIL PROBING			
ARTIFACTS OBSERVED, RECOVERED: BONE, FCR and 7 FLAKES			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE: 1:24,000 MAP 	
WRITTEN REFERENCES NONE			
COMMENTS: NONE			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: INA PROJECT: SW639	INVESTIGATORS: D1111 DATE: 6/86

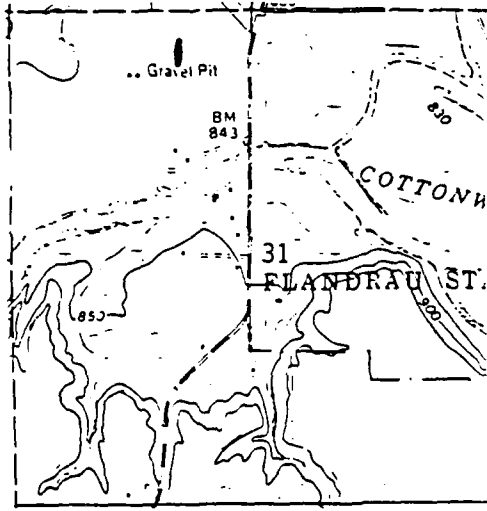
MINNESOTA ARCHAEOLOGICAL SITE FORM

166

COUNTY BROWN	SITE NAME	FIELD NUMBER 86CWS18	STATE NUMBER 213W 66
OWNER MELVIN LENDT FR SLEEPY EYE, MN 56238		U.S.G.S. QUAD LEAVENWORTH	
SITE LOCATION 1½ MILE WEST OF LEAVENWORTH ON CO 24; SITE IS ADJACENT TO ROAD ON NORTH		LEGAL DESCRIPTION E½, NE, NW SEC 29 T109N R. 33W twnsplEAVENWORTH	
SITE TYPE SMALL TOOL AND DEBITAGE SCATTER		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING TERRACE IN RIVER-FLOODPLAIN			
SITE CONDITION UNDER CULTIVATION		CURRENT LAND USE AGRICULTURAL	SITE AREA 10 ACRES
NATURE OF NEAREST WATER COTTON WOOD RIVER		DISTANCE TO WATER 1000 FT	DIRECTION OF SITE FROM WA SOUTH
ELEVATION OF SITE: 1000 FT		ELEVATION OF NEAREST WATER: 980 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION			
ARTIFACTS OBSERVED, RECOVERED: 2 SCRAPERS, 3 BIFACES, 1 UTILIZED/RETOUCHED FLAKE, 1 CORE AND 16 FLAKES			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE: 1:24,000 MAP 	
WRITTEN REFERENCES NONE			
COMMENTS: NONE			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA	INVESTIGATORS: JMM
		PROJECT: SW639	DATE: 6/86

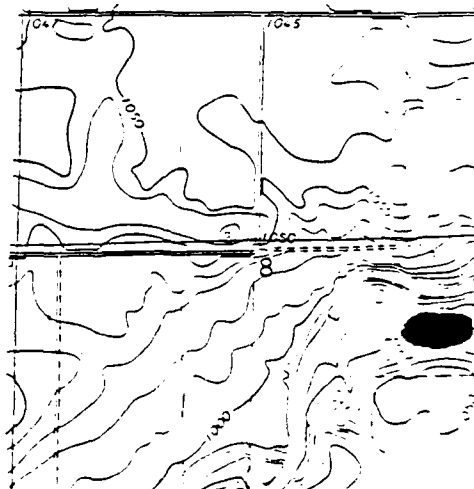
MINNESOTA ARCHAEOLOGICAL SITE FORM

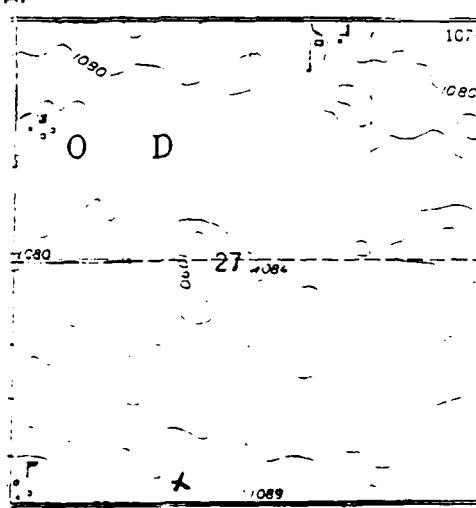
167

COUNTY BROWN	SITE NAME	FIELD NUMBER 86CWS14	STATE NUMBER 21BW67
OWNER WILBERT SPRENGER RR 2 NEW ULM, MN 56073		U.S.G.S. QUAD NEW ULM	
SITE LOCATION ABOUT 3/4 MILE SOUTHWEST OF NEW ULM ON CO 13; SITE IS LESS THAN 1/4 MILE WEST OF ROAD		LEGAL DESCRIPTION SE,NW,NW,NW SEC 31 T 110N R. 30W Twnsp:	
SITE TYPE SMALL DEBITAGE SCATTER		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING ON TERRACE IN RIVER FLOODPLAIN			
SITE CONDITION UNDER CULTIVATION	CURRENT LAND USE AGRICULTURAL		SITE AREA 1 ACRE
NATURE OF NEAREST WATER COTTONWOOD RIVER	DISTANCE TO WATER 1700 FT	DIRECTION OF SITE FROM WATER NORTH	
ELEVATION OF SITE: 850 FT		ELEVATION OF NEAREST WATER: 820 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION			
ARTIFACTS OBSERVED, RECOVERED: 1 FLAKE AND 1 CORE			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE: 1:24,000	
WRITTEN REFERENCES NONE		MAP	
COMMENTS: NONE			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA	INVESTIGATORS: DOBBS
		PROJECT: SW639	DATE: 6/86

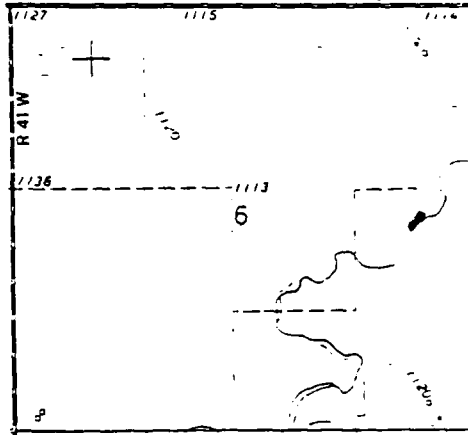
MINNESOTA ARCHAEOLOGICAL SITE FORM

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COUNTY REDWOOD	SITE NAME	FIELD NUMBER 86RWS17	STATE NUMBER 21, 24 57
OWNER		U.S.G.S. QUAD DELHI	
SITE LOCATION 1 MILE WEST OF REDWOOD FALLS, MN ON HWY 19; 2 MILES SOUTH ON CO 17; WEST ONE MILE; SITE IS $\frac{1}{4}$ MILE NORTHWEST OF CURVE IN ROAD		LEGAL DESCRIPTION NE,SW,NE,SE AND NW,SE,NE,SE SEC 8 T 112N R. 36W twosp: REDWOOD FALLS	
SITE TYPE SMALL TOOL AND DEBITAGE SCATTER		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING UPLANDS ADJACENT TO RIVER FLOODPLAIN			
SITE CONDITION UNDER CULTIVATION	CURRENT LAND USE AGRICULTURAL		SITE AREA 5 ACRES
NATURE OF NEAREST WATER REDWOOD RIVER	DISTANCE TO WATER 300 FT	DIRECTION OF SITE FROM WA SOUTH	
ELEVATION OF SITE: 1020 FT		ELEVATION OF NEAREST WATER: 980 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION			
ARTIFACTS OBSERVED, RECOVERED: 1 SCRAPER, 3 UTILIZED/RETOUCHED FLAKES, AND 16 FLAKES			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE: 1:24,000 MAP 	
WRITTEN REFERENCES NONE			
COMMENTS: NONE			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA	INVESTIGATORS: DORR
PROJECT: SW633		DATE: 6.88	

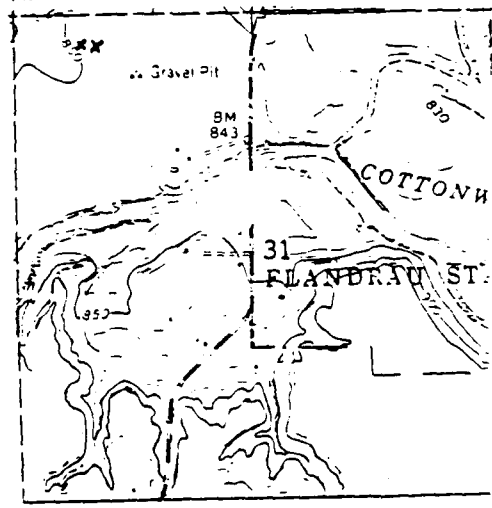
MINNESOTA ARCHAEOLOGICAL SITE FORM				
COUNTY REDWOOD	SITE NAME		FIELD NUMBER 86RWS3	STATE NUMBER
OWNER HOWARD WELU 204 F ST MARSHALL, MN 56258			U.S.G.S. QUAD MILROY	
SITE LOCATION 2½ MILES NORTH OF MILROY, MN ON HWY 68; 1 MILE NORTH ON GRAVEL; 1 3/8 MILE EAST; SITE IS JUST NORTH OF ROAD			LEGAL DESCRIPTION SE,SW,SE,SW SEC 27 T 112N R.39W twnbsp: UNDERWOOD	
SITE TYPE FIND SPOT		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC		
SITE DESCRIPTION / ENVIRONMENTAL SETTING PRAIRIE UPLANDS				
SITE CONDITION UNDER CULTIVATION		CURRENT LAND USE AGRICULTURAL		SITE AREA
NATURE OF NEAREST WATER REDWOOD RIVER		DISTANCE TO WATER 9800 FT	DIRECTION OF SITE FROM WA SOUTH	
ELEVATION OF SITE: 1080 FT		ELEVATION OF NEAREST WATER: 1050 FT		
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION				
ARTIFACTS OBSERVED, RECOVERED: 1 PROJECTILE POINT AND 2 POSSIBLE CORES				
LOCAL COLLECTIONS, INFORMANTS: NONE			MAP SCALE: 1:24,000	
WRITTEN REFERENCES NONE			MAP	
COMMENTS: IN RANDOM SAMPLE UNIT - PROJECTILE POINT LIKELY CAME FROM ROAD GRAVEL, FOUND IMMEDIATELY ADJACENT				
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA	INVESTIGATORS: DOBBS	
		PROJECT: SW639	DATE: 4/26	

MINNESOTA ARCHAEOLOGICAL SITE FORM

COUNTY LYON	SITE NAME BRUCE DEVOS RR3 MARSHALL, MN 56258	FIELD NUMBER 86RWS7	STATE NUMBER
OWNER BRUCE DEVOS RR3 MARSHALL, MN 56258		U.S.G.S. QUAD GREEN VALLEY	
SITE LOCATION FROM MARSHALL, MN 4 MILES NORTH ON HWY 59 TO CO 8; 1 MILE WEST; 3/4 MILE NORTH ON GRAVEL ROAD; SITE IS APPROXIMATELY 1/8 MILE WEST OF ROAD ON NORTH SIDE OF CREEK.		LEGAL DESCRIPTION NW, SE, SE, NE SEC 6 T 112N R. 41W twnbsp: FAIRVIEW	
SITE TYPE BONE CONCENTRATION		PROBABLE CULTURAL COMPONENTS: UNDETERMINED	
SITE DESCRIPTION / ENVIRONMENTAL SETTING BONE ERODING OUT OF LOW TERRACE IN FLOODPLAIN ALONG CREEK			
SITE CONDITION UNDER CULTIVATION	CURRENT LAND USE AGRICULTURAL	SITE AREA c. 1 ACRE	
NATURE OF NEAREST WATER THREEMILE CREEK	DISTANCE TO WATER 20 FT	DIRECTION OF SITE FROM WATER NORTH	
ELEVATION OF SITE: 1110 FT		ELEVATION OF NEAREST WATER: 1110 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION			
ARTIFACTS OBSERVED, RECOVERED: APPROXIMATELY 20 LARGE MAMMAL BONES			
LOCAL COLLECTIONS, INFORMANTS: BRUCE DEVOS		MAP SCALE: 1:24,000	
WRITTEN REFERENCES NOI.		MAP 	
COMMENTS: NONE BONE IS LIKELY BISON, NO ASSOCIATED CULTURAL MATERIAL. AREA SHOULD BE INVESTIGATED FURTHER.			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA	INVESTIGATORS: DOBBS
PROJECT: SW639		DATE: 5/96	

MINNESOTA ARCHAEOLOGICAL SITE FORM

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COUNTY BROWN	SITE NAME	FIELD NUMBER 86CWS15	STATE NUMBER
OWNER WILBERT SPRENGER RR 2 NEW ULM, MN 56073		U.S.G.S. QUAD NEW ULM	
SITE LOCATION ½ MILE SOUTHWEST OF NEW ULM, MN ON CO 13; SITE IS ½ MILE WEST OF ROAD		LEGAL DESCRIPTION NW,NW,NW SEC 31 T. 11N R. 30W twsp:	
SITE TYPE FIND SPOT		PROBABLE CULTURAL COMPONENTS: UNDETERMINED PREHISTORIC	
SITE DESCRIPTION / ENVIRONMENTAL SETTING TERRACE IN FLOODPLAIN OF RIVER			
SITE CONDITION UNDER CULTIVATION		CURRENT LAND USE AGRICULTURAL	SITE AREA 5 ACRE?
NATURE OF NEAREST WATER COTTONWOOD RIVER		DISTANCE TO WATER 2000 FT	DIRECTION OF SITE FROM WA NORTH
ELEVATION OF SITE: 850 FT		ELEVATION OF NEAREST WATER: 820 FT	
NATURE, EXTENT OF INVESTIGATION: CONTROLLED SURFACE COLLECTION, SCIL PROBING, AND AUGER TESTING			
ARTIFACTS OBSERVED, RECOVERED: 1 UTILIZED/RETOUCHED FLAKE AND 2 FLAKES			
LOCAL COLLECTIONS, INFORMANTS: NONE		MAP SCALE: 1:24,000 MAP 	
WRITTEN REFERENCES NONE			
COMMENTS: NONE			
ACCESSION NOS.	PHOTO NOS.	REPOSITORY: IMA	INVESTIGATORS: DOBBS
		PROJECT: SW639	DATE: 6/39

APPENDIX III: FIELD AND SITE NUMBERS ASSIGNED"(For release only to
professional archaeologists)

YMS - YELLOW MEDICINE RIVER SUBBASIN

RWS - REDWOOD RIVER SUBBASIN

CWS - COTTONWOOD RIVER SUBBASIN

IN - INTUITIVELY SELECTED AREA

FIELD #	SAMPLE UNIT	LEGAL DESCRIPTION	SITE #
86YMS1	18	SW,SW SEC 6 T113N R41W GREEN VALLEY	
86YMS2	29	NE,NW SEC 22 T113N R45W CANBY SE	21YM28
86YMS3	30	NE,SE SEC 32 T113N R44W PORTER SW	21LN16
86YMS4	IN	SE,SE SEC 25 T114N R41W WOOD LAKE NW	21YM38
86YMS5	6	NW,SW SEC 32 T115N R40W WOOD LAKE NW	21YM39
86YMS6	2	SW,SE SEC 36 T115N R41W WOOD LAKE NW	21YM40
86YMS7	5	NE,NW SEC 12 T113N R42W GREEN VALLEY	21YM19
86YMS8	5	NE,NW SEC 12 T113N R42W GREEN VALLEY	21LY21
86YMS9	15	NE,NW SEC 35 T115N R40W WOOD LAKE NW	FIND SPOT
86YMS10	14	SE,NW SEC 33 T115N R40W WOOD LAKE NW	FIND SPOT
86YMS11	1	NE,NE SEC 27 T114N R41W NORMANIA	
86YMS12	11	NE,NE SEC 25 T113N R43W MINNEOTA	21LY27
86YMS13	9	NE,NE SEC 2 T114N R41W NORMANIA	
86YMS14	IN	NW,NE SEC 4 T114N R40W WOOD LAKE NW	21YM42
86YMS15	IN	NW,NE SEC 4 T114N R40W WOOD LAKE NW	21YM43
86YMS16	3	SW,SW SEC 33 T115N R40W WOOD LAKE NW	21YM44
86RWS1	26	SW,NE SEC 35 T113N R41W GREEN VALLEY	
86RWS2	15	NE,SE SEC 31 T113N R40W COTTONWOOD	21LY34
86RWS3	18	SE,SW SEC 27 T112N R39W MILROY	FIND SPOT
86RWS4	14	SW,SW SEC 7 T111N R36W ROWENA	
86RWS5	28	NW,NE SEC 16 T110N R43W DEAD COON LAKE	21LY33
86RWS6	7A	NW,SE SEC 6 T112N R41W GREEN VALLEY	21LY32
86RWS7	IN	NE,SE SEC 5 T112N R41W GREEN VALLEY	FIND SPOT
86RWS8	6A	SE,NW SEC 5 T112N R41W GREEN VALLEY	
86RWS9	11	SW,SW SEC 23 T111N R42W MARSHALL	21LY30
86RWS10	5	SW,NE SEC 15 T112N R41W GREEN VALLEY	21LY31

86RWS11	1	NE,NE SEC 14 T111N R42W MARSHALL	21LY23
86RWS12	1	NE,NE SEC 14 T111N R42W MARSHALL	21LY24
86RWS13	1	NE,NE SEC 14 T111N R42W MARSHALL	
86RWS15	7	SE,NE SEC 14 T111N R42W MARSHALL	21LY25
86RWS16	7	SE,NE SEC 14 T111N R42W MARSHALL	21LY26
86RWS17	IN	NE,SE SEC 8 T112N R36W DELHI	21RW51
86RWS18	27	NW,NE SEC 35 T109N R43W CURRENT LAKE (SITE LOCATED IN 1/4;1/4 ADJACENT TO SAMPLE UNIT)	21LY35
86CWS1	27	NW,NW SEC 18 T110N R40W AMIRET	FIND SPOT
86CWS2	21	NE,SW SEC 20 T110N R38W WABASSO SW	
86CWS3	IN	NE,NE SEC 29 T110N R40W AMIRET	21LY15
86CWS4	IN	NE,NE SEC 29 T110N R40W AMIRET	21LY16
86CWS5	IN	NW,NE SEC 29 T110N R40W AMIRET	21LY17
86CWS6	IN	SE,SE SEC 30 T110N R40W AMIRET	21LY18
86CWS7	IN	NE,SE SEC 30 T110N R40W AMIRET	21LY20
86CWS8	IN	NW,SW SEC 21 T110N R40W AMIRET	
86CWS9	IN	SE,SW SEC 21 T110N R40W AMIRET	21LY22
86CWS10	1	NW,NW SEC 3 T109N R32W (TESTED AREA LOCATED IN 1/4;1/4 ADJACENT TO SAMPLE UNIT)	
86CWS11	6	NW,NE SEC 16 T109N R32W	21BW61
86CWS12	IN	SW,NW SEC 31 T110N R30W	21BW62
86CWS13	IN	NE,NE SEC 21 T109N R34W	21BW63
86CWS14	IN	NE,NW SEC 31 T110N R30W	FIND SPOT
86CWS15	IN	NW,NW SEC 31 T110N R30W	
86CWS16	IN	NE,NE SEC 29 T109N R33W LEAVENWORTH	21BW64
86CWS17	IN	SW,SE SEC 20 T109N R33W LEAVENWORTH	21BW65
86CWS18	IN	NW,NW SEC 20 T109N R33W LEAVENWORTH	21BW66

APPENDIX IV: IMA ANALYTICAL PROTOCOLS FOR DEBITAGE, SCRAPERS, AND
PROJECTILE POINTS"

A DISCUSSION OF THE ANALYSIS OF CHIPPED STONE TOOLS AND DEBITAGE
by Dan Wendt

Introduction

The best preserved artifacts on prehistoric archaeological sites are the by-products of reducing stone into stone tools. By studying the debris, a picture of the types of activities that occurred on a site can be gained.

Two source material types that occur in this area are cobbles that have been transported by glaciers and streams and nodules of siliceous stone that occur in sedimentary stone. Several procedures were used to form tools, but all involve the controlled fracture of the stone by applied pressure or impact. Stones that work the best for tool making have no natural cleavage plains or flaws. The rocks fracture along the lines of greatest stress to form a shell-like flake or conchoidal fracture.

This paper includes a description of the material classes found on sites in southeastern Minnesota. A material code sheet has been combined with a traditional lithic analysis scheme for ease of data collection and analysis. Discarded stone flakes, or debitage, have been classified by the process from which they were produced. Cobbles or nodules from which flakes have been struck are cores. Flakes and cores were further modified into several easily recognizable tool types by the additional removal of flakes. The types of tools, cores and debitage on a site can be a key to understanding the activities that occurred there.

LITHIC RESOURCES OF SOUTHEASTERN MINNESOTA

Code Sheet

- | | |
|---|-----------------------------|
| 0 | Unidentified |
| 1 | Hixton Silicified Sandstone |
| 2 | Prairie du Chien Chert |
| 3 | Cedar Valley Chert |
| 4 | Yellow Jasper |
| 5 | Quartz |
| 6 | Agate |
| 7 | Basaltic |
| 8 | Brown Chalcedony |
| 9 | Lake Superior Banded Agate |

- 10 Black Agate, North Shore
- 11 Jaspellite
- 12 Slate
- 13 Quartzite
- 14 Argillite
- 15 Tongue River Silica
- 16 Fine-grained Black Slate
- 17 Red Jasper
- 18 Burlington Chert
- 19 Brown Jasper
- 20 Petrified Wood
- 21 Granitic

I. LITHIC RESOURCES OF SOUTHEASTERN MINNESOTA

0 Unidentified aggregate category that contains specimens that can't be reliably identified.

1 Hixton Silicified Sandstone - a material resembling quartzite, but has the structure of a sandstone that has been filled in with silica. The color varies from white, yellow, red, and brown. Heat treatment darkens the colors present in the native stone. The primary source of this material is Silver Mound, near Hixton, in Jackson County, Wisconsin (Porter 1961).

2 Prairie du Chien Formation Chert - a mottled and swirled to oolitic chert ranging in color from orange to white and grey. Heat treatment turns this chert white or pale orange. Working this stone after heat treatment exposes a glossier appearance under the heat-treated surface. This formation is widely exposed in the midwest (Thwaites 1960) and is exposed in many outcrops in southeastern Minnesota.

3 Cedar Valley Formation Chert - this chert occurs as nodules of light grey, slightly translucent chert. This material has a lighter weathered ring between the cortex and internal chert which gives some flakes a banded appearance. The Grand Meadow quarry in Mower County, Minnesota (21MW8) is a known source of this material (Trow 1981). Heat treatment of this material lightens the color and gives it a pink cast.

4 Yellow jasper - this material is a glossy yellow-mustard color with little variability. The cortex is a chalky white color. It occurs in the

iron ore districts of southeastern Minnesota, located principally in Fillmore County. Ready (1981) describes one occurrence that was used prehistorically (21F060). Heat treatment of this material turns it to bright blood red.

5 Quartz - Clear and milky quartz is common as small cobbles in glacial till from the Superior lobe that covers much of central Minnesota and northwestern Wisconsin. The cortex is the smoothed and rounded surface of the glacial cobbles.

6 Agate - this is a highly translucent material that includes clear, white, pink, yellow, and red colors. Many variants of agate are common in the Superior lobe till. The cortex is the smooth surface of glacial cobbles.

7 Basaltic - this category includes all dense, dark-colored, fine-grained igneous or metamorphic stones having poor flaking quality (Ahler 1977:139). This category includes basalt, rhyolite and gabbro which are all common in Superior lobe till.

8 Brown chalcedony - this category includes all homogenous brown translucent materials resembling Knife River Flint. Brown chalcedony occurs in the Superior lobe till or in the famous Knife River Flint quarries in Dunn and Mercer Counties, North Dakota (Clayton, Bickley, and Stone 1970). Petrographic methods are required to distinguish these sources so they have been combined for this analysis.

9 Lake Superior Agate - this agate has fine bands of red, clear and white in concentric circles within a glacial cobble. This characteristic stone is present in Superior lobe till.

10 Grey Black Agate - this agate occurs as large, irregular blocks in the boundary waters area of Cook County, Minnesota. Thin flakes are translucent with bands of small black inclusions. Thicker pieces look black.

11 Jaspellite - this material is a red to purple oolitic jasper that occurs as blocks in the boundary waters area of Cook County, Minnesota, which is presumably near the source. It also occurs as cobbles in the Superior lobe till in east central Minnesota. This material occurs at many sites in northeastern Minnesota (Steinbring 1974).

12 Slate - this is a grey metamorphic stone that breaks in sheets along parallel plains. It is common in Superior lobe till where it occurs as weathered cobbles. This material probably wasn't worked by conventional flint knapping methods.

13 Quartzite - describes metamorphosed siliceous materials which include a wide variety of related materials that occur in Superior lobe till.

14 Argillite - an olive, olive-grey to dark blue-green, approaching black material. Internal color variation usually takes the form of streaks and bands (Shay 1971:52). This material is a metamorphosed siltstone that can grade to slate or shaly quartzites. The luster is dull. Some pieces are well suited to flint knapping (Kent Bakken, 1986).

15 Tongue River Silica - a grey, yellow to red fine-grained silica with a

11 luster (Porter 1962). This material occurs as glacial cobbles in northwestern Minnesota (Bakken 1986), southwestern North Dakota (Clayton et al 1970:288), and northwestern South Dakota to northwestern Iowa (Ahler 1977:139). Heat treatment turns the material red.

16 Fine-grained Black Shale - a very hard black shale-like material. This material may represent a finer grained variant of argillite. It is common on several Duluth-area sites (Steinbring 1974:67).

17 Red Jasper - a general category including red jaspers occurring in the Superior lobe till.

18 Burlington Chert - Burlington and Keokuk chert occur in middle Mississippian age outcroppings in west central Illinois and southern Iowa. This chert is essentially white, occasionally with slight blue to gray tint. It is highly fossiliferous with numerous crinoid and brachinpod fossil fragments. Crinoid stem fragments are characteristic. Heat treatment may create some pink tint (Meyers 1970).

19 Brown Jasper - this category includes a mud brown jasper of unknown origin. It has a dull lustre and is well suited to flint knapping.

20 Petrified Wood - this includes all silicified wood. It is typically a translucent agate-like material having the microstructure of wood.

21 Granite - this is a broad category of all coarse crystalline igneous and metamorphic rocks. Their coarse crystalline structure makes them poorly suited to flint knapping, but some flakes are generated in the production of ground stone tools.

22 Unidentified Chert

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Clayton, Lee, Bickley, C. A., and Stone, W. J.

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1961 Hixton silicified sandstone: a unique lithic material used by prehistoric cultures. Wisconsin Archaeologist, 42(2):78-85.

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Steinbring, Jack H.

1974 The Preceramic Archaeology of Northern Minnesota, in Aspects of Upper Great Lakes Anthropology: papers in honor of Lloyd A. Wilford, edited by Elden Johnson, pp 64-73.

Thwaite, F. T.

1960 Evidences of Dissected Erosion Surfaces in the Driftless Area. Transactions of the Wisconsin Academy of Sciences, Arts and Letters 49:17-49.

Trow, Thomas

1981 Paper presented at the 1981 Annual Council for Minnesota Archaeology Symposium, St. Paul.

II. CORES

A core is a block or nodule from which flakes are detached. An irregular core refers to cores reduced in a non-systematic manner. Several striking platforms may have been used creating no particular pattern to the flake removal and a non-descript appearance.

A polyhedral core is a core with a prepared striking platform from which flakes are removed in a systematic lateral preparation to form blades (long parallel sided flakes). The resulting core resembles a multi-sided pyramid or polyhedron.

A bipolar core is the result of placing a nodule or cobble on a hard anvil and striking it with a hammerstone. Flake scars originate at the two points of impact and crushing is visible at these points. Bipolar flake blanks were struck off the cores lateral faces and could be used in that form or modified into retouched tools.

Crude bifaces have been included with the cores because they either represent the initial stages of manufacture of a bifacial tool or the reduction of a block to produce useable flakes. Stage 1 and 2 bifaces have been included in this category of crude bifaces (Callahan 1974). These bifaces have been

edged, but the flakes have not extended to the center of the biface to thin its profile.

Callahan, E.

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 The Department of Sociology and Anthropology, Virginia
 Commonwealth University, Richmond.

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Anthropologist 24(83):39-50.

III. DEBITAGE ANALYSIS

Debitage is divided into a general flake category having the anatomy of a man-made flake (Figure #1) shatter which are rough chunks that lack this anatomy and flakes struck from specialized cores, including blades, bifacial thinning flakes and bipolar flakes. The general flake category is subdivided by the presence of cortex.

Primary Decortication Flakes - The first flakes to be removed from a core or nodule. These flakes have cortex completely covering the dorsal surface (White 1963).

Secondary Decortication Flakes - Secondary flakes (White 1963) have cortex covering part of the dorsal surface. These flakes were removed after the initial modification of a core. This category is split into two sub-categories: a) having cortex covering more than 50% of the dorsal surface; and b) having less than 50%.

Tertiary Flakes - These flakes have no cortex on the dorsal surface or striking platform (White 1963). The flake was struck from a core after the cortex was removed from that area.

Shatter - The initial modification of stone is represented by the production of rough chunks of chert known as shatter (Binford and Quimby 1963:286). Shatter is cuboidal and exhibits angular and irregular surfaces which often follow flaws in the parent material.

Bifacial Thinning Flakes - Bifacial thinning flakes are broad, thin flakes with a convex dorsal surface and concave ventral surface representing the shape of the biface from which it was struck. The platform has an acute angle with the dorsal surface and exhibits facets on the striking platform which are the result of prior bifacial flake removal. The edges feather out to a fine edge or the distal end may be rounded as a result of a hinge fracture (Styles 1981).

Blades - Blades are flakes struck from a prepared polyhedral core. These flakes are long, narrow and parallel sided. The length is over twice the width. These flakes typically follow the margins of one or two previous flake

scars. This forms characteristic ridges on the dorsal surface that run the length of the flake, giving it a triangular or trapezoidal cross section.

Bipolar Flakes - Bipolar flakes are produced by placing a cobble on a hard anvil and impacting it with a hammerstone (Leaf 1979). Bipolar knapping generates a set of products and biproducts. Bipolar flakes have two surfaces of percussion at opposite ends which are typically crushed. Flakes are typically prismatic or tetrahedral in cross section and have ripple scars indicating the two points of origin for the flake. Bipolar cores are treated with other cores. Some core fragments and exhausted cores may be in this category.

Ground Platform Thinning Flakes - This is a subset of bifacial thinning flakes. The discriminating characteristic is that the striking platform has been ground prior to flake removal. This procedure helps to reduce the shattering that erodes the edge of the biface during thinning. This procedure is typical of paleo Indian biface preparation (Callahan 1979).

References

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- Styles, Bonnie, W., Melvin L. Fowler, Steven Ahler, Frances King, Thomas
Styles
1981 Modoc Rock Shelter Archaeological Project, Randolph
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Interior, Heritage Conservation and Recreation Service
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Anthropological Papers, No. 19, Museum of Anthropology,
University of Michigan, Ann Arbor.

Institute for Minnesota Archaeology
Code Sheet for End Scraper Analysis

Analytical procedures for end scrapers are recorded in a spreadsheet format for future entry in the computer. The form required is the "IMA Attribute Form." The form consists of a series of rows and columns. Each numbered variable that follows is a column heading. Individual scraper information is listed across the rows in the appropriate column. Enter the following information in the blank line at the top of the form: Site # - upper left corner; Site Name (i.e. Adam's Site) and End Scraper Analysis - center; your name and today's date - upper right corner.

1. Accession #
2. Identification # - assign each scraper in your study a number from 1 through total number of scrapers in study.
3. Length - see Diagram 1. Length is measured from the working face to the proximal end in millimeters (mm).
4. Width - see Diagram 1. Width is measured at the widest part of the scraper in millimeters (mm).
5. Thickness - see Diagram 2. Thickness is measured at the thickest part of the scraper in millimeters (mm).
6. Working Face Length - see Diagram . Working Face Length is measured along the surface of the Working Edge in millimeters (mm).
7. Edge Angle - see Diagram 2. Use goneometer to measure angle at Distal Face bevel in degrees.
8. Working Face Angle - see Diagram 2. Use goneometer to measure angle of Working Face bevel in degrees. (NOTE: in almost all cases where Working Face angle is different from Edge angle, the reason is due to chipping and microflaking of the Working Face from usage).
9. Weight - measured in grams (g) to the nearest 10th of a gram.
10. Length to Width ratio.
11. Working Face Length to Length ratio.
12. Working Face Length to Width ratio.
13. Platform - see Diagram 2. Enter:
 - 0 - No data (platform missing)
 - 1 - Platform absent (intentionally removed)
 - 2 - Platform present

14. Planview - general shape of scraper when looking from dorsal side.

Enter:

1 - Long Triangular
(Length/Width is greater
than 5/4)



2 - Short Triangular
(Length/Width is less
than 5/4)



3 - Long Trapezoid
(Length/Width is greater
than 5/4)



4 - Short Trapezoid
(Length/Width is less
than 5/4)



5 - Square



6 - Rectangular



7 - Ovoid



8 - Irregular

15. "A" Cross-section - the shape in cross-section at the Working Face.

Enter:

1 - Triangular



2 - Scalene Triangular



3 - Trapezoidal



4 - Hemispherical



5 - Lenticular



16. "B" Cross-section - the shape in cross-section at the midpoint of the scraper. Enter same code numbers as for variable 15.

17. Lateral retouch - see Diagram 1. Enter:

- 0 - No data
- 1 - No lateral retouch
- 2 - Unilateral right
- 3 - Unilateral left
- 4 - Bilateral
- 5 - Indeterminate

18. Flaked over entire Dorsal surface - see Diagram 2. Enter:

- 0 - No data
- 1 - Absent
- 2 - Present

19. Ventral retouch - see Diagram 2. Enter:

- 0 - No data
- 1 - Absent
- 2 - Present

20. Ground Left Lateral Edge - see Diagram 1. Enter:

- 0 - No data
- 1 - Absent
- 2 - Present

21. Ground Right Lateral Edge - see Diagram 1. Enter:

- 0 - No data
- 1 - Absent
- 2 - Present

22. Raw Material Type - see "Raw Material Type Code Sheet for Lithic Analysis" included in Volunteer Manual, enter appropriate code number.

23. Location of Ventral Retouch - Ventral view. Enter:

- 0 - No retouch
- If more than one position
put in other position #(s)
in ascending order.



24. Location of Maximum Thickness. Enter:

- 1 - Distal end
- 2 - Middle
- 3 - Proximal end

25. Shape of Working Edge - use millimeter scaled Polar coordinates graph.
Measure radius of curvature (mm).

26. Symetry dorsal view. Enter:

1 - Symetrical



2 - Left asymetrical



3 - Right asymetrical



TYPICAL END SCRAPER

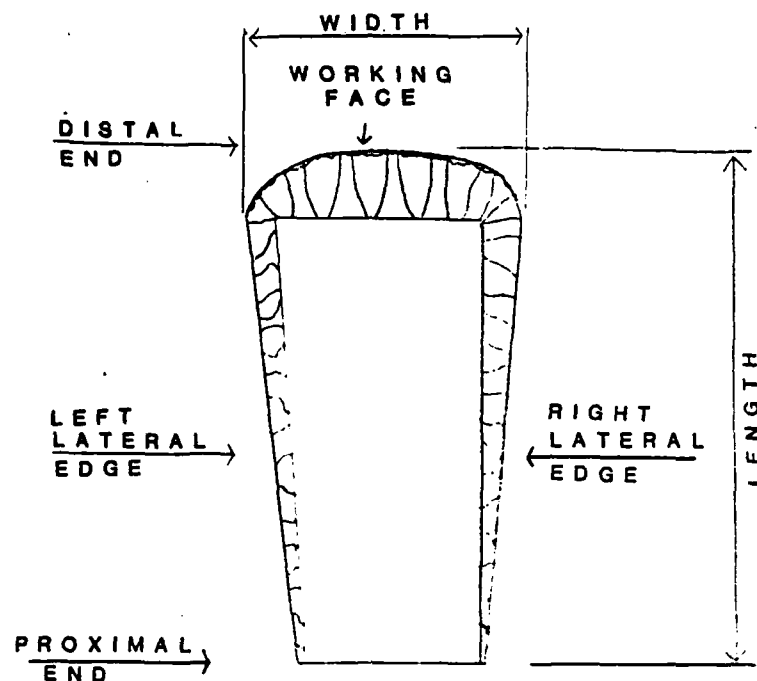


DIAGRAM 1

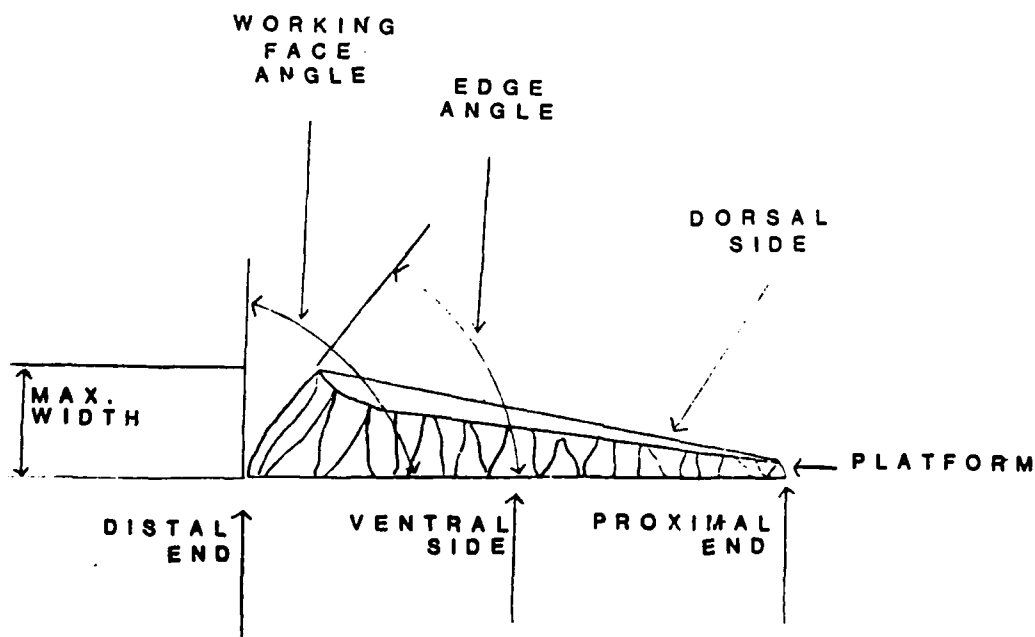


DIAGRAM 2

End Scraper Statistical Analysis

1. Produce Histograms of Length/Width ration, Working Face Length/Length ratio, Working Face Length/Width ratio and confirm normal distribution.
2. Produce Histogram of Edge Angle and attempt to determine if there was one or two populations present. Example: Steep angle and shallow angle scrapers or just a single normal distribution.
3. Scatter plot of radius of curvature vs Length/Width ratio. This may support Randy Withrow's contention that these are worn out scrapers that had been resharpened many times. Assumption is that the radius of curvature will get larger as the scrapers are resharpened. At the same time the scraper will get shorter but the width should not change.
4. Scatter plot of Thickness vs Edge Angle. If steep edge angle - indication of work on hard material - would also expect these to be the thickest.
5. Produce mean, range and standard deviation for all numeric variables.
6. K Means clustering from 2 to 6 of:
 - a. Planview, "A" Cross-section, "B" Cross-section, Location of Maximum Thickness, Symetry.
 - b. Planview, Platform, Lateral Retouch, Flaked Entire Dorsal Surface, Ventral Retouch, Ground Left Lateral Edge, Ground Right Lateral Edge, Location of Ventral Retouch.
 - c. All non numeric parameters.

The Institute for Minnesota Archaeology
Code sheet for Projectile Point Attributes

Version 1.2
Revision of Appendix C in Dobbs (1984)

This code sheet defines the variable names and values for the attributes that are to be used in analyzing both notched and unnotched triangular projectile points. Please note that these attributes are used only for triangular projectile points - they are not to be used for other kinds of projectile points.

1. LENGTH

Length of the projectile point in mm. This attribute is only coded if the point is unbroken.

2. WIDTH

Width of the projectile point in mm.

3. THICK

Maximum thickness of the projectile point in mm.

4. WEIGHT

Weight of the projectile point in grams.

5. MAT

Material of which the projectile point is made:

1. Hixton silicified sandstone
2. Prairie du Chien chert
3. Rapid Formation chert
4. Yellow jasper
5. Quartz
6. Agate
7. Basalt
8. Gabbro
9. Granite
10. Rhyolite
11. Sandstone
12. Slate
13. Limestone
14. Dolomite
15. Quartzite

6. FACEDESC

1. Point is unifacial - flaked on only one side
2. Point is bifacial - flaked on both sides

7. BASECON Configuration of the base of the point

1. Straight
2. Concave
3. Convex
4. Indeterminate

8. SIDECON Configuration of the sides of the point

1. Straight
2. Concave
3. Convex

9. SIDESERR Serrations on the sides of the point

0. Serrations absent
1. Some serrations but not continuous
2. Continuous serrations

10. NUMNOTCH Number of notches if point is notched

1. Broken, number of notches indeterminate
2. 1 notch
3. 2 notches
4. 3 notches

11. LOCNOTCH Location of notches

1. Side notched
2. Basally notched
3. Corner notched
4. Side and basal notching
5. Corner and basal notching

"APPENDIX V: VITAE FOR PROJECT PERSONNEL"**CLARK A. DOBBS****Personal information**

Home: 3428 Park Avenue, Minneapolis, MN 55407: 612/325-1512

Office: The Institute for Minnesota Archaeology, Inc., 1313 5th Street SE, Suite 205, Minneapolis, MN 55414: 612/623-0299

Education

1973 - B.A. in Anthropology, Indiana University, Bloomington IN

1979 - M.A. in Anthropology, University of Minnesota, Minneapolis, Minnesota

1984 - Ph.D in Anthropology, University of Minnesota, Minneapolis, MN

Archaeological field experience and employment

1975 - Indiana University Field School. Prairie Creek Site - a deeply stratified late-Pleistocene site, 6/15 - 8/15.

1975 - Field Archaeologist. Clark Maritime Center Project, Clark County, IN. Deep testing of alluvial bottoms to locate and assess prehistoric cultural resources. Indiana University, 9/1 - 11/1.

1976 - Field Archaeologist. Archaeological reconnaissance of Twin-Rush, Delaney Creek, and Hall-Flat Creek watersheds. Indiana University, 12/75 - 1/76.

1976 - Field Director. Southwest Jefferson County, Kentucky. Local Flood Protection Project. Deep testing of alluvial deposits along four miles of the Ohio River. Environmental Consultants, Inc., 3/1 - 7/15.

1976 - Field Director. Archaeological reconnaissance of the Southern Tier Expressway, western New York State. Environmental Consultants, Inc., 7/15 - 8/15.

1977 - Field Archaeologist. Archaeological investigations of the Rum River Bridge Project. The Science Museum of Minnesota, 4/1 - 4/15.

1977 - Field Assistant. Testing and excavation of prehistoric sites near Granite Falls, MN, The Science Museum of Minnesota, 6/1 - 8/20.

1977 - Field Archaeologist. Archaeological reconnaissance of the Big Sandy Lake area, Aitkin County, MN. The Science Museum of Minnesota, 8/20 - 9/25.

1978 - Associate Field Director. Sanderson Canyon Watershed Project, Terril, Brewster, and Pecos Counties, TX. Environmental Consultants, Inc., 6/1 - 9/15.

1978 - Research Assistant. Development of metrical data and linear regression equations for a number of individuals from different species of fish. The Science Museum of Minnesota, 10/15 - 12/15.

1979 - Field Assistant. University of Minnesota Archaeological Field School. Excavations of 21FA2 in Faribault County, MN. The University of Minnesota, 6/1 - 7/15.

1979 - Field technician. Archaeological reconnaissance of the Hiawatha National Forest, Upper Peninsula, MI. Soil Systems, Inc., 9/1 - 10/1. Preparation of background chapter, report on survey of Chippewa National Forest, MN.

1980 - Field Director. Archaeological reconnaissance, Center Creek Locality, Winnebago, MN. Location and systematic collection of archaeological sites affiliated with Oneota tradition. Dissertation research, May and June.

1980 - Field Director. Archaeological reconnaissance, Trunk Highway 53 Project. Initial survey of Highway 53 from Virginia, MN to International Falls, MN, 6/15 - 10/1. Supervised by Leslie D. Peterson, Trunk Highway Archaeologist, Minnesota Historical Society.

1980 - Archaeological reconnaissance, Chaska, MN. U. S. Army Corps of Engineers proposed flood control project. Directed by Elden Johnson, University of Minnesota, October.

1980 - Battle Creek City Park Archaeological reconnaissance, City of St. Paul. Directed by Guy E. Gibbon, October.

1981 - Field Director. Archaeological reconnaissance, Center Creek Locality, Winnebago, MN. Continued research into Oneota settlement patterns with assistance of University students and Minnesota Archaeological Society volunteers, May, June and September.

1981 - Field Director. Test excavations at 21H015, a Middle to Late Woodland site in north central Minnesota. Supervised by Leslie D. Peterson, July - August.

1982 - Archaeological survey in the vicinity of LaCrosse, WI

1983 - Chair and Organizer, Conference on western Oneota Ceramics, Red Wing, MN, April.

1983-1984 - Research Associate, The Institute for Minnesota Archaeology, Inc.

1983-1984 - Principal Investigator for research in south-central Minnesota at the Center Creek Locality (Blue Earth River) and along the upper Mississippi River (Red Wing Locality).

1983-1985 - Project Director, Bryan Archaeological Project.

1985 - Executive Director, The Institute for Minnesota Archaeology, Inc., 1513 Fifth Street SE, Suite 205, Minneapolis, MN 55414.

Teaching experience

Southwest State University/The Science Museum of Minnesota, teaching assistant, archaeological field school held in the vicinity of Granite Falls, MN

Department of Anthropology, University of Minnesota, Minneapolis, MN

Teaching Assistant:

Introduction to Social and Cultural Anthropology, Fall 1976, 1977, 1978;
Introduction to Physical Anthropology and Archaeology, Winter 1977, 1979;
Indians of North America, spring 1977, winter 1978; North American
Archaeology, spring 1978; Field school, summer session 1979.

Instructor:

Introduction to Physical Anthropology and Archaeology, fall 1980, 1981
(Continuing Education and Extension): summer 1981; Honors Section, fall 1981.

Environmental Archaeology, Spring 1980, 1981.

Prehistory of North America, Winter 1982

Minnesota Prehistory, Winter 1984.

Several non-credit courses through University of Minnesota including: What Is an Archaeological Laboratory; Settlement Studies in Prehistory; The Prairie and Prehistoric Peoples at Red Wing, MN.

Director, University of Minnesota Archaeological Field School, The Adams Site, June - July 1985.

Director, Institute for Minnesota Archaeology Summer Field Program in Public Archaeology, June - August 1985.

Report preparation and research reports

1971 - Glass Trade Beads from Quittenon: a Preliminary Analysis. Glenn A. Black Laboratory of Archaeology. Ms. on file.

1973 - Remember Man as You Pass By: Grave Art in Warren and Fountain Counties, IN. Original field research and documentation of early handcarved tombstones. Ms. on file with author.

1974 - Trade Beads at Quittenon Revisited: Additional Data, Additional Problems. Analysis of additional data, with expanded interpretation. Ms. on file, Tippecanoe County Historical Society, Lafayette, IN.

1976 - An Assessment of the Cultural Resources of the Delaney Creek Area, Washington County, IN. Report on file at Glenn A. Black Laboratory of Archaeology, Indiana University.

1976 - An Assessment of the Cultural Resources of the Twin-Rush Creek Area, Washington County, IN. Report on file with Glenn A. Black Laboratory of Archaeology, Indiana University. With Randall L. Guending.

1976 - Cultural Resources of Section 2, Southwest Jefferson County, KY. Flood Control Project. 200+ pages, 40+ maps. Report on file with U. S. Army Corps of Engineers, Louisville District, Louisville, KY.

1981 - An Archaeological Survey of Trunk Highway 53, Virginia to International Falls, MN. Report for MN/DOT prepared by the Minnesota Historical Society.

1981 - Test Excavations at 21M015: A Middle to Late Woodland Habitation Site in North-central Minnesota. Report submitted to Minnesota Historical Society for the Minnesota Department of Transportation.

1982-1985 - Assorted small contract reports

Publications

1971 - Museum Methods: a Syllabus. Co-author under direction of Dr. Wesley Hunt. Indiana University Museum.

1979 - Archaic Subsistence in Southwestern Minnesota: the View from Granite Falls. M.A. thesis, University of Minnesota.

1982 - Oneota Origins and Development: the Radiocarbon Evidence. In Oneota Studies, Guy E. Gibbon, ed.; Occasional Papers in Anthropology #1, Department of Anthropology, University of Minnesota.

1983 - Oneota Settlement Patterns in the Blue Earth River Valley, Minnesota. In Oneota Studies, Guy E. Gibbon, ed.; Occasional Papers in Anthropology #1, Department of Anthropology, University of Minnesota. Co-authored with Carol L. Kane III.

1984 - Oneota Settlement Patterns in the Blue Earth River Valley, Minnesota. Ph.D. dissertation, University of Minnesota. (Accepted for publication as 1988 Memoir of the Plains Anthropological Association).

1985 - The Archaeology of the Bryan Site (ed.). Complete volume 145:2:1-601 of the Minnesota Archaeologist. Also author of Preface and Excavations at the Bryan Site: 1983-1984 in this number.

1985 - An Archaeological Survey of the City of Red Wing. Institute for Minnesota Archaeology Reports of Investigations #2.

1986 - Wisconsin mounds recorded by the Northwest Archaeological Survey and evaluation of the Adams site (42P112). Reports of Investigations No. 7, The Institute for Minnesota Archaeology, Mpls., MN.

1986 - Archaeological excavations at the Bryan site (21GD4), Goodhue County, Minnesota: 1983 and 1984. Reports of Investigations No. 8, Institute for Minnesota Archaeology, Mpls., MN.

Papers presented at meetings

1978 - Incremental structures of Bison Dentition as Indicators of seasonality. Paper given at the Council for Minnesota Archaeology Conference, Hamline University, St. Paul, MN.

1980 - Oneota Settlement Patterns in the Blue Earth River Valley, South-central Minnesota. Paper given at the Midwest Archaeological Conference, Chicago, IL. With Orrin C. Shane III.

1981 - Oneota Origins and Development: the Radiocarbon Evidence. Paper presented at the Council for Minnesota Archaeology Spring Conference, Hamline University, St. Paul, MN.

1983 - Archaeological Investigations at the Bryan Site. Paper given at Mississippian Roundtable, in conjunction with the Midwest Archaeological Conference, Iowa City, IA, October.

1985 - Oneota and Upper Mississippian Cultures in Minnesota. Paper presented as part of the Oneota Symposium, Midwest Archaeological Conference, Iowa City, IA, October.

1986 - The Mississippian Presence in the Red Wing area, Minnesota. Paper presented at the Society for American Archaeology meetings as part of the symposium New perspectives on Cahokia: views from the peripheries. April, New Orleans, LA.

1986 - Microcomputer applications to the study of prehistoric earthworks at the Red Wing Locality. Poster session presented at the Workshop on Microcomputer Application in Archaeology, Society for American Archaeology meetings, April 25, New Orleans, LA.

Honors and awards

1970 - Phi Eta Sigma Academic Honorary, Indiana University.

1971-1973 - State of Indiana Academic Achievement stipend.

1979 - University of Minnesota Graduate School tuition scholarship.

1979-1982 - University of Minnesota Graduate School Dissertation Improvement Grant - \$1,000 for radiocarbon dates, maize analysis, travel.

1983 - University Computer Center, \$1,000 grant.

1983 - Institute for Minnesota Archaeology, Writing grant - \$800.

Vita

November/1986

Personal Data

Name: Kim Colette Breakey Address: 4064 Nicols Rd
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 (612) 155-9679

Date of Birth: 1/31/58

Education

B.A. Anthropology - Moorhead State University Fall 1980

Additional pertinent classes: Lithic Technology, Dr. Stanley A.
 Ahler, University of North Dakota
 Fall 1982

Advanced Laboratory Techniques,
 Dr. Stanley A. Ahler Fall 1983

Field and Laboratory Experience

1980 (June) Archaeological Field School, Dr. M.G. Michlovic

(Oct-Nov) Laboratory Assistant, Dr. M.G. Michlovic

1981 (April-Nov) Field Archaeological Assistant, University of
 North Dakota, Dr. Michael Gregg

(Dec-April 1983) Laboratory Archaeological Assistant, UND

1983 (April-Sept) Promoted to Advanced Laboratory Assistant, UND

(Oct-March 1984) Assumed Editorial Assistant duties for
 final report preparation, UND. Report size: 4 volumes, 3500
 pages.

1984 (May-Sept) Field Assistant, Institute for Minnesota
 Archaeology, Dr. Clark Dobbs and Douglas A. Birk Projects:
 The Bryan Site (21GD4), Spring Creek Survey, "Fort Duquense"
 (21M020), Pike's Fort (21M021)

(Nov-March 1985) Laboratory Research Assistant, IMA
 Projects: processing and preservation of artifacts from
 21M020 and Pike's Fort.

1985 (April-May) Field Assistant, Rice County Survey, Dr. Barbara
 H. O'Connell

(June-Dec) Field and laboratory Assistant, IMA Projects:
 continued excavation at 21M020 and Pike's Fort and
 subsequent artifact processing and preservation; research

project for Wisconsin Historical Society on Hill/Lewis Mound data

1986 (Jan-Nov) Field and Laboratory Assistant, IMA Projects: Continued excavation and processing and preservation of artifacts from 21M020; geomorphological survey of three river systems in southwestern Minnesota (SW659); limited testing at Red Wing Mississippian village site (21GD159)

Publications

- 1981 A description of some ceramics from the Middle Red River valley, Minnesota-North Dakota. The Minnesota Archaeologist. Vol 40, Number 1, pp 33-41. Minnesota Archaeological Society, Building 27, Fort Snelling, St. Paul.
- 1985 Stanley A. Ahler, junior author
An analysis of pottery from On-A-Slant village, Fort Abraham Lincoln State Park, North Dakota. Journal of the North Dakota Archaeological Association, Vol 2, pp 1-36. University of North Dakota, Grand Forks.

References

- | | |
|--------------------|--|
| Douglas A. Bird | Institute for Minnesota Archaeology
1313 5th St S.E. Suite 205
Minneapolis, MN 55414
(612) 623-0299 |
| Dr. Clark A. Dobbs | Institute for Minnesota Archaeology
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Minneapolis, MN 55414
(612) 623-0299 |
| Dr. Michael Gregg | Department of Anthropology
University of North Dakota
Grand Forks, ND 58201
(701) 777-2435 |
| Dr. M.G. Michlovic | Department of Anthropology
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Moorhead, MN 56560
(218) 236-2632 |

Jeffrey A. Tollefson
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Gaylord, Minnesota 55334
Phone: (507) 246-5231

197

Education:

University of Minnesota
Minneapolis, MN
3 years.
Archaeology Major/Math Minor.
Overall GPA: 3.72
Major GPA: 3.86
Minor GPA: 3.22

St. Cloud State University
St. Cloud, MN
2 years.
English Major.
Overall GPA: 3.45

Occupational History:

Farming (3 years):. Worked on a dairy farm, all aspects, and operated all types of heavy equipment.

Archaeological dig (7 months): Worked as a research assistant, supervising digging crews, designing data recovery facilities, surveying, mapping and general archaeological recovery tasks (digging, recording, filing, etc.).

Orthodontic Lab Technician (3 1/2 years): Worked part-time during college doing general lab work connected with orthodontic practice.

References:

Dr. Douglas Aaker
St. Cloud, MN
(612) 253-8908 - office

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University of Minnesota
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Currently at:
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Gaylord, MN
(612) 237-5477

Thank You!

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565 Portland #2B
St. Paul, MN 55102
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EDUCATION

Graduate Studies in Anthropology, University of Texas at San Antonio, 9/85-5/86. (G.P.A. 4.0).

B.A., Gustavus Adolphus College, Cum Laude, Majors in International Economics and French, May 1985.

Institute for European Studies, including coursework at the University of Paris-Sorbonne, 9/83-5/84.

EMPLOYMENT HISTORY

Research Assistant and Field Archaeologist, Institute for Minnesota Archaeology, Minneapolis, MN, 6/86-present.

Technical Laboratory Staff III, Center for Archaeological Research, University of Texas at San Antonio, 9/85-5/86.

French Tutor, French Department, Gustavus Adolphus College, St. Peter, MN 9/84-5/85.

Spanish Tutor, Spanish Department, Gustavus Adolphus College, St. Peter, MN 9/84-5/85.

Assistant Librarian, Institute for European Studies, Paris, France, 9/83-5/84.

Shipping and Receiving Clerk, Medical Arts Press, Minneapolis, MN, Summers of 1980-1983.

References available upon request.

project for Wisconsin Historical Society on Hill/Lewis Mound
data

- 1986 (Jan-Nov) Field and Laboratory Assistant, IMA Projects:
Continued excavation and processing and preservation of
artifacts from 21M020; geomorphological survey of three
river systems in southwestern Minnesota (SW639); limited
testing at Red Wing Mississippian village site (216D158)

Publications

- 1981 A description of some ceramics from the Middle Red River
valley, Minnesota-North Dakota. The Minnesota
Archaeologist. Vol 40, Number 1, pp 33-41. Minnesota
Archaeological Society, Building 27, Fort Snelling, St.
Paul.
- 1985 Stanley A. Ahler, junior author
An analysis of pottery from On-A-Slant village, Fort
Abraham Lincoln State Park, North Dakota. Journal of
the North Dakota Archaeological Association, Vol 2, pp
1-36. University of North Dakota, Grand Forks.

References

- | | |
|--------------------|--|
| Douglas A. Birk | Institute for Minnesota Archaeology
1515 5th St S.E. Suite 205
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(612) 623-0299 |
| Dr. Clark A. Dobbs | Institute for Minnesota Archaeology
1515 5th St S.E. Suite 205
Minneapolis, MN 55414
(612) 623-0299 |
| Dr. Michael Gregg | Department of Anthropology
University of North Dakota
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(701) 777-2455 |
| Dr. M.G. Michlovic | Department of Anthropology
Moorhead State University
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Minneapolis, MN
3 years.
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Major GPA: 3.86
Minor GPA: 3.22

St. Cloud State University
St. Cloud, MN
2 years.
English Major.
Overall GPA: 3.45

Occupational History:

Farming (3 years): Worked on a dairy farm, all aspects, and operated all types of heavy equipment.

Archaeological dig (7 months): Worked as a research assistant, supervising digging crews, designing data recovery facilities, surveying, mapping and general archaeological recovery tasks (digging, recording, filing, etc.).

Orthodontic Lab Technician (3 1/2 years): Worked part-time during college doing general lab work connected with orthodontic practice.

References:

Dr. Douglas Aaker
St. Cloud, MN
(612) 253-8908 - office

Clark Dobbs
University of Minnesota
Minneapolis, MN
Currently at:
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Timothy Bauer
Gaylord, MN
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Graduate Studies in Anthropology, University of Texas at San Antonio, 9/85-5/86. (G.F.A. 4.0).

B.A., Gustavus Adolphus College, Cum Laude, Majors in International Economics and French, May 1985.

Institute for European Studies, including coursework at the University of Paris-Sorbonne, 9/83-5/84.

EMPLOYMENT HISTORY

Research Assistant and Field Archaeologist, Institute for Minnesota Archaeology, Minneapolis, MN, 6/86-present.

Technical Laboratory Staff III, Center for Archaeological Research, University of Texas at San Antonio, 9/85-5/86.

French Tutor, French Department, Gustavus Adolphus College, St. Peter, MN 9/84-5/85.

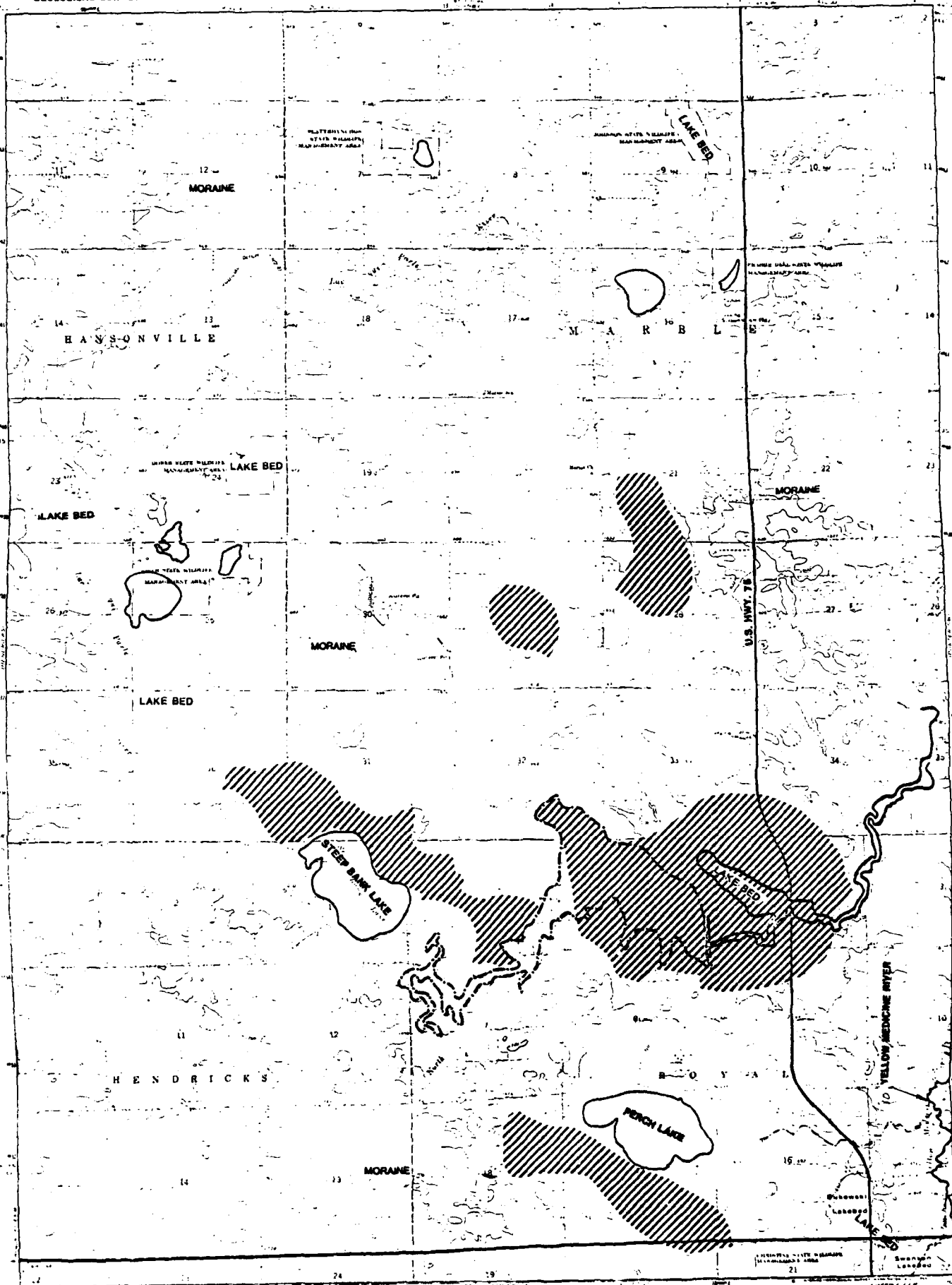
Spanish Tutor, Spanish Department, Gustavus Adolphus College, St. Peter, MN 9/84-5/85.

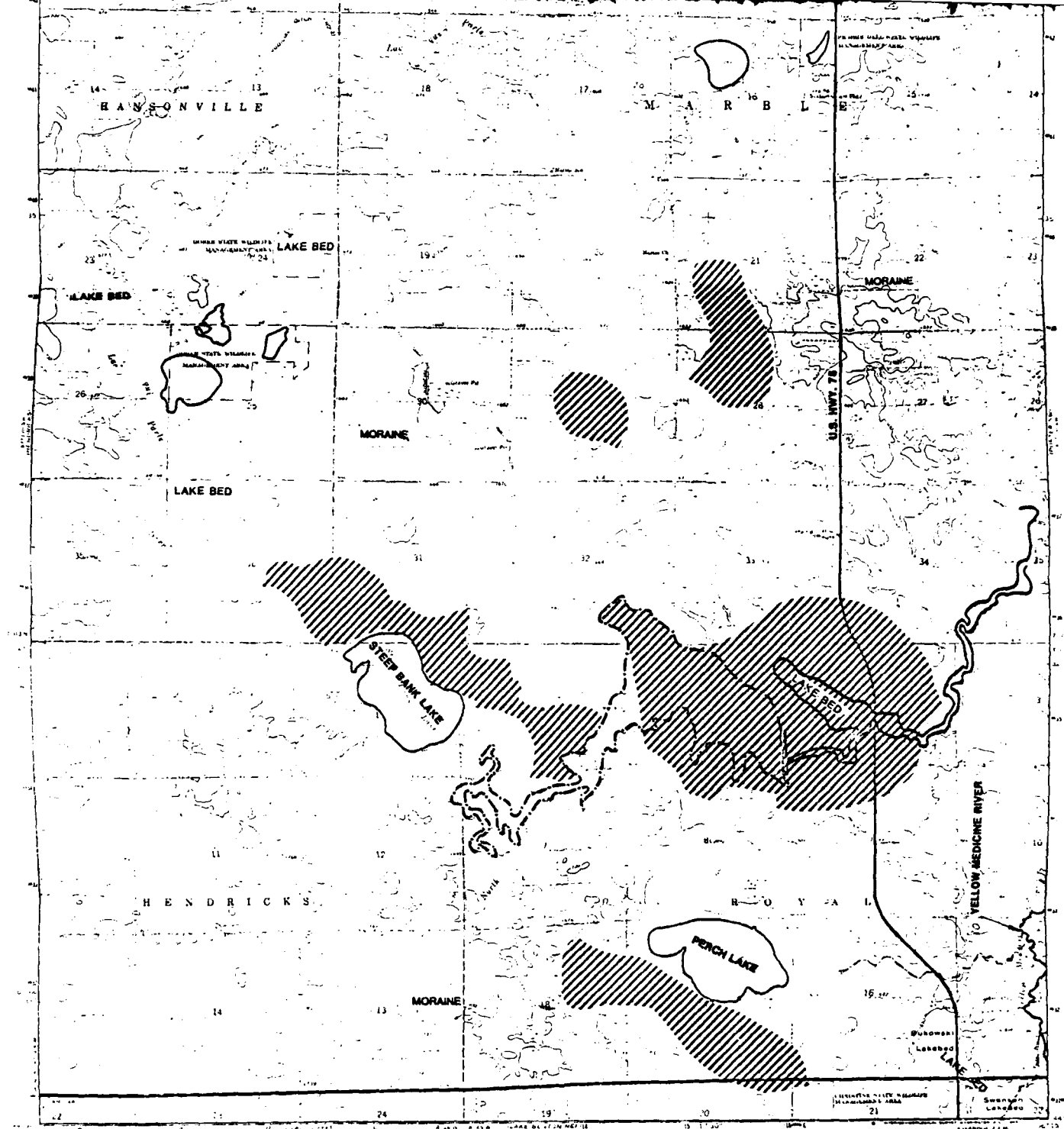
Assistant Librarian, Institute for European Studies, Paris, France, 9/83-5/84.

Shipping and Receiving Clerk, Medical Arts Press, Minneapolis, MN, Summers of 1980-1983.

References available upon request.

CANBY SE QUADRANGLE
MINNESOTA-LINCOLN CO
7.5 MINUTE SERIES (TOPOGRAPHIC)





Revised, edited, and published by the U.S. Geological Survey
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 at a price of \$1.00 per copy plus shipping and handling charges

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 FOR SALE BY U.S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR WASHINGTON, D.C. 20542
 A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

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 FOR SALE BY U.S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR WASHINGTON, D.C. 20542
 A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

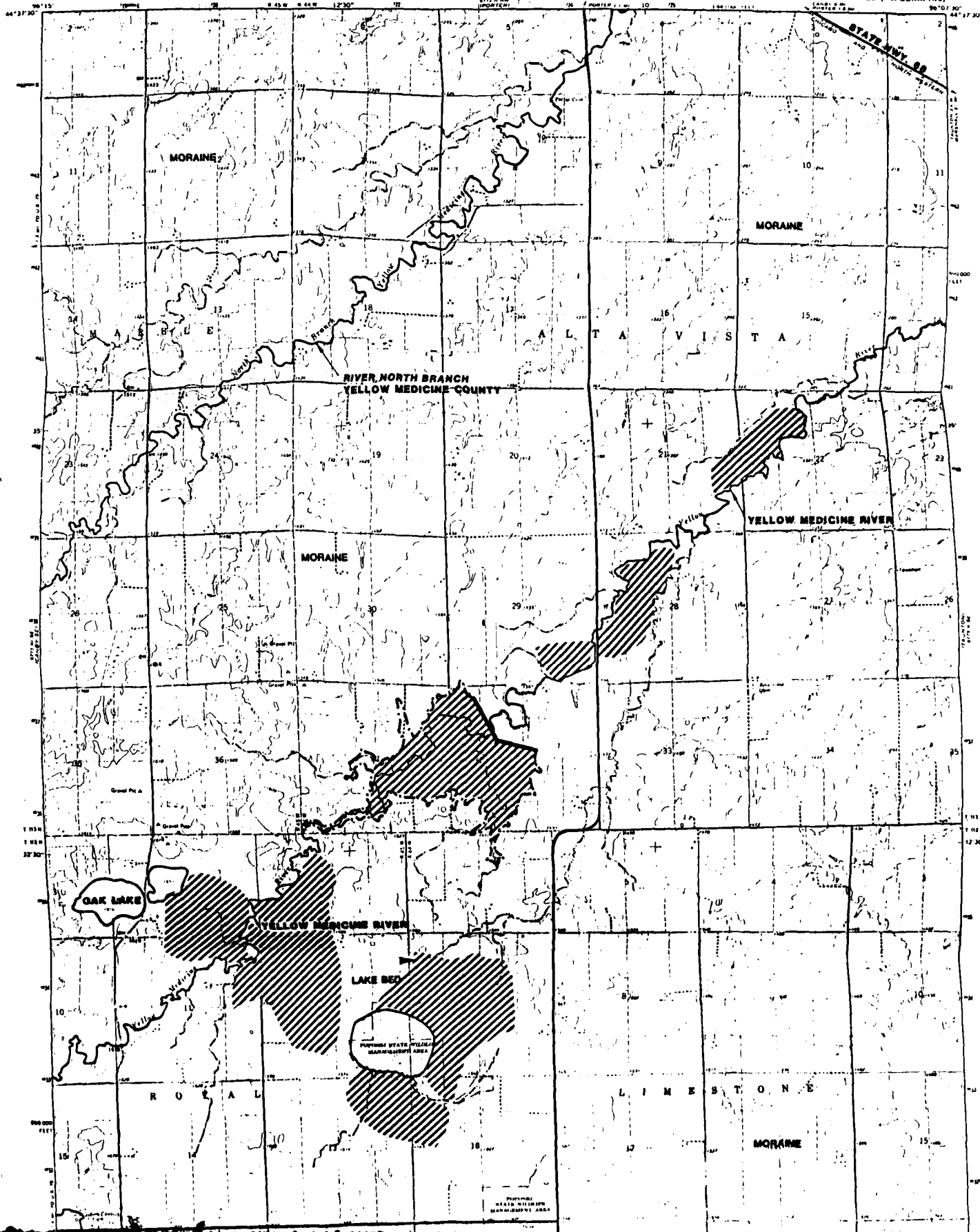
ROAD CLASSIFICATION
 Primary
 Secondary
 U.S. Route
 CANBY SE. MINN.
 1967
 1967
 1967

FIGURE 2: CANBY SE QUADRANGLE

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STATE OF MINNESOTA
DEPARTMENT OF ADMINISTRATION

PORTER SW QUADRANGLE
MINNESOTA-LINCOLN CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



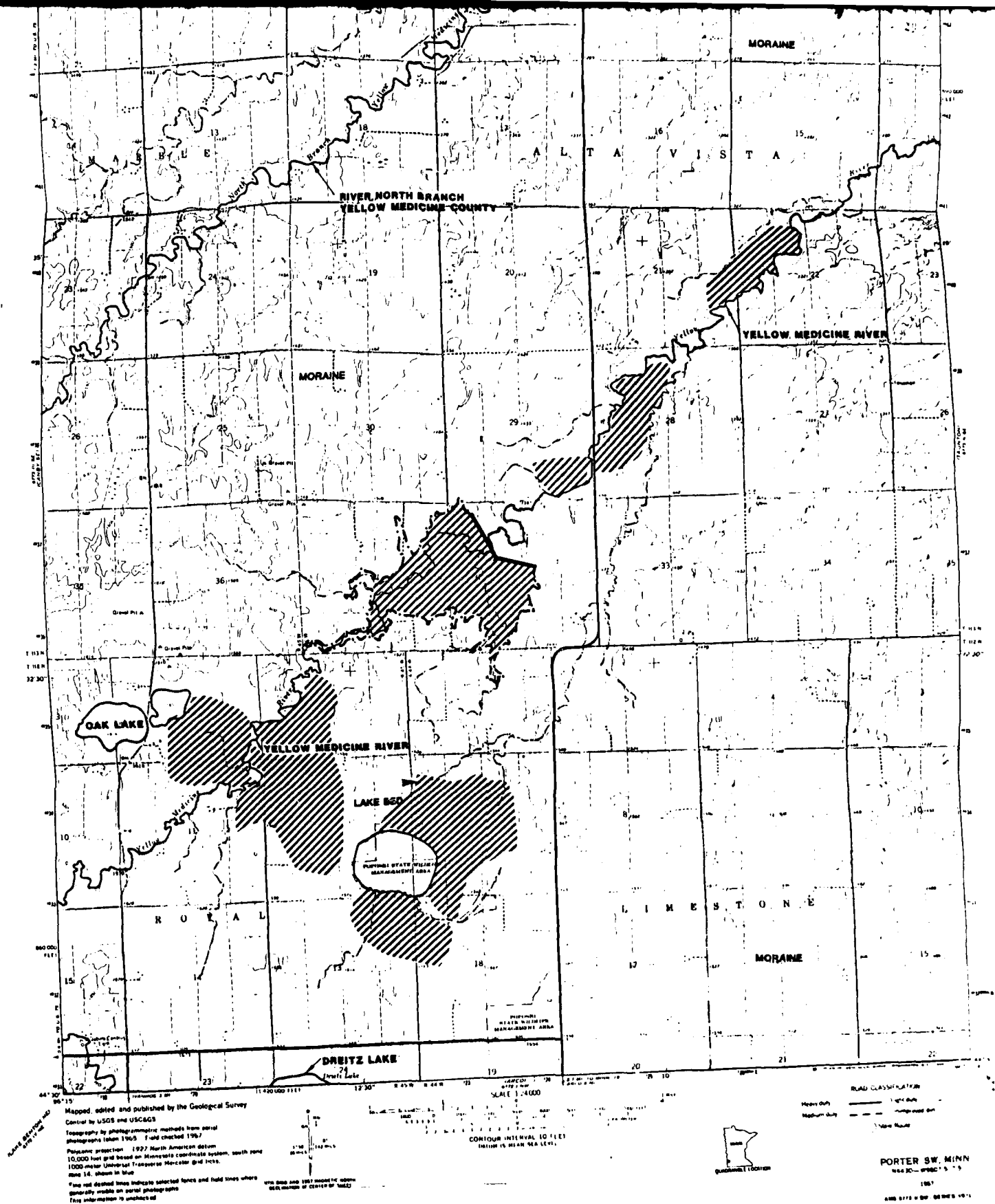
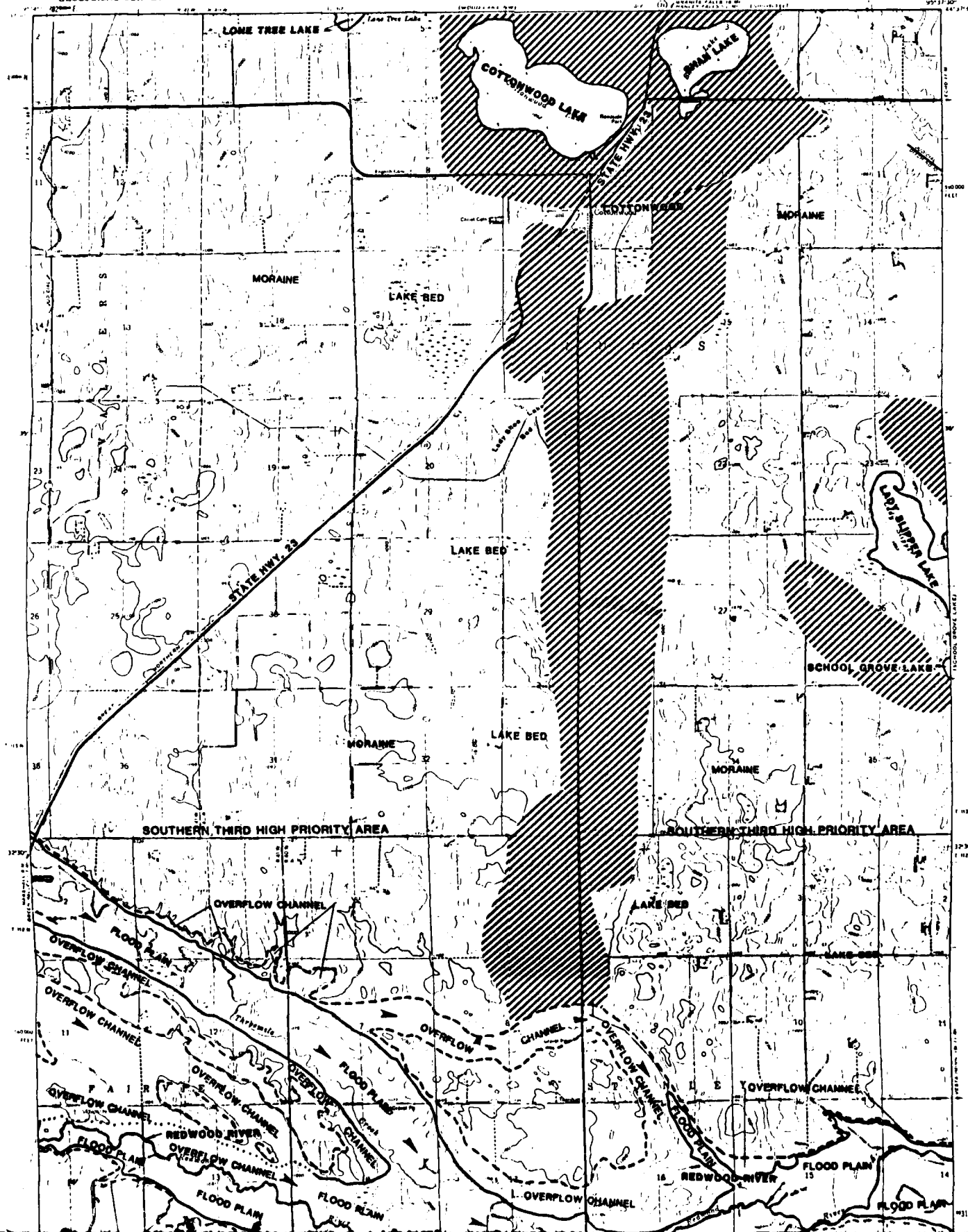


FIGURE 3: PORTER SW QUADRANGLE

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STATE OF MINNESOTA
DEPARTMENT OF CONSERVATION

COTTONWOOD QUADRANGLE
MINNESOTA-LYON CO
7.5 MINUTE SERIES (TOPOGRAPHIC)



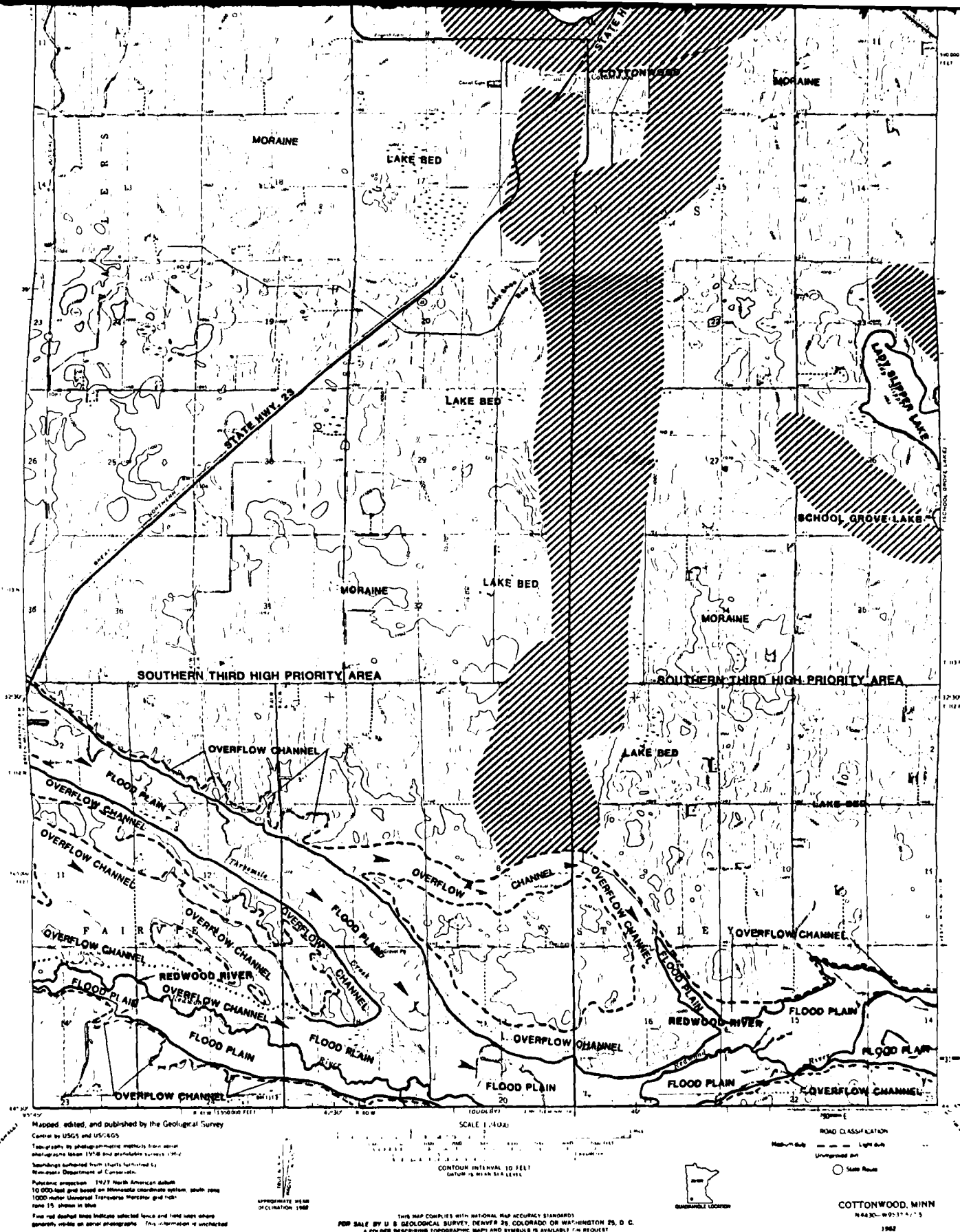
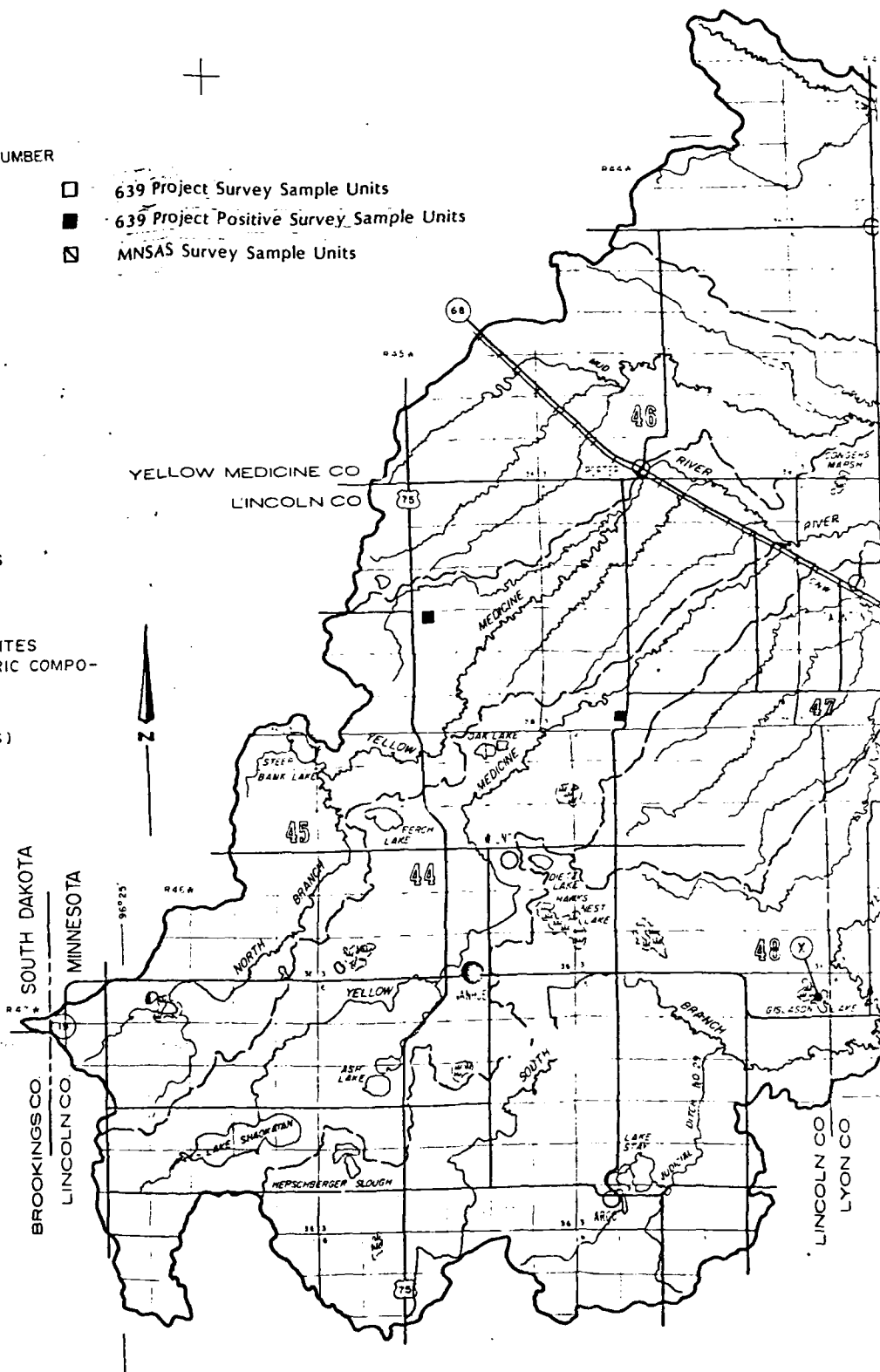
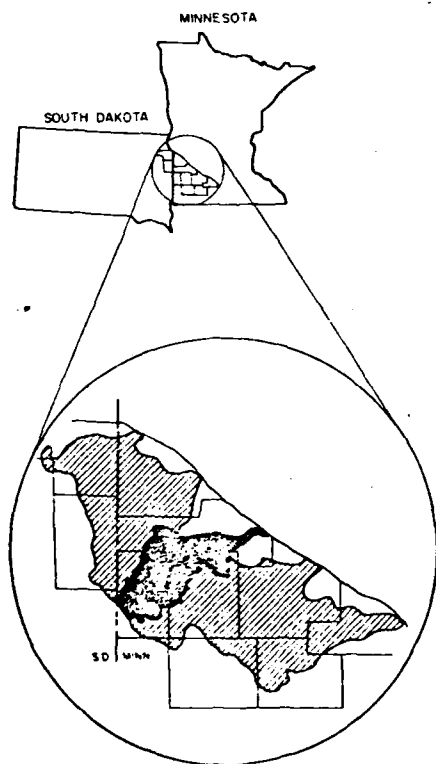


FIGURE 4: COTTONWOOD QUADRANGLE

U.S. DEPARTMENT OF AGRICULTURE
DEPARTMENT OF THE ARMY

LEGEND

- | | | | |
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| | SUBBASIN BOUNDARY | | 639 Project Survey Sample Units |
| | CNI BOUNDARY AND NUMBER | | 639 Project Positive Survey Sample Units |
| | STATE BOUNDARY | | MNSAS Survey Sample Units |
| | COUNTY BOUNDARY | | |
| | DRAINAGE | | |
| | LAKE | | |
| | MARSH | | |
| | COUNTY SEAT | | |
| | TOWNS UNDER 2000 | | |
| | U.S. HIGHWAY | | |
| | STATE HIGHWAY | | |
| | SECONDARY ROADS | | |
| | RAILROAD | | |
| | GLO TOWNSHIP LINES | | |
| | SECTION LINES | | |
| | PREHISTORIC
ARCHAEOLOGICAL SITES
(SOME WITH HISTORIC COMPO-
NENTS PRESENT) | | |
| | REPORTED SITES
(WITHOUT NUMBERS) | | |



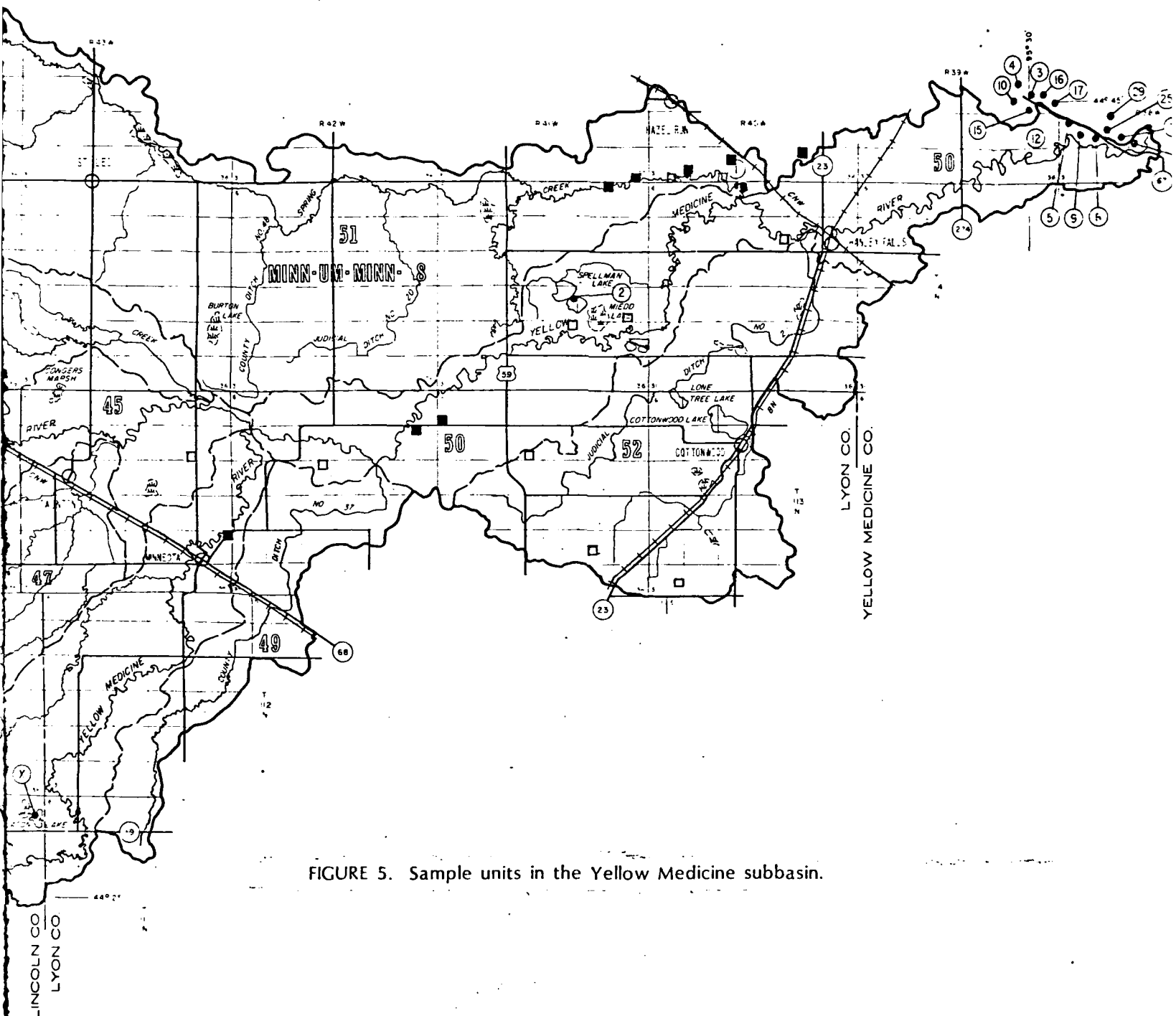
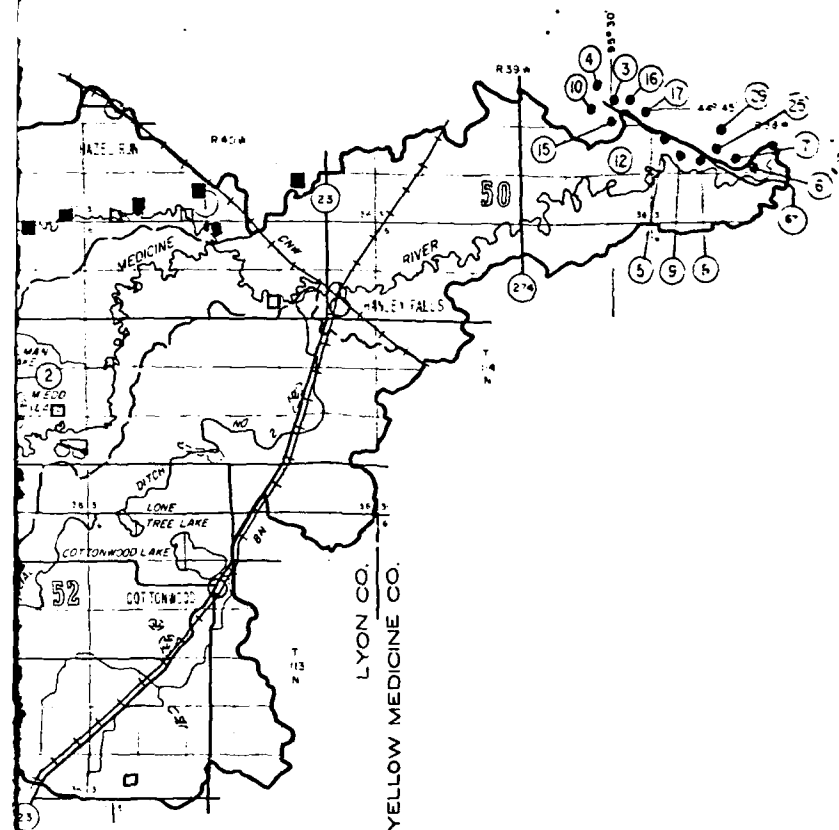


FIGURE 5. Sample units in the Yellow Medicine subbasin.

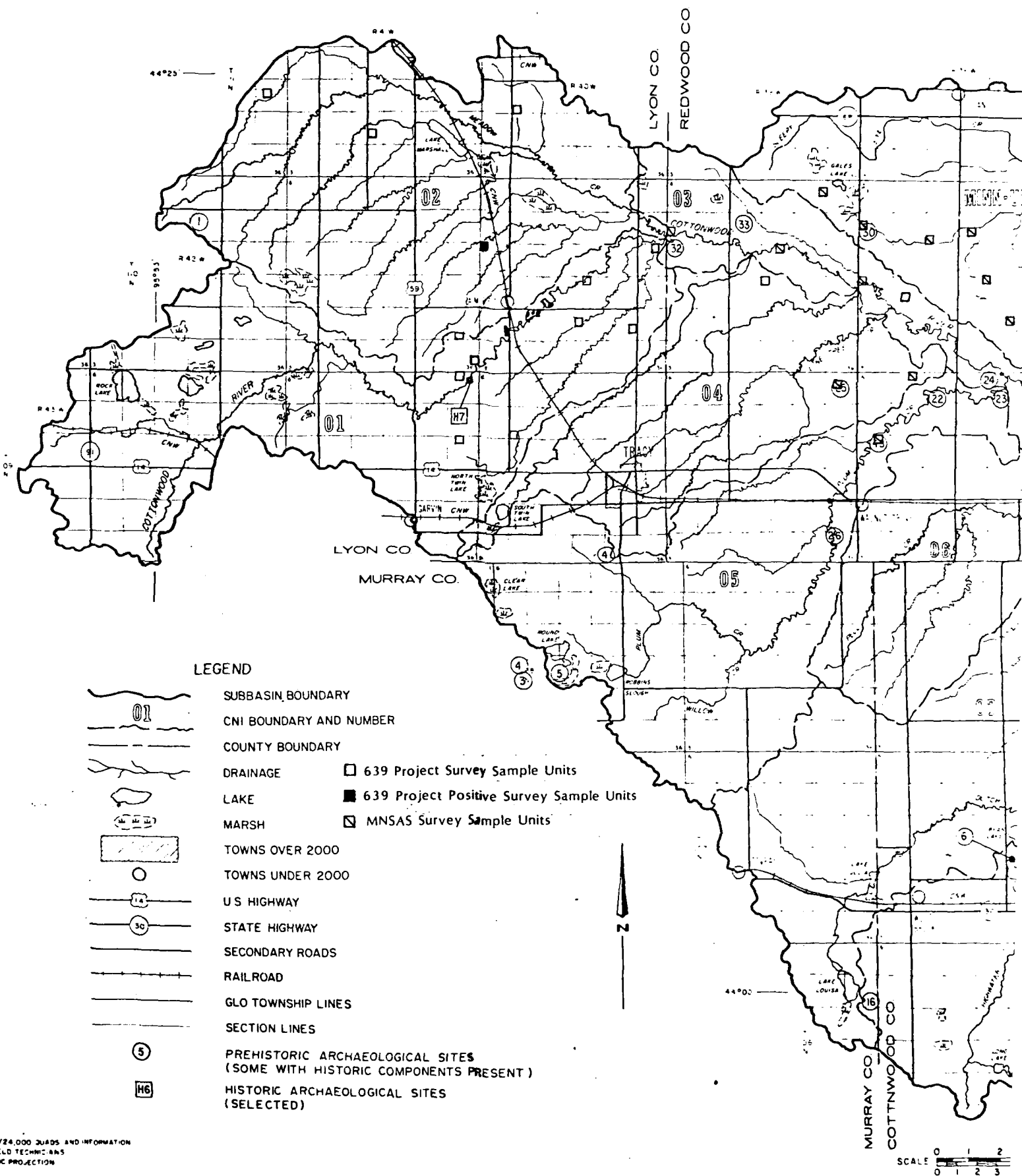
SCALE 0 1 2 3 4 5 6 MILES
0 1 2 3 4 5 6 7 8 9 KILOMETERS

**YELLOW
UPPER MINNESOTA**
CORPS OF ENGINEERS
MINNESOTA



Yellow Medicine subbasin.

YELLOW MEDICINE RIVER **UPPER MINNESOTA RIVER SUBBASINS STUDY** by the **CORPS OF ENGINEERS AND THE SOIL CONSERVATION SERVICE** **MINNESOTA AND SOUTH DAKOTA**



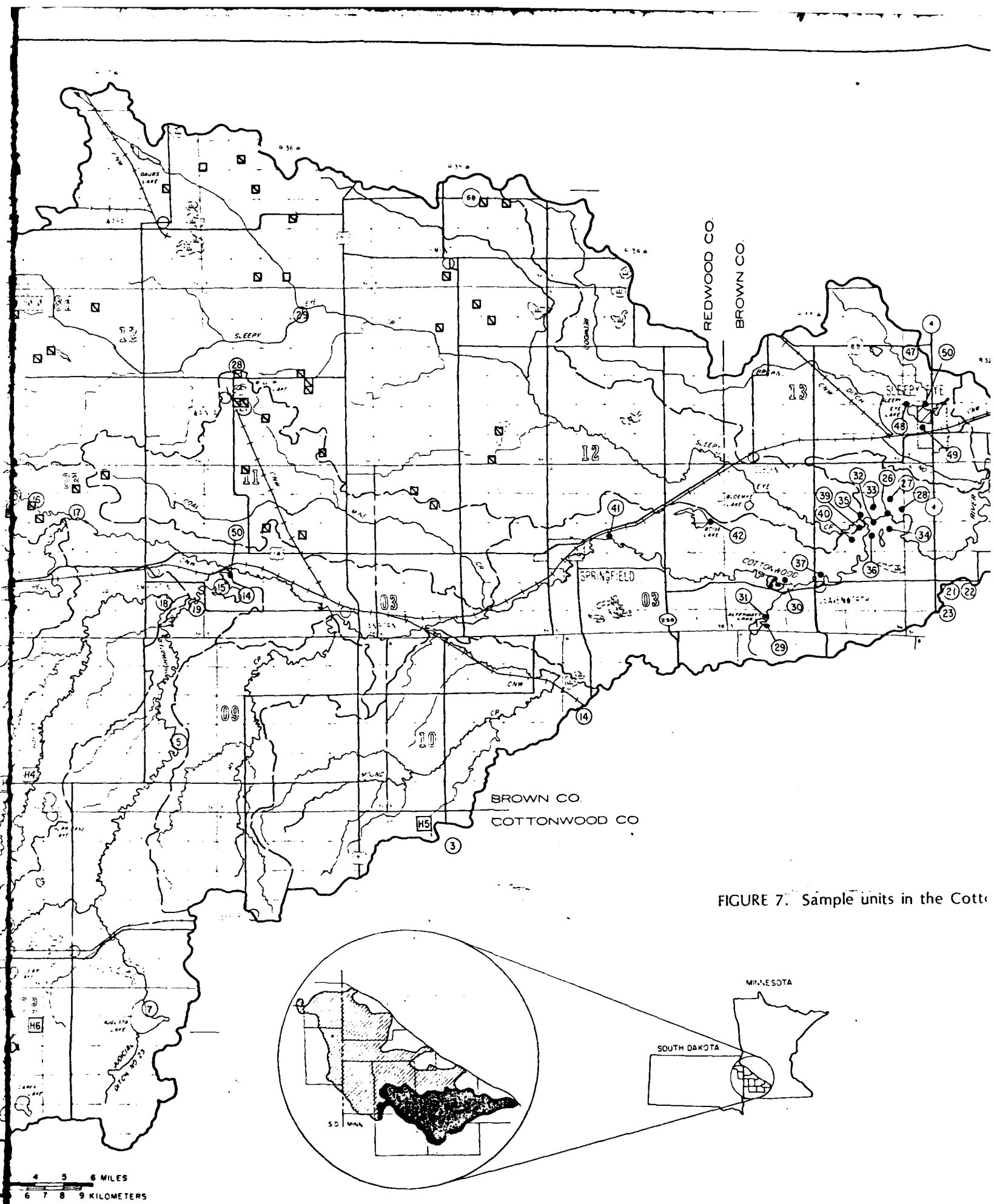


FIGURE 7. Sample units in the Cott

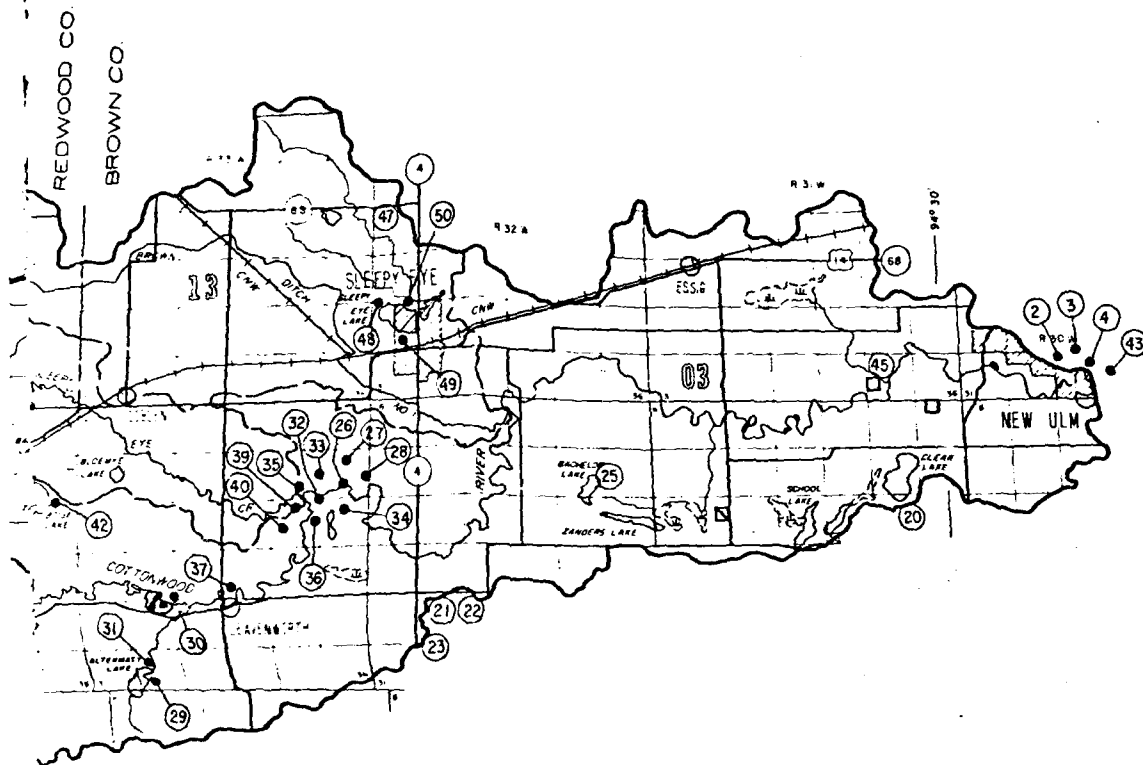
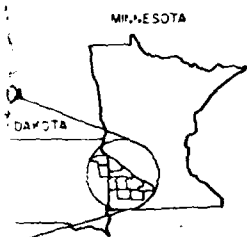


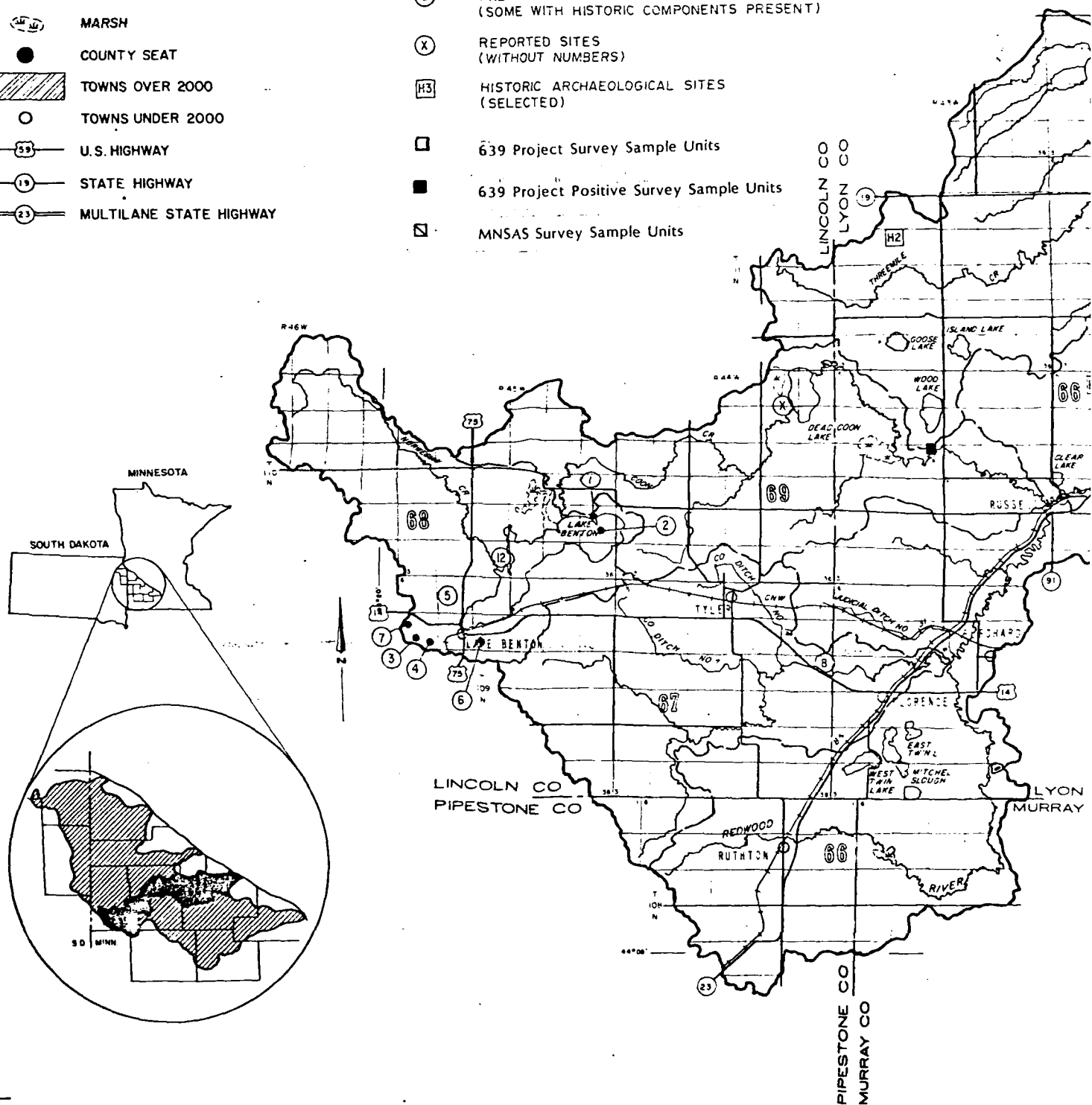
FIGURE 7. Sample units in the Cottonwood subbasin.



COTTONWOOD RIVER **UPPER MINNESOTA RIVER SUBBASINS STUDY** by the **CORPS OF ENGINEERS AND THE SOIL CONSERVATION SERVICE** **MINNESOTA**

LEGEND

- | | | | |
|--|-------------------------|--|---|
| | SUBBASIN BOUNDARY | | SECONDARY ROAD |
| | CNI BOUNDARY AND NUMBER | | RAILROAD |
| | COUNTY BOUNDARY | | G.L.O. TOWNSHIP LINE |
| | DRAINAGE | | SECTION LINE |
| | LAKE | | PREHISTORIC ARCHAEOLOGICAL SITES
(SOME WITH HISTORIC COMPONENTS PRESENT) |
| | MARSH | | REPORTED SITES
(WITHOUT NUMBERS) |
| | COUNTY SEAT | | HISTORIC ARCHAEOLOGICAL SITES
(SELECTED) |
| | TOWNS OVER 2000 | | 639 Project Survey Sample Units |
| | TOWNS UNDER 2000 | | 639 Project Positive Survey Sample Units |
| | U.S. HIGHWAY | | MNSAS Survey Sample Units |
| | STATE HIGHWAY | | |
| | MULTILANE STATE HIGHWAY | | |



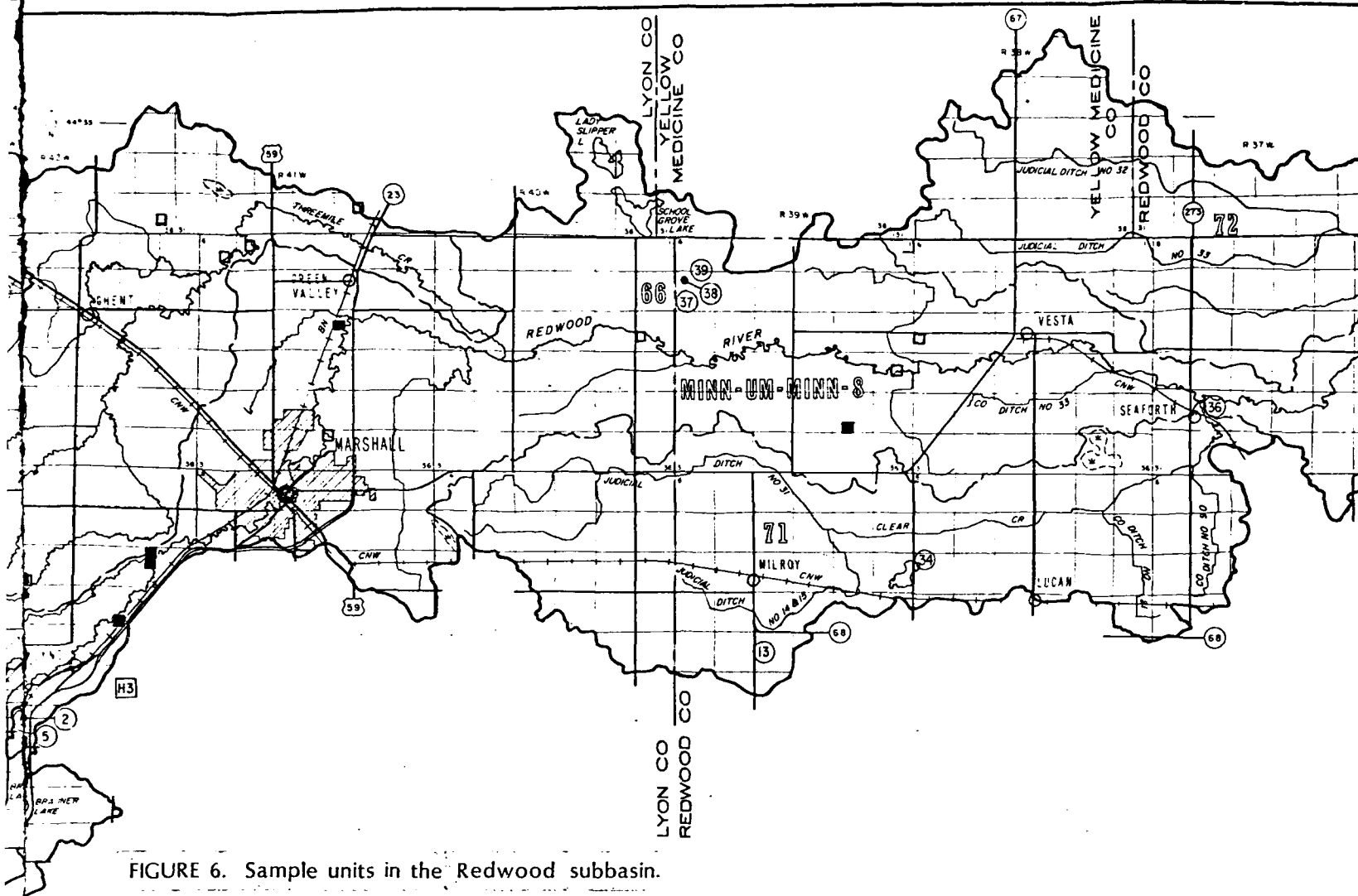
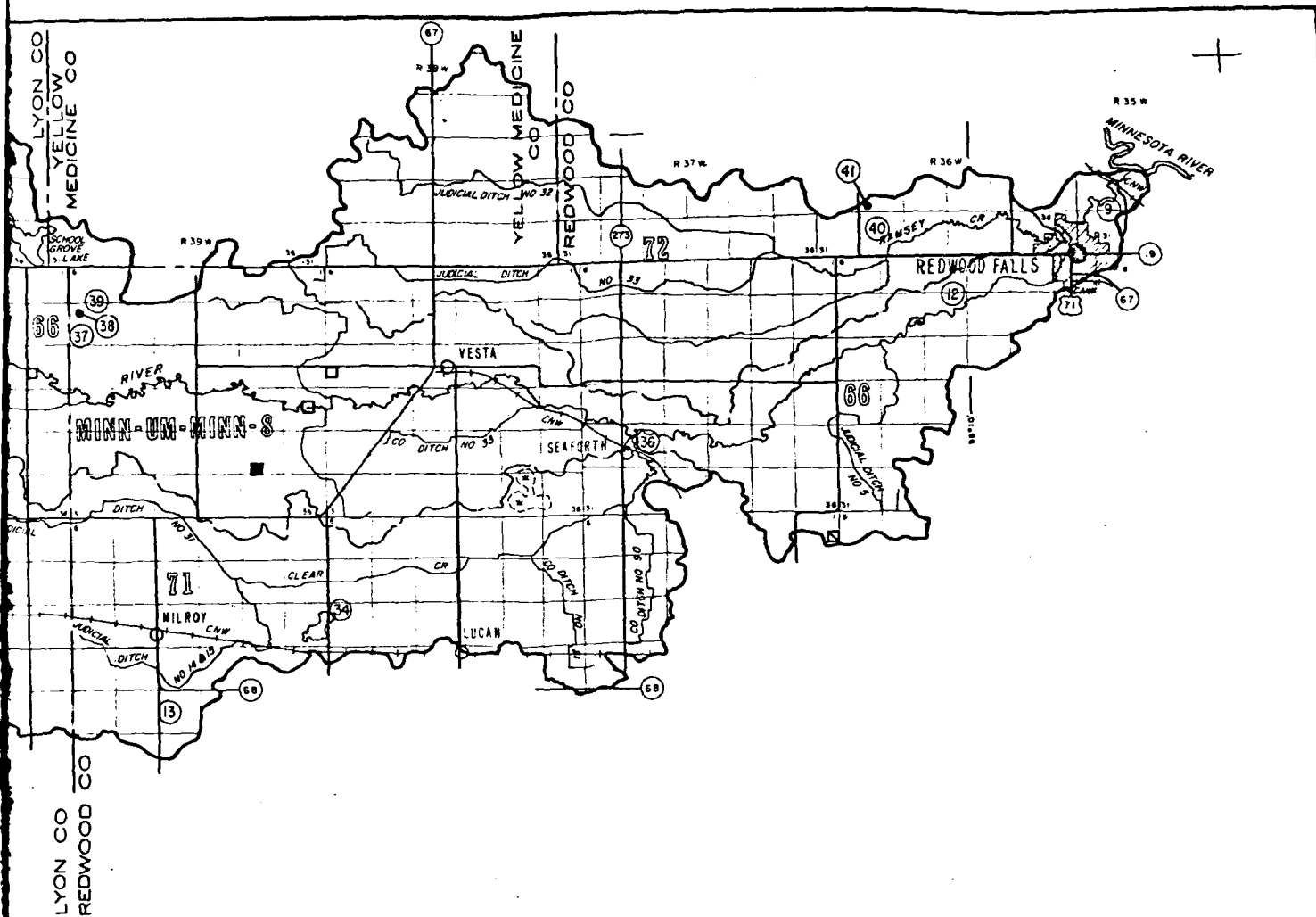


FIGURE 6. Sample units in the Redwood subbasin.

SCALE 0 1 2 3 4 5 6 MILES
0 1 2 3 4 5 6 7 8 9 KILOMETERS

RE
UPPER MINNESOTA
CORPS OF ENGINEERS



basin.

REDWOOD RIVER

UPPER MINNESOTA RIVER SUBBASINS STUDY

by the

CORPS OF ENGINEERS AND THE SOIL CONSERVATION SERVICE

MINNESOTA