

**AN ARCHAEOLOGICAL AND GEOMORPHIC SURVEY OF PALEOINDIAN
SITES AT HARLAN COUNTY LAKE, HARLAN COUNTY, NEBRASKA**

Steven R. Holen, David W. May and Paul M. Prettyman

**Nebraska Archaeological Survey
Technical Report 96-01
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ABSTRACT

The Harlan County Lake Paleoindian Project utilizes information from amateur archaeologists to document Paleoindian cultural resources at Harlan County Lake. Background information on Paleoindian resources and geomorphology at the lake and nearby areas of the Republican River valley is presented. Ten new sites are recorded, nine of which contain Paleoindian artifacts. Eight other previously recorded sites have additional Paleoindian components added, or additional Paleoindian artifacts described from previously recorded possible Paleoindian sites.

Two sites were tested to determine if intact Paleoindian components exist. The first site, 25HN178, first thought to be a possible Folsom site, instead is interpreted as a Late Archaic or Woodland site based on radiocarbon ages. One Folsom artifact is present at the site, however. Site 25HN183, has burned features in late Pleistocene loess. One feature contained small burned bone fragments, ash and charcoal. At present, we do not know if this site represents human-constructed or a natural burn features.

Information concerning late Pleistocene paleontological finds at Harlan County Lake is presented. In addition, there is a discussion of unprovenienced Paleoindian artifacts.

We conclude that there is a diverse and very significant Paleoindian occupation in the Harlan County Lake area. These important resources are being exposed because most of the shoreline of Harlan County Lake is eroded into Late Pleistocene and early Holocene geological deposits. Recommendations for management of these rare cultural resources include additional testing at some sites, and an extensive survey of all Late Pleistocene and early Holocene deposits exposed at the lake. At present, we do not have enough information to determine whether any of these sites are for the National Register of Historic Places.

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EXECUTIVE SUMMARY

The Harlan County Lake Paleoindian Project utilizes information from local informants to document Paleoindian cultural resources at Harlan County Lake. Background information on Paleoindian resources and geomorphology at the lake and nearby areas of the Republican River valley is presented. Ten new sites are recorded, nine of which contain Paleoindian artifacts. Eight other previously recorded sites have additional Paleoindian components added, or additional Paleoindian artifacts described from previously recorded possible Paleoindian sites. Two sites were tested to determine if intact Paleoindian components exist. The first site, 25HN178, first thought to be a possible Folsom site, instead is interpreted as a Late Archaic or Woodland site based on radiocarbon ages. One Folsom artifact is present at the site, however. Site 25HN183, has burned features in late Pleistocene loess. One feature contained small burned bone fragments, ash and charcoal. At present, we do not know if this site represents human-constructed or naturally burned features.

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The study performed herein by the Contractor for the Corps of Engineers is authorized in the National Historic Preservation Act of 1966, as amended. Accomplishment of this work provides documentation evidencing compliance with Executive Order 11593 "Protection and Enhancement of the Cultural Environment" dated 13 May 1971, and Section 110 of the National Historic Preservation Act.

Funds for this investigation and report were provided by the U.S. Army Corps of Engineers. The Corps may not necessarily agree with the contents of this report in its entirety. The report reflects the professional views of the Contractor who is responsible for collection of the data, analysis, conclusions and recommendations.

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I. INTRODUCTION

This report, which documents Paleoindian resources at Harlan County Lake, is the result of three factors. First, Steve Holen and David May have been involved in Paleoindian archaeology at two Bureau of Reclamation Reservoirs in the Republican River drainage since 1988. This research has led to a recognition of the great potential in the Republican River drainage to learn more about Paleoindian adaptations on the Central Plains. The second factor is the report by Paul Prettyman to Steve Holen of a mammoth on the beach of Harlan County Lake in 1990. This led to salvage investigations at the site under the direction of the senior author, then associated with the Museum of Anthropology at the University of Kansas, who obtained an Antiquities Permit from the Corps of Engineers enabling this salvage excavation. This excavation indicated a probable human association with late Pleistocene mammoth remains. The third factor is the recognition of Paleoindian artifacts from Harlan County Lake in several private collections. This provided additional evidence of the rich nature of the Paleoindian resources in this area. These three factors, combined with more recent reports of a possible Folsom site and additional sites containing fractured mammoth limb bone, resulted in the proposal to the U.S. Corps of Engineers to document these important resources.

Previous cultural resource management reports have not recognized the extent and significance of the Paleoindian occupation of the Harlan County Lake area. In part, this is because of the ephemeral nature of Paleoindian sites. In addition, the local informants, who know of these resources, were only consulted in a cursory manner during cultural resource management projects at the lake.

Information from local informants is utilized to document a rich and diverse Paleoindian record at Harlan County Lake. Without the cooperation of these individuals, this study would have not been possible. All Paleoindian artifacts from local collections were photographed and documented. This actually became a larger portion of the project than anticipated because many more Paleoindian artifacts were identified during research on these collections than were originally thought to be present when the project was proposed. Ten new archaeological sites were recorded (Fig. I-1) and information regarding Paleoindian components or artifacts were added to eight other sites (Fig. I-2).

This study follows a successful pattern of previous collaboration by the Nebraska Archaeological Survey with local informants to better understand Central Plains archaeology. This cooperation has resulted in major reports and publications including those dealing with Clovis lithic procurement at Lovewell Reservoir (Hoard et al. 1992, 1993) and a report on a large Skidi Pawnee village assemblage (Holen and Peterson 1995).

Fieldwork at the lake consisted of pedestrian survey of locations where Paleoindian artifacts had previously been found. We searched for additional artifacts and documented the geomorphic situation at each site to determine the age of geological deposits which might contain additional Paleoindian materials. Two sites with the potential to contain intact Paleoindian deposits were tested to determine if those deposits existed.

This study is organized into five chapters and a References Cited section. The Introduction presents previous Paleoindian archaeological studies of the Harlan County

Lake area and nearby reservoirs in the Republican River drainage. The second chapter is David May's discussion of previous research on the geomorphology and stratigraphy of Harlan County Lake and nearby areas. In addition, he presents a synopsis of the extent of Late Pleistocene and early Holocene deposits at Harlan County Lake which potentially contain Paleoindian sites. The third section presents information regarding new Paleoindian sites, and previously recorded sites which have new Paleoindian components, at Harlan County Lake. In addition, this section documents Paleoindian artifact finds which have no provenience, paleontological finds, and a report on geofacts found during the survey portion of the project. Results of test excavations at three sites is the subject of the fourth chapter. The Conclusion and Recommendations chapter contains a review of the significant contributions of the report and a discussion of the research potential of Harlan County Lake in terms of Paleoindian resources. Recommendations for additional documentation of the Paleoindian record at Harlan County Lake are presented.

Previous Paleoindian Research at Harlan County Lake

Previous archaeological investigations at Harlan County Lake have documented little evidence of a Paleoindian occupation in this section of the Republican River Valley. Pepperl and Falk (1978:13) state regarding previous work at the lake, "Evidence of occupation during the earlier Paleo-Indian period, with its emphasis on big game hunting, and the Archaic, or Foraging period had not been recovered". Later, an extensive archaeological survey found scant evidence for Paleoindian sites (Roetzel et al. 1982). Three sites, 25HN57, 110, and 138 were suggested to have some indication of Paleoindian occupation, but the evidence is weak. Adair and Brown (1987: 112-113) suggest that the Sindt Point Site, 25HN16, may have a Paleoindian component based on a bison bone bed reported by Paul Prettyman. Dendy (1995:25) recognizes a Paleoindian occupation of the lake area based on the presence of Folsom and Clovis projectile points found around the lake by Paul Prettyman. Dendy (1995:39-40) also recorded a site with mammoth skeletal material and nearby surface lithic artifacts. Dendy correctly suggests there is no definitive association between the mammoth bones and artifacts.

The only excavation of a possible Paleoindian site at Harlan County Lake occurred at the North Cove Site (Adair and Brown 1987; Adair 1989). Here, purported Smoky Hill Silicified Chalk artifacts were found in a Late Wisconsinan gully fill (Logan 1989). This interpretation has been challenged by Holen (1991) who interprets these "artifacts" as geofacts, brought up into the late Pleistocene gully fill from the underlying gravels by spring action. Smoky Hill Silicified Chalk fragments common in the gravels below the site, exhibit a gradation of rounding from fresh sharp pieces to heavily rounded gravel. I will discuss other geofacts found around the lake later in the report.

It is apparent that very little is known regarding the Paleoindian record in the Harlan County Lake portion of the Republican River valley. This study represents the preliminary step in providing a better understanding Paleoindian resources of the Harlan County Lake area.

Previous Investigations at Paleoindian Sites in the Republican River Drainage

Previous investigations have documented a significant Paleoindian occupation in the Republican River drainage. I will discuss the two nearest locations where significant Paleoindian research has been conducted, to place the Harlan County Lake Paleoindian research in a spatial and temporal context. Investigations at two Bureau of Reclamation reservoirs, Medicine Creek to the west, and Lovewell to the east spatially bracket Harlan County Lake. At Medicine Creek Reservoir major excavations have documented three sites, Allen, Lime Creek, and Red Smoke, each containing multiple early Holocene Paleoindian horizons (Bamforth 1991; Davis 1953, 1954, 1962; Holder and Wyke 1949; Holen 1995a). In addition, recent excavations at the La Sena Site have exposed highly fractured mammoth limb bone deep in late Wisconsinan loess (May and Holen 1993). These 18,000 year old fractured limb bones exhibit high velocity impact points, similar to those in Figure III-33, and bone flaking interpreted as human induced (Holen 1995a&b; Holen and May 1994; May and Holen 1994). A second mammoth site tested in 1995, the Shaffert Mammoth, also contains highly fractured limb bones. This site is situated on private land on a tributary of Medicine Creek.

Fieldwork at Lovewell Reservoir has documented two Clovis components (Holen and Eckles 1989). Very long-distance lithic procurement by Clovis groups on the Central Plains is demonstrated at the Eckles Clovis Site (Hoard et al. 1991, 1993). Another site, called the Lovewell Mammoth, dates to 18,000 radiocarbon years ago. This mammoth exhibits highly fractured and flaked limb bone in association with what appears to be a highly polished bone artifact (Holen 1996). A diverse fauna with many extinct species is found in terrace fill deposits dating to the late Farmdalian/early Woodfordian (Holen et al. 1995).

Other Paleoindian artifacts have been documented from Franklin, Webster, and Nuckolls Counties to the east of Harlan County Lake (Barbour and Schultz 1936, Figure 200). A "Franklin County Site" is mentioned but apparently was never investigated.

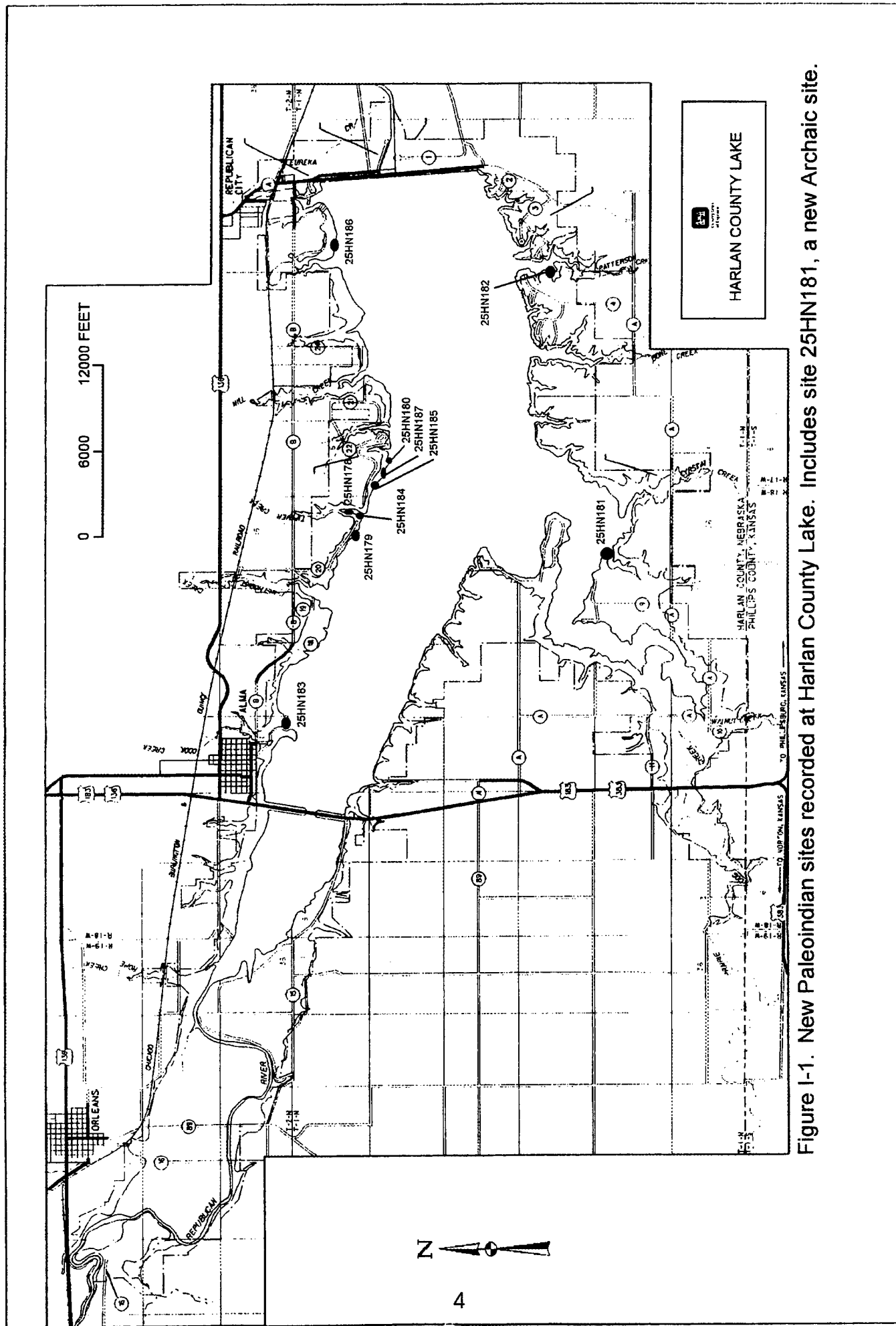


Figure I-1. New Paleolithic sites recorded at Harlan County Lake. Includes site 25HN181, a new Archaic site.

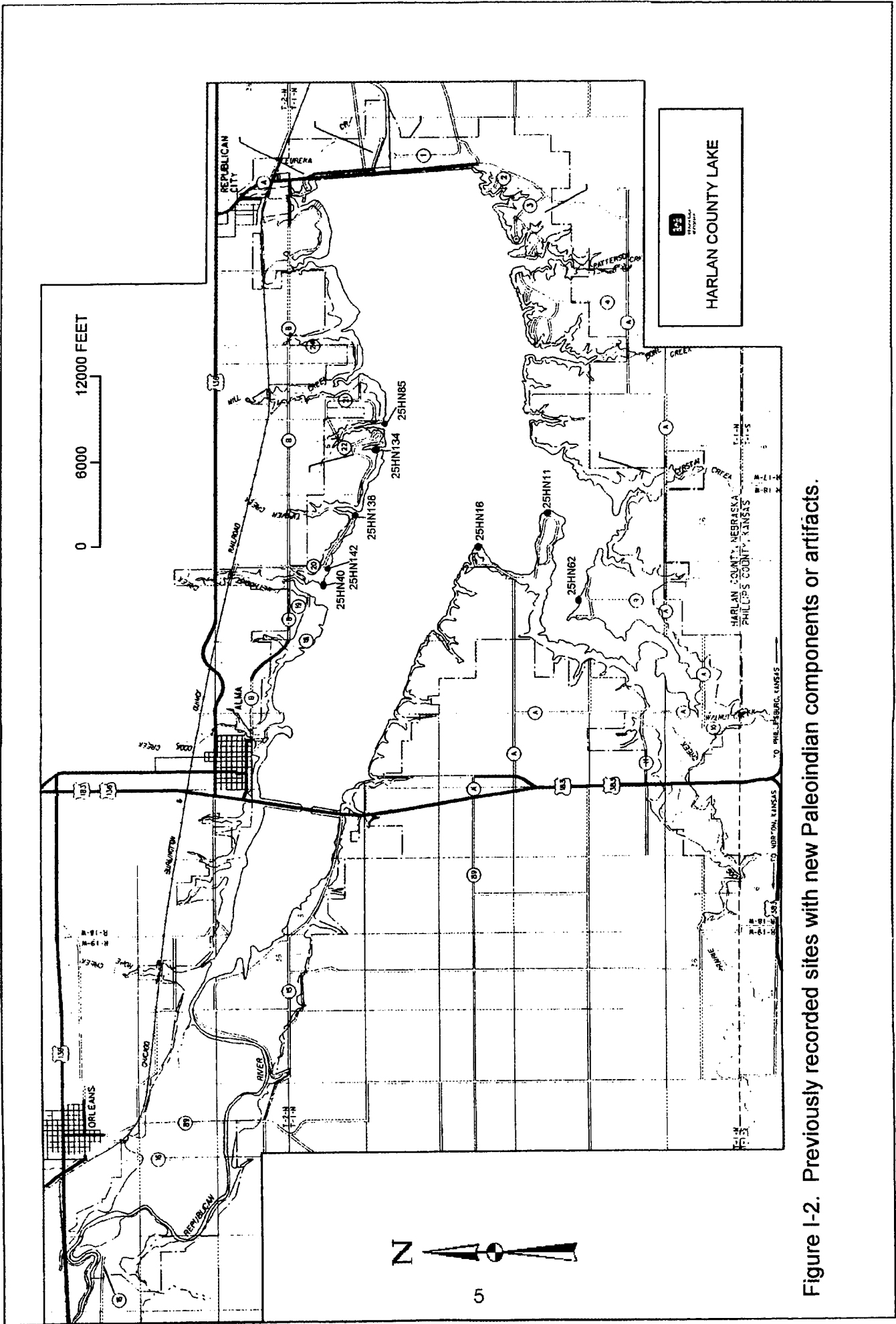


Figure I-2. Previously recorded sites with new Paleindian components or artifacts.

II. LATE PLEISTOCENE AND EARLY HOLOCENE GEOMORPHOLOGY AND STRATIGRAPHY OF THE PROJECT AREA

Previous Studies In and Near the Project Area

The earliest systematic study of landforms and valley fills in the Republican River Valley near Harlan County Lake was conducted by C.B. Schultz and his students in the late 1940's (Schultz et al. 1951). They recognized two fluvial terraces (Terraces 3 and 2) that are the surfaces of three Late Pleistocene and early Holocene valley fills (Terrace-3 fill, Terrace-2B fill, and Terrace-2A fill). Although the nomenclature for some of the buried soils within these fills and the loess deposits mantling the fills has evolved during the past 45 years, a brief review of the stratigraphy of these valley fills and the morphology of these terraces as described by Schultz et al. (1951) is warranted for at least two reasons. Firstly, Schultz et al. (1951) had the opportunity to view stratigraphic sections along the Republican River in the project area before it was flooded. Secondly, they were fortunate enough to view the sediments exposed in the long, cross-valley trench that was excavated for the foundation of Harlan County Dam.

Terrace 3 in Schultz et al. (1951) general summary of terraces in Nebraska was the surface of a late-Wisconsinan loess that mantled a sandy and silty valley fill, the Todd Valley formation of Lugin (1935) and Lueninghoener (1947). Now the sands comprising the valley fill below Terrace 3 in the Republican River Valley are usually informally referred to as part of the Gilman Canyon Formation (Souders and Kuzila 1990). Schultz et al. (1951) recognized a paleosol formed in the basal sand and silt of Terrace 3 fill that they referred to as "soil W." Schultz and Hillerud (1978) later indicated that this paleosol is in part correlative with the Sangamon paleosol (Figure 1). I think it is likely that this basal soil is part of the Gilman Canyon Formation of Reed and Dreeszen (1965).

Schultz et al. (1951) recognized two discrete valley fills (Terrace-2B fill and Terrace-2A fill) beneath the Terrace-2 complex in the Republican River valley in and near the project area. They reported that "the tops of the two fills are essentially the same height above the flood plains in most localities, so it is difficult, if not impossible, to distinguish the two by geomorphological methods" (Schultz et al. 1951, p. 29). Thus, they resorted to using the stratigraphic relationships of buried soils in the two fills to differentiate them. Very important to this study is their description (and photograph) of the stratigraphic section of Terrace-2B fill in the trench excavated for the Harlan County Dam (Schultz et al. 1951, pp. 29-30). They recognized the modern soil and four buried soils in the section. Schultz et al. (1951, p. 30) considered the most deeply buried soil to be the Brady paleosol, but later Schultz and Hillerud (1977a, 1977b, 1978) revised their interpretation and referred to this soil as the Gilman Canyon paleosol at the top of the Gilman Canyon Formation (Figure II-1). Given this stratigraphy, their Terrace-2B fill could be one of two fills. One possibility is that it could be Terrace 3 fill that has been eroded during the interval of Peoria Loess deposition (21,000 to 11,000 yr B.P.). Some of the mantle of Peoria Loess overlying alluvium of the Gilman Canyon Formation could have been vertically truncated by erosion, such that the surface of the Peoria Loess mantle now lies near the elevation of the top of Terrace-2A fill. A second possibility is that much of Terrace 2B fill above the basal Gilman Canyon paleosol is actually a late-

Wisconsinan valley fill comprised largely of reworked Peoria Loess. This fill would have been deposited sometime during the latter part of Peoria Loess deposition in the valley. Martin (1990) and Souders and Kuzila (1990) also suggest that such a fill may exist in this reach of the Republican River Valley.

Terrace-2A fill, as defined by Schultz et al. (1948, 1951) in the Republican River Basin, consists almost entirely of silt and contains three buried soils below the modern, surface soil (Figure II-1). The top of this fill has been called Republican River Terrace 2 (Schultz et al. 1948) and the Stockville Terrace (Brice 1966) in the Medicine Creek valley, a major tributary valley upstream of the project area. This is the oldest valley fill in the Republican River valley in which Schultz et al. (1948, 1951) found human artifacts in the early 1950's.

Little geomorphological research was conducted in the Harlan County Lake area again until the mid-1980's when 28 archaeological sites in the project area were tested for the U.S. Army Corps of Engineers (Adair and Brown 1987). During these investigations Kevin Cornwell (1987) mapped the distribution of terraces around the margin of Harlan County Lake, and also constructed cross-sections of the pre-reservoir valley bottom in the project area. His work is important to this study because he provided some detail of the distribution of Schultz et al. (1951) landforms in the Republican River valley and in tributary valleys that have been partially inundated by Harlan County Lake. However, the report provides very little new information about stratigraphy and the age of deposits beneath the landforms that he mapped. Most of what is presented is a review of Schultz et al. (1951) and a summary of the early radiocarbon ages in the Republican River Basin that were reported in Libby (1951).

Perhaps the single most important event that stimulated renewed stratigraphic investigations of Late Pleistocene deposits around Harlan County Lake was the discovery of a possible Late Pleistocene human artifact (a flake fragment) in a screen at the North Cove site (25HN164) when the site was investigated during the mid-1980's (Adair and Brown 1987). This find led to an intensive and interdisciplinary investigation of the site in the fall of 1987. As part of this effort William C. Johnson (1989) was involved to delineate stratigraphy at the site, and to discern Quaternary landscape evolution at and near the site. Johnson's (1989) report on the North Cove site included numerous new radiocarbon ages for Late Pleistocene sediments and the Brady paleosol at and near the North Cove site. Johnson (1989) reported humate ages for the Brady paleosol at the site of $10,550 \pm 160$ and $10,220 \pm 140$ yr B.P. Two other soil humate ages were determined for the Brady paleosol where it outcrops along the lake shore just east of the mouth of North Cove. Here the base of the Brady paleosol had an age of $11,530 \pm 150$ yr B.P., while the uppermost few centimeters of the Brady paleosol had an age of $10,270 \pm 160$ yr B.P. (Johnson 1989).

Charles W. Martin, a Geography Ph.D. student of William C. Johnson, undertook a systematic study of landscape evolution along the Republican River at and upstream of Harlan County Lake after spending time working at the North Cove site. His work resulted in a doctoral dissertation and several publications relevant to this project (Martin 1990, 1992a, 1992b, 1993; Martin and Johnson 1995). In particular, Martin studied the Gilman Canyon paleosols and Brady paleosol around Harlan County Lake, and Holocene terraces in the upper reaches of the reservoir and farther upstream.

Martin (1990, 1993) and Martin and Johnson (1994) determined ages for the uppermost part of the Gilman Canyon formation where it is exposed beneath loess-mantled Terrace 3 or higher landforms around Harlan County Reservoir. The ages of soil humates Martin (1993) collected from an exposure of Gilman Canyon paleosols just west of the mouth of North Cove ranged from $30,700 \pm 990$ yr B.P. for the lowest paleosol to $27,850 \pm 830$ yr B.P. for the highest paleosol. Martin and Johnson (1995) have reported ages of soil total humates, the humic acid fraction, and the residue fraction from Gilman Canyon paleosols in Bone Cove ranging from 20,370 to 26,730 yr B.P. Martin (1993) has reported ages of $21,550 \pm 500$ yr B.P. for soil humates from the upper Gilman Canyon paleosol, and ages of $21,250 \pm 530$ yr B.P. and $19,730 \pm 300$ yr B.P. for charcoal lenses in Peoria Loess just above the uppermost Gilman Canyon paleosol along the south shore of Harlan County Lake just west of Coyote Canyon. Another important contribution of Charles Martin's work that is pertinent to this study is his dating of the Brady paleosol. Humate ages of samples he collected ranged from $11,780 \pm 60$ to $10,360 \pm 130$ yr B.P. (Martin 1990, 1993). Finally, Martin (1992b) provided ages for valley fills beneath two terraces at and just beyond the upper end of Harlan County Reservoir. Martin's (1992b) high terrace is equivalent to Schultz *et al.* (1951) Terrace 2 (Fill 2A), and Martin's low terrace is equivalent to Schultz *et al.* (1951) Terrace 1. Martin (1992b) dated the incision that created the high terrace (Terrace 2) at between 4500 and 3700 yr B.P. Thus, fill 2A dates from approximately 10,500 or 11,000 yr B.P. to about 4500 yr B.P. or slightly younger.

Two separate studies conducted during the late 1980's and early 1990's just downstream from Harlan County Dam in the Republican River Valley deserve mention. Vernon L. Souders and Mark S. Kuzila (1990) cored a hole in an 80-foot high loess-mantled terrace along the south side of the Republican River across from Naponee, Nebraska. They reported poorly-sorted sand of the Gilman Canyon formation at the base (58.5 ft.) of their core. They sampled and dated both the base and top of a 5.5-ft.-thick paleosol in the Gilman Canyon formation that occurred 44.5 to 50.0 ft below the loess-mantled terrace. Souders and Kuzila (1990) reported an age of $29,870 \pm 1650$ yr B.P. for the base of the Gilman Canyon formation paleosol, and an age of $19,770 \pm 590$ yr B.P. for the top of the paleosol. Locally, the Brady paleosol was 13.5-14.5 ft. deep and dated $10,130 \pm 130$ yr B.P. From their study of terraces along the Republican downstream of Harlan County Dam Souders and Kuzila (1990) concluded that the 80-ft terrace they drilled is a Gilman Canyon landform (i.e. Medial Wisconsinan), and that a distinct, lower, Late Wisconsinan terrace probably exists. Thus, they in effect suggest that Terrace 3 of Schultz *et al.* (1951) is the Gilman Canyon terrace that they cored.

The Distribution of Late Pleistocene and Early Holocene Deposits Around Harlan County Reservoir

Part of the geomorphic investigation associated with this project involved defining locations around Harlan Lake where Late Pleistocene and early Holocene deposits are found. Given that the initial geomorphological work performed for the Corps of Engineers included a map of geomorphic provinces (Cornwell 1987), I have chosen to use the landforms on this map (Figure II-2) as a way of organizing the discussion of

specific landforms and the distribution of Late Pleistocene and early Holocene deposits around the lake.

Cornwell (1987) mapped a large area of "loessial upland" around the lake. This loessial upland is largely comprised of Peoria Loess. Many of the high bluffs along the south shore are comprised of and expose Peoria Loess and Gilman Canyon deposits and paleosols. The Gilman Canyon deposits in the Republican River Basin range in age from approximately 30,000 to 21,000 yr B.P. (May and Holen 1993; Martin 1993; Souders and Kuzila 1990); Peoria Loess ranges in age from 21,000 to about 11,500 or 10,500 yr B.P. in and near the project area (Johnson 1989; Souders and Kuzila 1990; Martin 1993). Thus, the Gilman Canyon soils, and the thick, overlying Peoria Loess deposits that are well exposed on the south shore of Harlan County Lake could contain Late Pleistocene cultural remains.

Cornwell (1987) mapped remnants of terrace along much of the north shore of Harlan County Lake, including a large area at Alma and west of Alma, and along Prairie Dog Creek (including White Cat Point and the area south of Prairie Dog Bay). Cornwell (1987) considered these remnants to be Terrace 2 in the scheme of Schultz et al. (1951). Apparently he mapped these terrace remnants without investigating the stratigraphy of sediments beneath these in great detail. This is not surprising given that his map is the first such map of geomorphic provinces in the Harlan County Lake area. His map, then, is based primarily on elevation of terrace remnants above the former pre-lake elevation of the Republican River channel. Therefore, he does not address the issue of the complexity of Terrace 2 fills (fills 2B and 2A) that was first outlined by Schultz et al. (1951), nor does he recognize and map remnants of Terrace 3 in the vicinity of the lake. Thus, the terrace remnants that Cornwell (1987) has mapped should be viewed as Late-Pleistocene (11,500 yr B.P.) to Late Holocene (4,500 yr B.P.) surfaces, with deposits beneath them ranging from 30,000 years old or older to younger than 4,500 years old.

Around most of Harlan County Lake only the upper Peoria Loess, Brady paleosol, Holocene alluvial deposits and buried soils, Late Wisconsin eolian deposits (Peoria Loess), and Holocene eolian deposits (Bignell Loess) are exposed today. It is difficult to see the base of the fills beneath the terraces except in the upper reaches of the reservoir area and in tributary valleys. Thus, it is difficult to separate remnants of Terrace 3 fill that have been cut by Holocene erosion to near the elevation of Terrace 2 from remnants of Terrace 2B and 2A fills. However, small remnants of Terrace 3 (and vertically eroded lower remnants of Terrace 3) are tentatively identified along the present shoreline of Harlan County Lake. For instance, a terrace remnant 0.3 mi. northwest of Sindt Point along the south shore of the lake is a remnant of Terrace 3 (This area is mapped as "loessial upland" on Cornwell's 1987 map). Likewise, some of the remnants of terrace along the north shore from North Cove east to Hunter Cove that are included on Cornwell's (1987) map are probably truncated remnants of Terrace 3 fill. Along this part of the shore, the Brady paleosol is exposed a few meters below the terrace, which is about at lake level between North Cove and Mill Creek.

Two sites at Harlan County Lake, that may expose sediments equivalent to Schultz et al. (1951) Terrace 2B fill, have been studied during the past decade. The first is the North Cove site (25HN164). Here, at the confluence of North Cove with the north edge of the Republican River Valley, spring deposits overlie cross-bedded sand. Numerous radiocarbon ages reveal that the spring deposits and overlying Brady paleosol range in

age from 14,700 to 10,120 yr B.P. (Johnson 1989). The second site where potential Terrace 2B deposits have been studied, but have not been directly dated, is the exposure along the south side of Prairie Dog Bay (south 1/2 of southeast 1/4 section 23, T.1N, R.18W). Here Martin (1990, 1993) has described the stratigraphy at four localities, and dated the Brady paleosol at the two localities where it is exposed within two to three meters of the surface. The significance of his work to this summary of terraces and valley fills is that he identifies two separate fills beneath the extensive remnant of terrace that stretches for 2 km to the upland, and several kilometers up Prairie Dog Creek valley (Figure II-2) (Cornwell 1987). The terrace across the two fills varies locally in relief by only 1.5 meters. In his Ph.D. dissertation, Martin (1990) suggested that the two localities along the shoreline where the Brady paleosol is not exposed are remnants of Peoria Loess dating between 20,000 and 13,000 yr B.P. He envisioned that incision after 13,000 yr B.P. created the inset fill (and overlying Peoria Loess or reworked loess) that contains a buried Brady paleosol. In his 1993 paper he again suggests this alternative and offers a second; the remnants of fill without the Brady paleosol could be remnants of an inset Holocene fill. My interpretation of the site is essentially the same as the one that Martin (1990) offered: the remnants of Peoria Loess that do not contain a buried Brady paleosol are remnants of an older, loess-mantled terrace (Terrace 3?). Given the absence of the Brady paleosol in the loess, these slightly higher remnants were beveled to the elevation of the lower terrace (Terrace 2) during the Holocene. Thus, Late Pleistocene and early Holocene deposits are probably found beneath the very extensive terrace that extends up Prairie Dog Creek (Figure II-2), and these deposits could contain Late Pleistocene cultural remains.

Terrace Fill 2A is of interest to this study because the Brady paleosol occurs at the base of the fill. Thus, remnants of Terrace 2 that have Fill 2A beneath the surface could potentially have very deeply buried archaeological deposits of Late Pleistocene and very earliest Holocene age (Schultz et al. 1948; May 1992). These are probably common along the upper end of the reservoir, both on the north side near Alma, and along the south side across from Alma.

In summary, the terrace remnants that Cornwell delineates on his map of landforms around Harlan County Lake provide the minimum spatial extent for buried Late Pleistocene and early Holocene human remains. Given the complex stratigraphy beneath the Terrace 2 complex, evidence that Terrace 3 has been beveled to near the elevation of Terrace 2 in many places, and the ages of Terrace 3, 2B, and basal 2A deposits, buried Late Pleistocene deposits are prevalent beneath these mapped terraces. Furthermore, Peoria Loess is exposed extensively along the south shore of the lake. Given that Peoria Loess dates from about 21,000 to 11,500 or 10,500 yr B.P., the potential exists for finding *in situ* evidence of human occupation in both upland loess-mantled areas, and where Peoria Loess caps older and higher alluvial valley fills. Thus, Late Pleistocene and early Holocene cultural materials could be exposed along almost all of the present shoreline of Harlan County Lake.

**Diagrammatic Interpretation of the Terrace Sequence
in the Central Great Plains
(Showing Stratigraphic Positions of Various Age Indicators)**

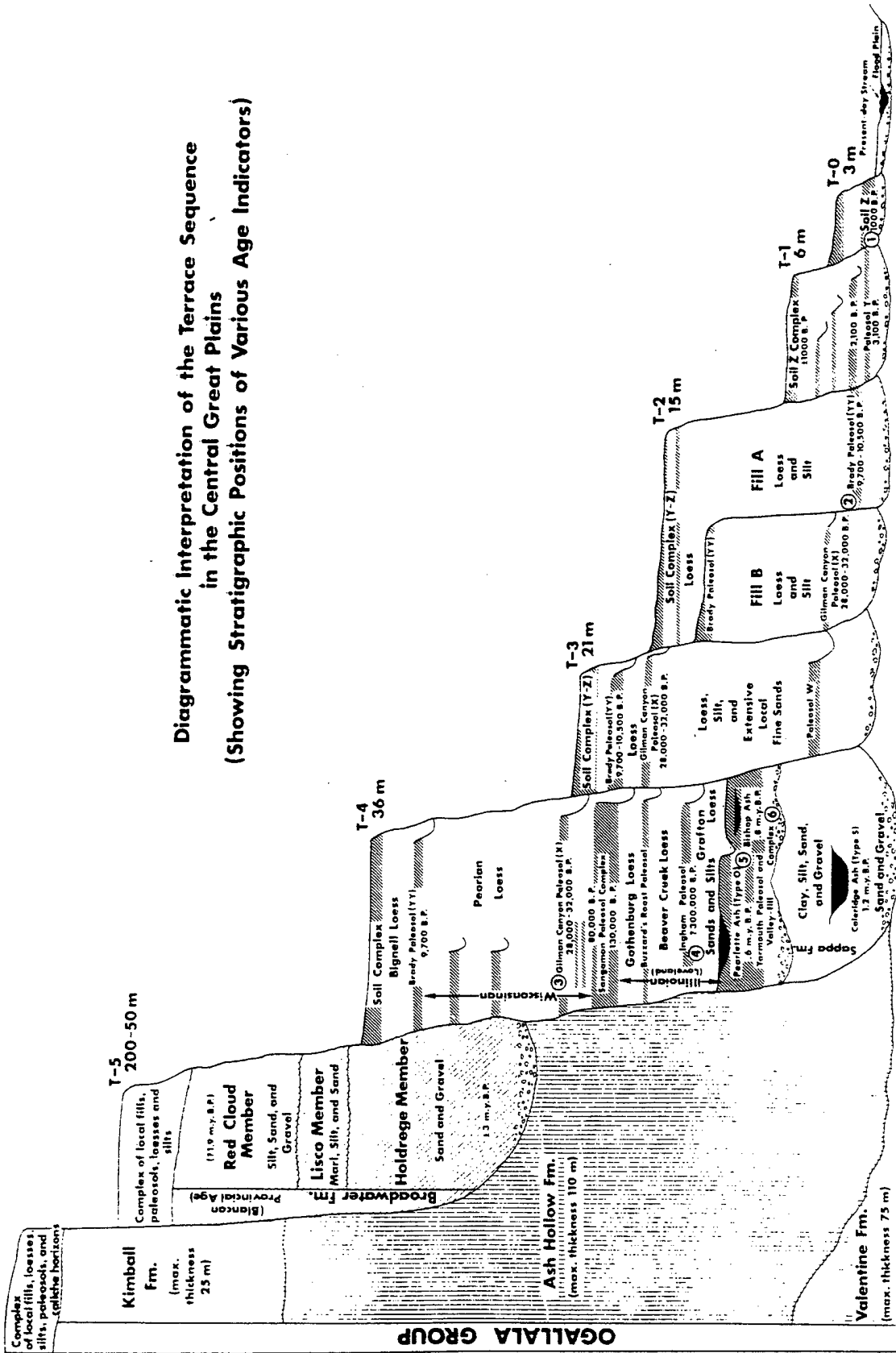
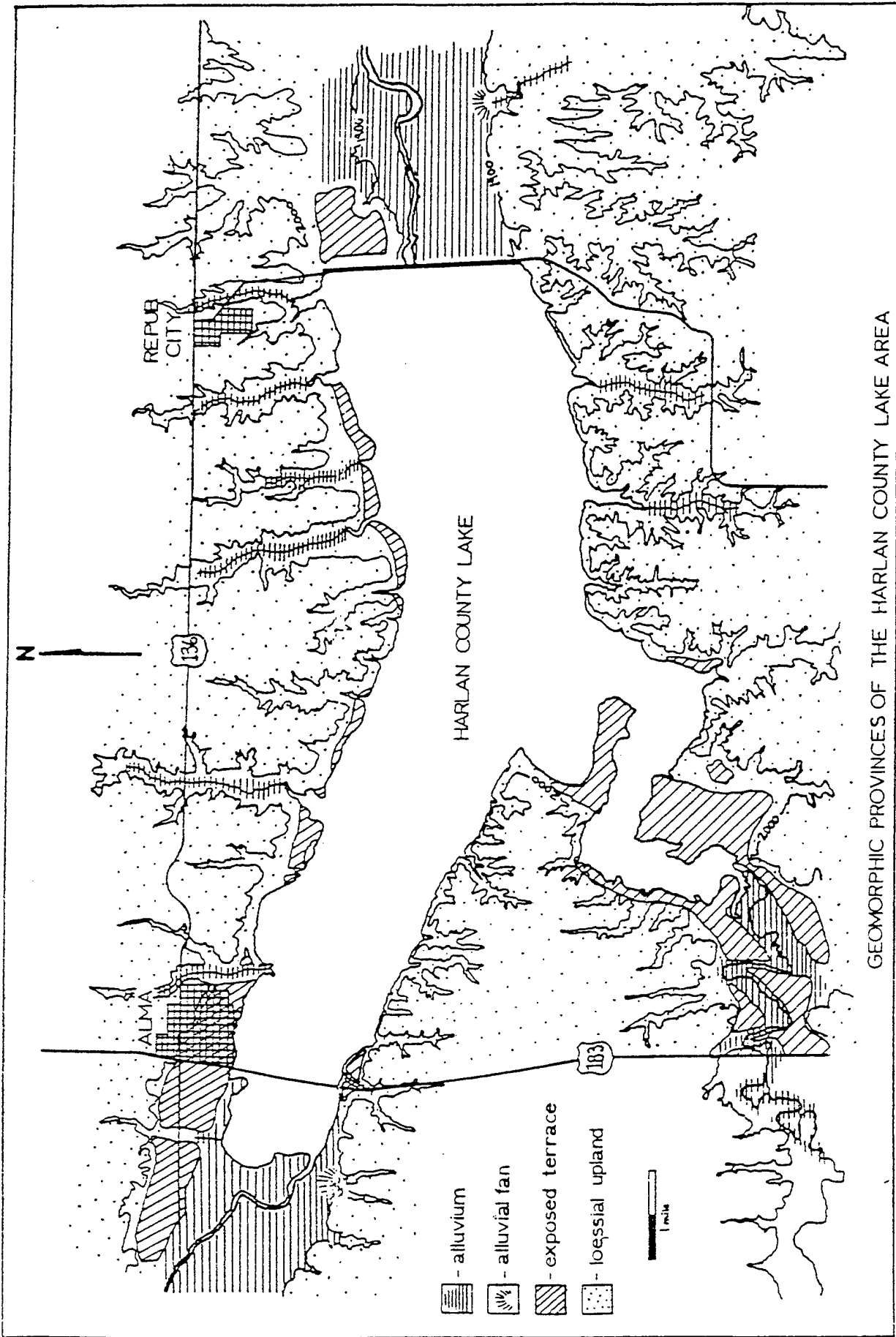


Figure II-1. Terraces in the Central Great Plains (from Schultz and Hillerud 1977b, p. 106, Figure 3).



GEOMORPHIC PROVINCES OF THE HARLAN COUNTY LAKE AREA

Figure II-2. Geomorphic provinces around Harlan County Lake (from Cornwell 1987, p. 30, Figure 8).

III. EVIDENCE OF THE PALEOINDIAN OCCUPATION IN THE HARLAN COUNTY LAKE AREA

Harlan County Lake contains many miles of eroded beaches consisting of early Holocene and late Pleistocene geological deposits. Paleoindian artifacts have been found on these eroded beaches indicating a significant, previously undocumented Paleoindian occupation of this section of the Republican River valley. Paleoindian artifacts in most areas are no doubt eroding out of the early Holocene Brady soil exposed just above the beach in cutbanks. Geological deposits stratigraphically lower than the Brady Soil are Peorian loess which forms most beaches during low water level. This loess is too old to contain the early Holocene patterned lithic artifacts described in this report, although this loess does contain mammoth sites with probable human association, and also could contain Clovis artifacts near the contact with the Brady Soil. All collections were made on beach surfaces, and nearly all artifacts were found at low water levels, at 1935-1945 ft. in elevation.

Ten new sites, including eight probable Paleoindian sites, one Archaic and one dual-component Paleoindian/Woodland site, were recorded as a result of this survey. In addition, information regarding Paleoindian components or artifacts was added to eight previously recorded sites. Unprovenanced Paleoindian artifacts are also described.

Each area where Paleoindian artifacts were found previously was surveyed to determine if cultural deposits were still present. A geomorphic assessment was made of each locality to define whether late Pleistocene/early Holocene deposits are present which could contain a Paleoindian site. A heavy concentration of Paleoindian sites was noted on the north shore of the lake on either side of Tipover Cove, east to North Cove. This entire area was surveyed. Areas with high potential to contain Paleoindian deposits were surveyed more than once, because erosion is occurring on the shoreline constantly.

Information regarding each new site, and previously recorded site found to have a new Paleoindian component or artifact, is presented below. First, new sites will be discussed, followed by previously recorded sites. The three sites which have been tested, 25HN178, 25HN183, and 25HN185, will be described in the next section.

New Sites with Paleoindian Components

25HN179, Eagle Roost Site

The Eagle Roost Site, 25HN179, is a Folsom site. These artifacts were found over a several year period eroded out on the beach (Fig. III-1). However, they were found within a very small area about 10 meters square. It consists of three Folsom projectile point bases, one unfluted lanceolate projectile point, one possible fluted point fragment and one Paleoindian knife (Fig. III-2).

During our survey, we noted a 2.5m cutbank behind a broad beach in the area where the artifacts had been found (Fig. III-1). The beach consists of Peorian loess. The lower portion of the cutbank is Peorian loess which grades upward into the Brady soil. Artifacts are probably eroding out of the very base of the Brady soil or upper few centimeters of Peorian loess.

Our survey found one undiagnostic Smoky Hill Silicified Chalk flake eroded out of place on the beach surface. *In situ* artifacts or features have never been found at this site. The artifacts are described below (Fig. III-2).

Catalogue #	Description
25HN179-1	Folsom point base made of Hartville Chert, fluted on both faces, basal grinding snap/impact fracture, some surface polish probably due to beach erosion in sandy matrix.
25HN179-2	Base of a small narrow Folsom point made of White River Group Chalcedony, fluted on one face only, basal grinding, snap fracture, some surface polish probably due to beach erosion in a sandy matrix.
25HN179-3	Short basal fragment of a Folsom point made of Smoky Hill Silicified Chalk, fluted on both faces, basally ground, snap fracture.
25HN179-4	Possible Folsom point made of Smoky Hill Silicified Chalk, fluted on one face, no basal grinding, snap fracture and basal damage, small crude point may have been broken during manufacture, or the "flute" could be an impact fracture on some other type of projectile point.
25HN179-5	Unifacial side scraper made on a large straight expanding flake of Hartville chert, retouch on both lateral edges, more steeply retouched on thicker lateral edge, while the other edge may have been used as a knife, a similar artifact is shown in Frison (1982:51, Fig.2.23e) from a Folsom component in Wyoming.
25HN179-6	Lanceolate projectile point made of White River Group Chalcedony, small section of tip broken off by an impact fracture, one basal ear broken off, basal grinding present, lateral edges show use and resharpening, thick cross-section probably due to resharpening, three basal thinning flakes present on one face.

The presence of projectile point bases and the side scraper suggests this was a Folsom campsite where some retooling took place after a kill/butchering episode. Broken projectile point bases were removed from foreshafts and discarded. The spatial proximity of the scraper and the unfluted projectile point to Folsom projectile points suggests they are probably associated with the Folsom component. Another line of evidence suggests these two tools are associated with the Folsom component. The scraper is made of the same exotic lithic material, Hartville chert, as one Folsom point, and the unfluted point is made of the same lithic material, White River Group Chalcedony, as another Folsom point.

25HN180

At this location, a broken Folsom projectile point was found sometime about 1989. The artifact was found about 40 meters east, of the east side of a small unnamed drainage which enters the lake from the north between Tipover and North Cove. There is a 8 meter cutbank in this area (Fig. III-3). The Brady Soil dips down from the surface 2-3 meters in this location. The artifact no doubt eroded from the base of the Brady Soil or upper few centimeters of the Peorian loess. No Paleoindian artifacts or features were noted during our survey.

On the beach we found a partial bison mandible (*Bison bison antiquus*), a bison tooth, and a mammoth astragalus were found eroded out of place. A rodent skull (*Spermophilus richardsonii*) was excavated from 4 meters deep in Peorian loess. The Folsom point is described below (Fig. III-4).

25HN180-1 A Folsom point with the distal one-third missing is made of a light gray very high quality chert, possibly Edwards Plateau. The point is very well made with fine narrow pressure flakes along the edge and wide flutes on both faces, and is basally ground. It was broken by an impact fracture.

A second artifact, found on the beach in this location, is worthy of mention. It has the overall outline of a crude Folsom point. However, the artifact is a retouched flake with the bulb of percussion being at the "tip" on the ventral face. Unifacial retouch around the entire margin of the artifact, including the concave "base", is generally on the dorsal side of the flake with a small amount on the ventral face. Whether this artifact was accidentally retouched into a rough Folsom point outline, or was purposefully made into this shape is unknown. It is interesting that it was found in the same approximate location as the previously described Folsom point.

25HN182

At this location, an Agate Basin projectile point was found eroded out of position lying next to bison bone in the base of a dark early Holocene gully fill (Fig. III-5). Our survey found bison and mammoth bone eroded out of place on the beach below this gully fill. We also found a large thick biface made of Smoky Hill Silicified Chalk (Fig. III-6) with concretions attached, eroded out of place on the beach. Dendy (1995:49) lists two "isolated finds" on the west shore of Patterson Harbor, although no exact location is presented. These two artifacts are bifaces made of Smoky Hill Silicified Chalk. The relationship between these two "isolated finds" and site 25HN182 cannot be determined at this point.

The stratigraphy at 25HN182 was described in a series of vertical faces along steps cut in the mostly vertical exposure along the west side of Patterson Creek in Patterson Harbor, and from sediments extracted with an Oakfield corer at the base of the exposure. Measurements were all made from the top of the bank, which slopes up toward the west-southwest.

Depth (cm)	Soil Horizon	Description
0-54	A	Dark grayish brown (10YR 4/2) silt; weak, very fine, subangular blocky structure; slightly hard; slight reaction to 1N HCl; smooth and gradual boundary.
54-80	AB	Brown (10YR 4/3) silt; moderate, very fine-to-fine, subangular blocky structure; slightly hard; slight reaction to 1N HCl; smooth and gradual boundary.
80-106	B	Brown (10YR 5/3) silt; moderate, fine, subangular blocky structure; hard; many, fine, filaments of carbonate on peds; violent reaction to 1N HCl; smooth and clear boundary.
106-205	C1	Brown (10YR 5/3) silt; weak, very fine, subangular blocky structure; hard; common, fine, vertical, carbonate concretions; violent reaction to 1N HCl; slightly dipping and gradual boundary.
205-238	C2	Brown (10YR 4/3) silt loam; weak, very fine, subangular blocky structure; slightly hard; common, fine, carbonate concretions on peds; strong reaction to 1N HCl; slightly dipping (to north-northeast) and gradual boundary.
238-293	C3	Dark brown (10YR 3/3) silt loam; weak, fine, subangular structure breaking to moderate, very fine, angular blocky structure; many, very fine, carbonate filaments; few, fine, vertical carbonate concretions; strong reaction to 1N HCl; slightly dipping and gradual boundary.
293-321	2A1b1	Very dark grayish brown (10YR 3/2) silt loam; weak, fine, subangular blocky structure breaking to weak, very fine, angular blocky structure; common, fine, vertical carbonate concretions in very upper part of horizon; slight reaction to 1N HCl at top of horizon; slightly dipping, gradual boundary; root tubules; charcoal present at 318 cm depth; gradually boundary (Brady paleosol?).
321-375	2A2b1	Black (10YR 2/1) silt loam; weak, very fine, subangular blocky structure; common, fine, vertical, carbonate concretions; slightly dipping and clear boundary; root tubules.
375-394	2A3b1	Very dark grayish brown (10YR 3/2) silt loam; weak, very fine, subangular blocky structure; few, fine, vertical, carbonate concretions; slightly dipping and clear boundary.
394-606	2BC1	Dark gray (10YR 3/1) silt loam; weak, fine, subangular blocky structure breaking to moderate, very fine, angular blocky structure; continuous, thin, black (10YR 2/1) organs; smooth and gradual boundary; bone exposed at depth of 538 cm; ¹⁴ C sample of bulk sediment collected between depths of 601 and 606 cm.
606-661	2BC2	Dark gray (10YR 3/1) silt loam; moderate, fine, angular blocky structure; many, fine, distinct yellow-brown mottles; smooth and clear boundary.
661-677	2C1	Dark gray (10YR 4/1) silt loam; smooth and clear boundary.
677-720	2C2	Very dark gray (10YR 3/1) silt loam; abrupt boundary.
720+	2C3	Poorly sorted coarse to very coarse sand.

This site consists of the basal sediments of the Terrace 2A fill, including the thick Brady paleosol which overlies bedrock. There is a late Holocene soil near the surface which developed after most of the Terrace TA fill was locally incised and laterally eroded by Patterson Creek.

One very tiny bone fragment was noted in the east profile cut, but was in poor condition and not collected. There is very high potential for a Paleoindian site at this location and further work should be conducted.

25HN182-1 Agate Basin projectile point made of Smoky Hill Silicified Chalk, the base is broken off by a snap fracture. Point is lenticular in cross-section, with slightly expanding lateral sides. Broken length, 94.3 mm; maximum width, 27.2 mm; thickness, 9.1 mm.

25HN182-2 A crude biface with heavy encrustation of caliche/concretions, is made of Smoky Hill Silicified Chalk. It is roughly rectangular in shape and one end appears to be broken off.

25HN184

During low water level in 1994, a hearth containing burned rock was observed eroding from a cutbank on the west side of Tipover Cove about 40 m north of the point between the cove and lake (Fig. III-7). A few years earlier, lithic material was noted in place at about this same depth. Our survey of the area did not find any remnants of the hearth or lithics, however we did find mammoth and horse bone eroded out of place about 40 meters north of the reported hearth location. The hearth would have been eroding from about two meters deep in Peorian loess and this probably represents an age of 12,000-15,000 years BP. A very ephemeral resource was exposed very briefly and eroded away in one season.

25HN186

At this location, the midsection of a Folsom projectile point was found several years ago. The point was found during low water level on a Peorian loess beach surface. North of the location where the midsection was found there is a Peorian loess cutbank about 2 meters high along the shoreline (Fig. III-8). Along the east bank of the cove-like area the Brady soil is present above the Peorian loess on the terrace remnant. The Folsom point probably eroded out from the base of the Brady Soil or very top of the Peorian loess. Other lithic fragments in the area of the Folsom point were noted in the past. Our survey found two undiagnostic flakes on the beach below the cutbank. These are probably related to a late prehistoric site of unknown cultural affiliation, 25HN114, which is in the campground and extends down to the cutbank (Roetzel et al. 1982). The Folsom point (Fig. III-9) is given a different site number because it was found about 50 meters out from the cutbank at low water level.

25HN186-1 This Folsom midsection is made from a high-quality light purple White River Group Chalcedony. It appears to have been broken by impact. The artifact is thin, fluted on both faces and well-made, with fine pressure flaking along the edges.

25HN187

This site location documents the find of two Paleoindian projectile points along an eroding beach east of Tipover Cove (Fig. III-10). This beach has one of the most extensive outcrops of the Brady paleosol at the lake. The points are no doubt eroding out of this early Holocene soil. The two points do not come from a single location, but were found separately on the beach during low water level.. The Agate Basin point and a Frederick point tip were found (Fig. III-11). This area has a very high potential to contain intact Paleoindian sites.

25HN187-1 Complete Agate Basin point made of Smoky Hill Silicified Chalk. Point is 92.3 mm long, 16 mm wide at the base, 26.2 mm wide about three-quarters of the way up from the base, and 9mm thick.

25HN187-2 The distal portion of an oblique parallel-flaked Frederick point. Found in two pieces, this point is made from a high-quality dark brown Smoky Hill Silicified Chalk.

25HN181

One new Archaic site was surveyed to determine its topographic relationship with Paleoindian sites on the south side of the lake. In this location south of Praire Dog Creek, large corner-notched points made of Smoky Hill Silicified Chalk were found. Our survey noted numerous lithic flakes of this same local material on the beach. The geomorphic situation is a Terrace 2 or 3 surface on an eroded beach. Archaic materials are eroding from the upper 60 cm of the terrace surface. Since this site is not part of the Paleoindian focus of this study it will not be considered further.

Previously Recorded Sites with New Paleoindian Components

25HN11

Two Folsom points have been found at this location. Flakes and debitage of Smoky Hill Silicified Chalk are common on the beach at present. One Folsom point was found in 1994, and the other several years earlier. Both artifacts were found at low water levels on a Peorian loess beach. The geomorphic situation is a Peorian loess-capped Terrace 3. At the surface there is a Brady soil overlain by modern topsoil exposed in the 1-2 meter high cutbank above the beach (Fig. III-12). It appears there is a Folsom component eroding out of the base of the Brady soil in this area, although no trace of artifacts or features were found in the cutbank after two intensive surveys of the area. The artifacts are shown in Figure III-13).

25HN11-1 The artifact is a small complete point made of local Smoky Hill Silicified Chalk. It is fluted on both faces, and has a heavily ground base. Dimensions are: length, 36.8 mm; width at base, 16 mm; maximum width 18.7 mm; and maximum thickness, 4.3 mm.

25HN11-2 The second Folsom point is broken at the midsection and is made of Smoky Hill Silicified Chalk. The artifact was broken during manufacture when the flute on the second flute face hinged through the artifact. The artifact was then discarded.

A similar situation is present farther south at site 25HN57. Roetzel et al. (1982:184) illustrate a "fluted" projectile point from this site, although basally thinned would be a better description. This suggestion of a Paleoindian occupation at 25HN57 occurs in a very similar eroded beach situation as site 25HN11.

25HN16

The Sindt Point Site has been previously suggested as a potential Paleoindian site, based on the observation of a bison bone bed by Paul Prettyman (Adair and Brown 1987:112-113). They recommended that "the reported bone bed be examined by professional personnel at the earliest time whenever the lake water recedes enough to expose it" (ibid:113). We found bone from large bison (*Bison bison antiquus*) on the beach during two different surveys in 1995.

In addition to the *Bison bison antiquus* on the beach at Sindt point, a Clovis point base and a distal portion of a Folsom point were previously found (Fig. III-15) on the Peorian loess beach in this location. This evidence indicates that the earlier suggestion by Adair and Brown (1987), of the possible existence of a Paleoindian site at this location, appears to be correct. In addition to the above evidence, green fractured mammoth limb bone was found at this location during the present survey, which could suggest human modification of mammoth bone at this location. The geomorphic situation is presently a Peorian loess beach in front of a high Peorian loess cutbank (Fig. III-14).

25HN16-1 Distal portion of a Folsom point made of Smoky Hill Silicified Chalk. Tip is broken by probable impact, snap fracture at midsection, artifact is fluted on both faces and is thin and well-made.

25HN16-2 Clovis point made of Smoky Hill Silicified Chalk, broken at midsection by a snap fracture, asymmetrical heavily ground concave base. The point is fluted on one face by two flutes, one earlier stage thinning flake (flute?) was removed from the second face. The point appears to have been produced on a large thin flake with remnants of an original flake scar on both faces at the midsection.

25HN40

Test excavations at 25HN40 identified a Woodland occupation (Adair and Brown 1991:191). This component sits atop the terrace which consists of Peorian loess with a topsoil at the surface (Fig. III-16). This topsoil is probably a Brady soil overlain by modern topsoil. The present survey documents at least one and possibly two Paleoindian occupations buried more deeply at this site. The first Paleoindian component is represented by three artifacts found several years ago. These include one projectile point, and two projectile points worked down into drills by alternate bevel resharpening (Fig. III-17). This technology is found in both the late Plains Paleoindian complex known as Frederick and in the Meserve/Dalton complex, however, one of the drill bases retains oblique parallel flaking indicating a Frederick component is the more probable cultural interpretation. These artifacts are probably eroding out of the Brady soil near the surface of the terrace. These points were found near the mouth of Methodist Cove on the east side about ten meters north into the cove. The presence of drills suggest a campsite where woodworking and other activities requiring a drill, were taking place.

- 25HN40-1 Small lanceolate projectile point made of very poor quality Smoky Hill Silicified Chalk, with a slightly concave base, and a concave section broken out of lateral side. This artifact was probably never completed.
- 25HN40-2 Concave base drill made of Smoky Hill Silicified Chalk, probably worked down from a lanceolate projectile point, ground base, tip broken off.
- 25HN40-3 Concave base drill made of Permian chert, probably worked down from a lanceolate Frederick projectile point, based on the oblique parallel flaking near the base, ground base, tip broken off.

A second interesting feature at this site was noted many years ago. On the lakeshore side of the site, a layer of burned proboscidean bone was noted near the top of a Peorian loess cutbank above the beach. This feature has since eroded away, however, our survey noted mineralized proboscidean bone on the beach in this area. Burned proboscidean bone would probably indicate cultural activity. There are no widespread natural burns in the loess in this location, like those on the south side of the lake, which could cause the bone to burn naturally.

25HN56

In 1994, highly fractured mammoth limb bone fragments were found on the northeast point of White Cat Point. We had originally planned to test this site, however, when the lake receded this year, no new mammoth bone fragments were found. One hole dug in the beach before we arrived may have been caused by someone removing a bone fragment.

We reported a historic component about 100 meters east of this location along the north shore of White Cat Point. This historic component consists of a dark circular

feature about two meters in diameter on the beach. This feature is interpreted as a well. The second feature is a basement or cellar which has cut limestone fragments eroding out. The feature shows up in profile in the two meter high cutbank. These cut blocks may represent pieces of the foundation of a structure which once stood above this basement or cellar. Iron artifacts, whiteware, window and bottle glass were noted eroded out of position by this feature. The occupation probably dates to the late 19th century.

25HN62

This site was previously tested and reported to be a late Prehistoric "Upper Republican or more recent Plains Village occupation" (Adair and Brown 1987:258-259). However, the small triangular corner notched projectile points found in the test units would suggest to us that the site is probably a Woodland occupation. This interpretation is based on the fact that Upper Republican peoples generally used small triangular side-notched projectile points, and later Plains Village groups used small unnotched triangular points. Small corner notched points are usually associated with Woodland sites dating 500-1000 A.D.

An artifact found at this site several years ago indicates a possible Paleoindian component is also present (Fig. III-19). The nearly complete projectile point was found in a deeply incised vehicle trail which is now directly next to the cutbank on the north edge of the site. We surface surveyed the area and found a few undiagnostic Smoky Hill Silicified Chalk flakes and debitage fragments in the field near the cutbank, and three lithic pieces on a small rise 100 meters to the south. A few undiagnostic lithic pieces were noted on the beach below the site also.

25HN62-1 This artifact, made of Smoky Hill Silicified Chalk, is a lanceolate projectile point, nearly complete with only one basal corner missing. It has a ground base and contracts slightly at the base. The base is very slightly indented. No cultural designation possible, although the artifact appear to be a generalized lanceolate Paleoindian point (see Fig. III-29).

We surveyed the cutbank under the site and for three-eighths of a mile to the east (Fig. III-18). In most areas, there is a Brady soil buried one to two meters deep below the surface with overlying Holocene loess or alluvial silt. About 250 meters east of 25HN62, one Smoky Hill Silicified Chalk flake fragment was found in this buried soil about 1.5 meters deep. Troweling a profile did not reveal any evidence of a cultural horizon. This area should be monitored periodically.

The geomorphic situation at this site does not necessarily support the finding of Paleoindian artifacts at the surface. The buried Brady soil along the cutbank in most places indicates this type of artifact should be buried too deep to be found on the surface. The lanceolate point could be an item collected at some other location and brought to the site by much later occupants.

25HN85, North Cove Mammoth Site

This site consists of mammoth bone, tooth and tusk fragments on a Peorian loess beach (Dendy 1995:39-40) found at very low water level. A local informant, who has worked with the senior author on three mammoth sites with highly fractured limb bone, reports that green-fractured limb bone was present at this site in 1993. Surface lithic artifacts found scattered among the mammoth bone suggests a possible, although by no means certain, human association as recognized by Dendy (1995:39-40). Spurred endscrapers like those described by Dendy from the beach near the bone, are most commonly found at Paleoindian sites in the Great Plains. This site is buried in Peorian loess suggesting this mammoth is probably over 12,000 years old. The senior author of this report visited John Dendy at Harlan County Lake, during the summer of 1993, and discussed the implications of the fractured mammoth limb bone research being conducted at Medicine Creek Reservoir in the same type of loess deposits.

One additional artifact was found by a local informant near the mammoth bone. It is a lanceolate projectile point/knife (Fig. III-20).

25HN85-1 This artifact is made from Smoky Hill Silicified Chalk. It has a stemmed heavily ground base. The lateral sides have been sharpened by alternate beveling, and the tool was probably last used as a knife. The artifact is rather thick in cross-section in comparison with its width, this may be due to heavy resharpening. The projectile point does not fit any known Paleoindian type.

Dendy (1995: 40) correctly suggests regarding the lithic artifacts found near the mammoth bone, "These lithics do not necessarily confirm the association of human activity with the mammoth remains" and recognizes that the artifacts could be from younger deposits which were deflated or eroded downslope from a younger site. This holds true for the projectile point/knife also. This point cannot be definitely assigned a cultural affiliation. The spurred end scrapers are a very common tool among Paleoindian groups and the association between the mammoth bone and stone tools could be real.

25HN134

This site was first listed by Roetzel et al. (1982) as an Upper Republican site. The site area was enlarged by Dendy (1995:46). At this location, two Paleoindian projectile points (Fig. III-21) were found by a local informant on the beach at low lake level. About 27-37 meters to the east of these point finds, a mammoth has been eroding out of Peorian loess for several years. The area was surveyed but no additional evidence of cultural material or mammoth bone was found.

25HN134-1 This artifact is a complete lanceolate projectile point, and is designated either a Goshen or Midland type. It is made of Smoky Hill Silicified Chalk. The lateral sides expand slightly from the base and basal grinding is present. The base exhibits a slight concavity. The point was manufactured on a thin flake, and the original flake scar is evident on the midsection of one face. Dimensions are: length, 63.8 mm; width at base, 23.1 mm; maximum width, 27.3 mm; thickness, 6.5 mm.

25HN134-2 This artifact is the distal portion of an Eden (Cody Complex) projectile point. It has the typical diamond shape cross-section of these long narrow points. The medial ridge is ground on both faces. The artifact exhibits fine collateral pressure flaking. The tip is missing, broken off by an impact fracture. The lithic material is porcellanite, very exotic to this area. One source of porcellanite, and the source area for the comparative sample used to identify this artifact, is in the Powder River Basin of Wyoming.

25HN138

This site is a previously recorded possible Paleoindian site based on the presence of a "mastadon (sic) toe bone" and one flake on the beach (Roetzel et al. 1982:40-41). However, the primary component recognized at the time of our survey is an extensive Upper Republican component eroding from a buried soil horizon in a cutbank extending for about 100 meters east/west along the north shore of the lake (Fig. III-22). Several interesting finds suggest the initial Paleoindian designation, based on almost no evidence, is correct.

Our research indicates a Clovis component at the site, extending the temporal range of this site back at least 11,000 years. The base of a Clovis point and a steeply retouched prismatic blade (Fig. III-23) was found lying in close proximity during low water level at this location within the last two years. This material probably eroded out of the very top of Peorian loess or base of the Brady paleosol as the cutbank receded.

Our survey found lithic material on the surface of the Peorian loess beach just above water level. Based on the presence of ceramics, some lithics appear to be eroding down from the Upper Republican component. One lithic piece appeared to be *in situ*, however this could not be determined for certain. One other lithic piece was found standing vertically in a dark rodent burrow in the Peorian loess. This lithic piece had, no doubt, been brought down from the Upper Republican component.

One musk ox vertebra was found on the surface of the beach and another was excavated from Peorian loess. This is the same location where Ken and Marie Brown of the University of Kansas excavated a musk ox skull in the mid-1980's.

25HN138-1 Basal portion of a Clovis point made of light and dark green Smoky Hill Silicified chalk. Heavy basal grinding on both lateral edges up to the snap fracture and on concave base. Fluted with a single flute on both faces.

25HN138-2 Prismatic blade made of very high quality medium dark brown Smoky Hill Silicified Chalk. Retouched on both lateral edges. On the left lateral edge (dorsal face with platform at top) the retouch is very steep. This steep retouch extends onto the distal end. This tool fits the "convex side scraper" Paleoindian tool category of Irwin-Williams et al. 1973).

25HN142

In an area of about 200 meters along the beach, the remains of two mammoths were eroding out over the past 20 years. The first mammoth was reported to the Corps of Engineers office. It was eroding from near the surface of a low cutbank in Peorian loess. Later, a doctor from Holdrege came and excavated part of this mammoth. Another mammoth has been eroding out of the beach, and this survey located at least two fragments. Near this latter mammoth, a unifacially retouched flake was found which appears to be a Paleoindian tool type (Fig. III-24). Two lanceolate Paleoindian projectile points, (Fig. III-24) have also been found along the beach.

25HN142-1 A long thin bifacial reduction flake exhibits unifacial retouch on the generally parallel lateral sides. This tool probably functioned as a knife. Artifact is made of high-quality Smoky Hill Silicified Chalk. This artifact is described because of its similarity to Paleoindian tool types and because it was found near the eroding mammoth bone.

25HN142-2 Small, generally thick lanceolate projectile point made of Smoky Hill Silicified Chalk, small part of tip is broken off as is the small portion of a basal corner. Base is slightly concave and a small amount of basal grinding is evident. On one face there is a 15mm long basal thinning flake present.

25HN142-3 Basal two-thirds of a lanceolate projectile point made of Smoky Hill Silicified Chalk. The artifact has generally parallel sides and a slightly indented base. Alternate bevel resharpening is evident near the fracture and basal grinding present.

Three mammoth bone fragments from this area are available for description. The first is a 45cm long piece of large limb bone which has been altered by several taphonomic processes, including weathering, spalling, spiral fracture, and abrasion on green fractured surfaces. Most interesting are the four linear indentations/grooves with striations, similar to cut marks, which run at a 90 degree angle to the long axis of the bone. There is also one small impact point/flake removal made after the bone was broken lengthwise. Iron staining is present on one linear striated area and on the cortical

surface at one end of the bone. Too many taphonomic processes have altered this bone to determine the cause of the linear striated grooves.

A second piece of mammoth limb bone from the same general area is an 18cm long fragment of thick cortical bone exhibiting intersecting spiral fractures, weathering cracks, and some abrasion. Morphologically, it bears a striking similarity to green fractured bone from the La Sena Mammoth Site, which is interpreted as a mammoth bone quarry site by Holen (1995a&b).

The third piece is a somewhat thin cortical fragment which has intersecting spiral fractures. Some concretions are attached to the surface.

Unprovenienced Finds of Paleoindian Artifacts

Bone Cove Projectile Point (Fig.III-25)

The artifact, found on a large sand bar along Bone Creek, is the broken distal end of a lanceolate point which is rather thick in cross-section. It exhibits oblique-parallel flaking and is probably a Frederick point. The very tip of the artifact is missing and the snap fracture at the break may have been caused by impact. The artifact exhibits heavy sand polish and no doubt has been moved far from its original position by fluvial action. Therefore, its original provenience is unknown and a true site location is impossible. For this reason, although the location of this find is known, we choose not to give it a site number.

This very interesting artifact is made of mahogany obsidian, the nearest source of this material being the Obsidian Cliff area of Yellowstone Park, Wyoming, some 1,060 km from the lake. This is the only occurrence of this lithic material in Nebraska, known to the senior author.

Other Projectile Points

Some Paleoindian projectile points found at Harlan County Lake have no provenience. The first artifact is a nearly complete Goshen point made of Smoky Hill Silicified Chalk (Fig. III-26). The very tip is broken off, possibly by an impact. The artifact is smaller than most Goshen points reported by Frison from the Mill Iron Site in Montana (Frison 1991), however, another Goshen point in the University of Nebraska State Museum (UNSM) collections from Chase County farther west in the Republican River basin, has the same basal width, but is somewhat longer. This is a thin well-made point with some collateral flaking like that present on many Goshen points. It has a straight ground base, The lateral sides up about one third of the length are also ground. Dimensions are: length 50.6mm; width at base, 18.7mm; maximum width, 20.6mm, and thickness, 5.9mm. This represents the most southeastward occurrence of Goshen points presently reported.

The second point is a base made of Smoky Hill Silicified Chalk (Fig. III-27). It has straight lateral sides and is broken by a snap fracture, possibly during manufacture. This interpretation is based on the fact that there is a flaw in the stone at the fracture and the point does not have a ground base, indicating it was probably never completed.

The third artifact is the distal end of a thin lanceolate projectile point made of Pennsylvanian chert. It has some oblique parallel flaking and may be the tip of a well-made Frederick point (Fig. III-27).

One additional distal end of a well-made lanceolate artifact is probably the tip of an Agate Basin point. It is made of high-quality Smoky Hill Silicified Chalk.

Endscraper Site

On the south side of the lake between the modern highway and the old highway to Alma, a large endscraper made of Hartville Uplift chert (Fig. III-29) was found. This scraper is probably a Paleoindian artifact based on morphology and the exotic nature of the lithic material. Other endscrapers of the same type were also found in this area. This artifact is not assigned a site number because the exact find spot is not known. It may have eroded out of early Holocene deposits at the base of Terrace 2.

Spurred Endscrapers (Fig. III-30)

Four endscrapers with lateral spurs are thought to be Paleoindian tools, although this artifact type is occasionally found in later sites. Two of the endscrapers are made of Alibates "flint" (silicified dolomite) from northern Texas. One is made from Permian chert and the other from a translucent chalcedony of unknown origin.

Drill

One drill is probably worked down from a lanceolate projectile point like those from site 25HN40. This drill was found on the beach surface about halfway between Pheasant Point and Methodist Cove in the late 1960s or early 1970s. The drill is complete and made from a high-quality Smoky Hill Silicified Chalk. The base is slightly concave, and is basally thinned on both faces. No basal grinding or wear on the bit is present, and the artifact has the appearance of just being manufactured or resharpened but never used. It may be a reworked Frederick point like those at site 25HN40 on Methodist Cove to the east.

Artifact Found in Peorian Loess

One artifact was found along the south side of the lake, probably on the west side of Patterson Cove. This find is significant for two reasons, 1) the geomorphic position indicates considerable antiquity, and 2) the artifact is steeply retouched around the edges and appears to be a patterned tool. The senior author has never seen an artifact like this, after viewing thousands of all types and ages of artifacts in the Central Plains.

The artifact was salvaged from a Peorian loess beach, with a several meter high Peorian loess cutbank behind the beach. The dorsal portion of the artifact was visible in a small Peorian loess remnant isolated by rill erosion. This artifact was removed from *in situ* loess on the beach and was heavily coated with concretions except for the exposed portion of the dorsal surface. After soaking in vinegar for several days the encrustation dissolved. This salvage operation has saved a very important artifact and contextual information which would otherwise have been lost to erosion during the next rain.

The artifact is long and narrow, plano-convex in cross-section (Fig. III-31) and is made from Smoky Hill Silicified Chalk. It is steeply retouched along the lateral sides down to a rounded tip. The "proximal" end is wider and flatter. The ventral surface is

generally flat with broad percussion flakes that have removed most of the cortical surface. When viewed from the dorsal surface, the artifact has a slight curvature.

The geomorphic setting in Peorian loess indicates a minimum age of about 10,500-11,500 years B.P., although the position several meters deep in Peorian loess indicates it is significantly older. Peorian loess deposition in this area began about 20,000-21,000 years B.P. and ceases about 10,500-11,500 B.P. thus bracketing the age of the artifact. The position of the artifact, several meters deep in Peorian loess, indicates it is definitely older than 12,000 years old, and quite probably older than 14,000 years old. This interpretation is further supported because the artifact does not appear to be similar to known Clovis and Folsom tools, or other Paleoindian tools, on the Plains. The heavy encrustation of calcium carbonate also suggest considerable antiquity. This same heavy encrustation is common on faunal remains found deep in Peorian loess at Harlan County Lake.

High-Velocity Impact Fracture on Proboscidean Bone

One fragment of proboscidean limb bone exhibits intersecting spiral fractures (Fig. III-32). This fracture was caused by an impact which left a negative cone of percussion as the force of the blow proceeded from the exterior of the shaft through the cortical bone into the hollow interior cavity. This fragment was found on the beach in the vicinity of sites 25HN134 and 25HN180 along the north shore of the lake. Mammoth remains have been noted previously at site 25HN134. Mammoth limb bone, broken by humans, is apparently eroding out of the beach in this area. Impact points like this one are present at the La Sena and Lovewell Mammoth sites and represent human reduction of mammoth limb bone (Holen 1995a&b, 1996).

Paleontological Finds Made During the Survey

Besides the mammoth remains discussed previously, several finds of late Wisconsinan faunal remains were collected during the survey. Some were removed from *in situ* position in the Peorian loess, while others were found lying eroded out of place on the beach. Faunal elements removed from the loess include a musk ox *vertebra* (*Symbos cavifrons*), a peccary mandible (*Platygonus* sp.), a large bison (*Bison bison antiquus*) second phalanx, a rodent skull (*Spermophilus richardsonii*), and a rabbit pelvis (genus and species unknown), and a possible caribou (*Rangifer tarandus*) mandible fragment. Other specimens found at various locations on the beach, which probably eroded from Peorian loess, include a horse calcaneum (*Equus* sp.), a probable woodland caribou (*Rangifer tarandus*) femoral head, musk ox vertebrae, and several bison bones in the size range of *Bison bison antiquus*. One additional element appears to be a very large dire wolf (*Canis dirus*) radius midsection.

Geofacts at Harlan County Lake: A Cautionary Note

While surveying on the south side of the lake we investigated an exposed alluvial channel fill east of the mouth of Prairie Dog Creek. While the definite age of this fill is not known, it probably dates 30,000-50,000 years old and quite possibly even older. In the alluvial gravels, a piece of white Smoky Hill Silicified Chalk with several flakes removed was found (Fig. III-33). Along one edge, three flakes are removed in sequence, and when this piece was first found it certainly appeared to be an artifact. However,

upon closer examination this "artifact" is surely a geofact. Another Smoky Hill Silicified Chalk fragment, with a flake removed was found *in situ* nearby.

At site 25HN178, there is an alluvial fill consisting of sands and gravels below alluvial silts. This deposit is minimally 30,000-50,000 years old. On the surface of these gravels we picked up two flakes which exhibit a bulb of percussion and are sand polished. These geofacts, one of Smoky Hill Silicified Chalk and one of a high quality mottled chert, are very similar to the "artifacts" reported from the North Cove site. Another irregular piece of Smoky Hill Silicified Chalk from the same gravel deposit has two flakes removed, each leaving a negative bulb of percussion. The two flakes themselves are still in the alluvial fill.

Smoky Hill Silicified Chalk has been reworked into alluvial fills in the area of the Republican River for millions of years. I have found angular pieces embedded in Ogallala Formation green quartzite which was formed in 7-12 million year old alluvial sands and gravels. Smoky Hill Silicified Chalk pieces of all sizes are constantly being reworked in high energy alluvial settings in the Republican River valley. During floods, pieces of lithic material are battered and broken, producing flakes and negative bulbs of percussion as well as several stages of rounding caused by the abrasive action of movement in sands and gravels. These geofacts are ubiquitous in alluvial sand and gravel fills in the Republican River valley. Any lithic piece which originates in alluvium in this valley, which is not an obviously patterned lithic artifact, should be viewed with great caution by archaeologists, because it is most likely a geofact. Proving that any lithic piece, found in an alluvial setting with sands and gravels in the vicinity, is of human manufacture (other than an obviously patterned artifact like the Bone Cove projectile point), would be extremely difficult, indeed probably impossible.



Figure III-1. Eagle Roost Site, 25HN179. Paul Prettyman standing at location of site. View to west.



Figure III-2. Eagle Roost Site, 25HN179. Left: Paleoindian scraper knife. Upper row left: Folsom point base. Upper row right: possible Folsom point fragment. Lower row left: Folsom point base made of Hartville chert. Lower row right: Folsom point base made of White River Group Chalcedony. Right: lanceolate point made of White River Group Chalcedony.



Figure III-3. Site 25HN180, view to east. Note Brady paleosol dipping to south.

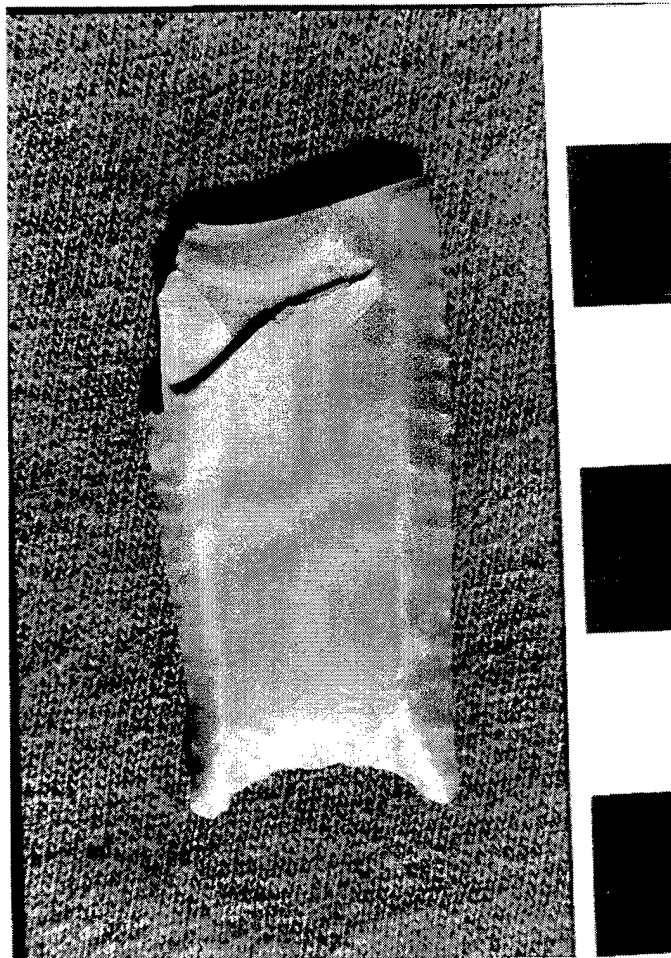


Figure III-4. Close-up view of Folsom point from 25HN180, centimeter scale.



Figure III-5. Site 25HN182, view to west. Note dark gully fill.



Figure III-6. Site 25HN182 artifacts. Left: Agate Basin point. Right: crude biface with attached concretions.



Figure III-7. Site 25HN184, view to north.



Figure III-8. Site 25HN186, view to west.

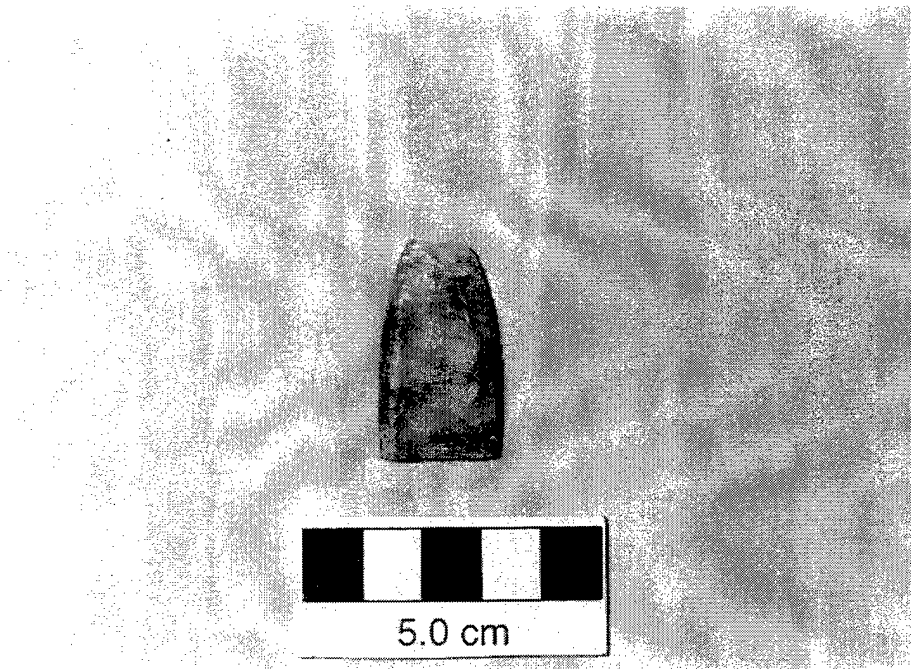


Figure III-9. Folsom point midsection from 25HN186.

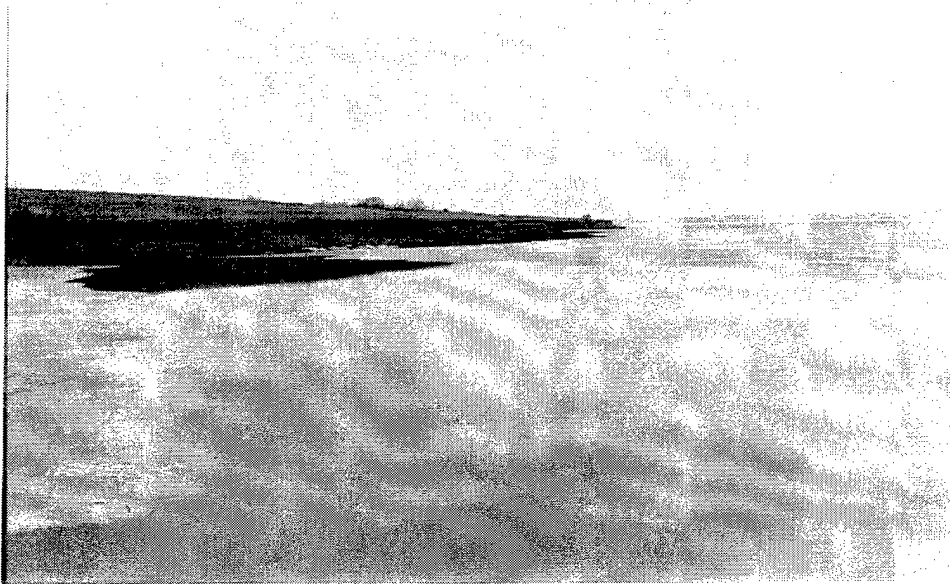


Figure III-10. Site 25HN187, view to east. Site 25HN185 underwater in center of photo.

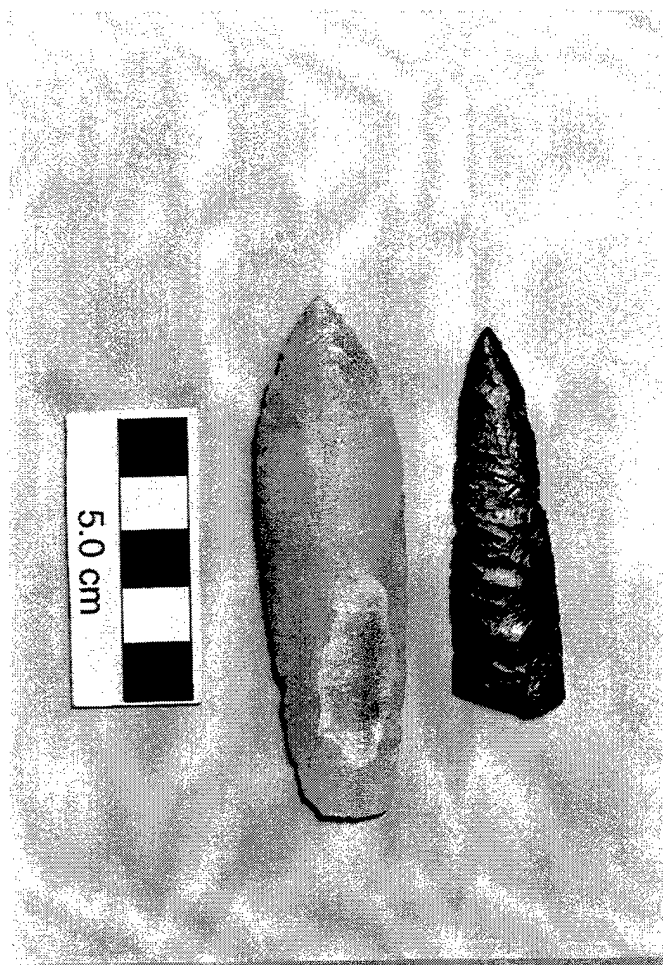


Figure III-11. Site 25HN187 artifacts. Left: Agate Basin point. Right: Frederick point.



Figure III-12. Site 25HN11, view to south.

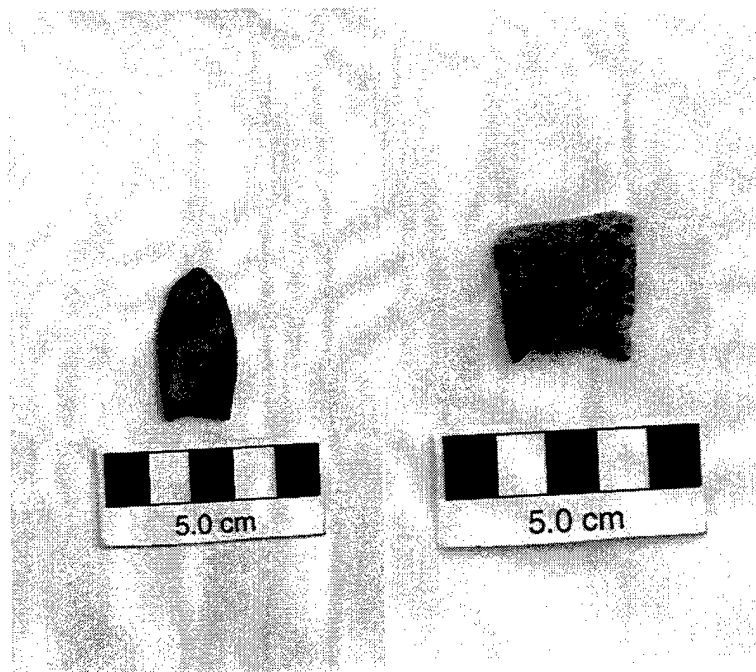


Figure III-13. Site 25HN11 artifacts. Left: complete Folsom point. Right: Folsom point broken during manufacture.



Figure III-14. Sindt Point Site, 25HN16, view to north.

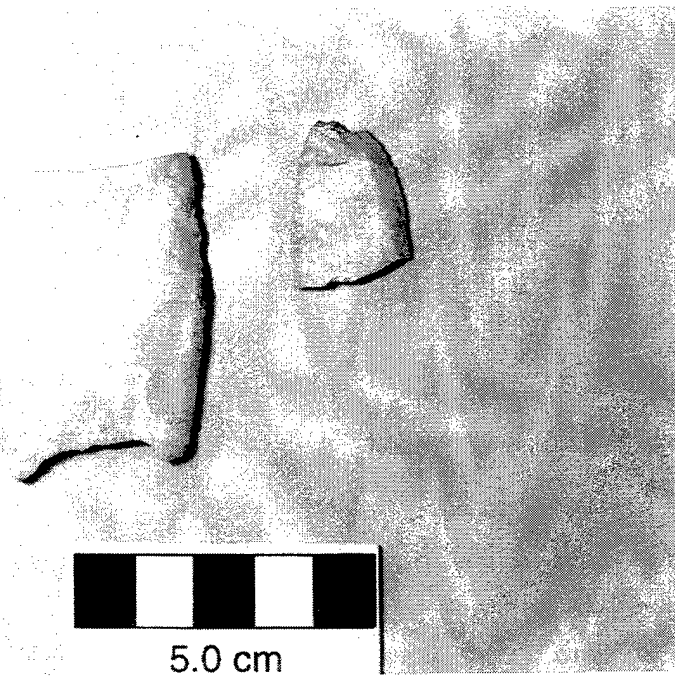


Figure III-15. Sindt Point Site artifacts. Left: Clovis point. Right: Folsom point.



Figure III-16. Site 25HN40, view to west.

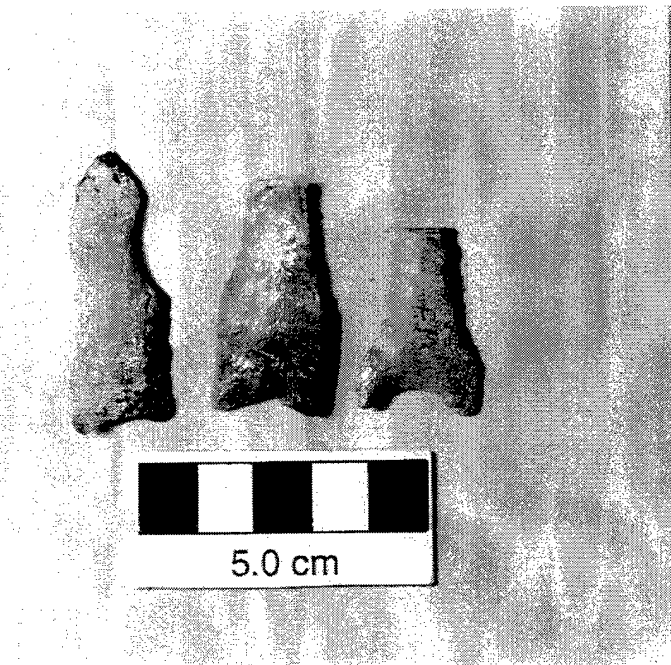


Figure III-17. Site 25HN40 artifacts. Left: projectile point. Center: Frederick point/drill. Right: drill.



Figure III-18. Site 25HN62 on cutbank across bay. View to south.



Figure III-19. Artifact from 25HN62.



Figure III-20. Projectile point from 25HN85.



Figure III-21. Artifacts from 25HN134. Left: Goshen or Midland point ? Right: Eden point.



Figure III-22. Site 25HN138, view to east. Note the Brady paleosol, the lowest of two buried soils.



Figure III-23 Artifacts from 25HN138. Left: Clovis point base. Right: convex unifacial side- scraper.



Figure III-24. Site 25HN142 artifacts. Left: unifacially retouched flake. Center: lanceolate point with basal thinning flakes. Right: lanceolate point.

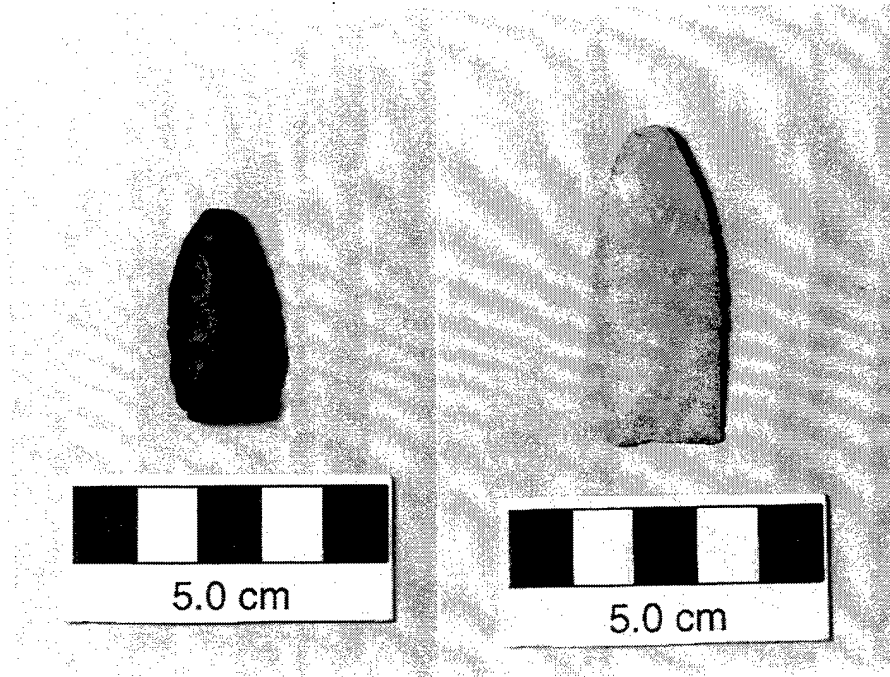


Figure III-25. Left: Bone Cove Site, mahogany obsidian Frederick point.

Figure III-26. Right: Unprovenienced Goshen point.

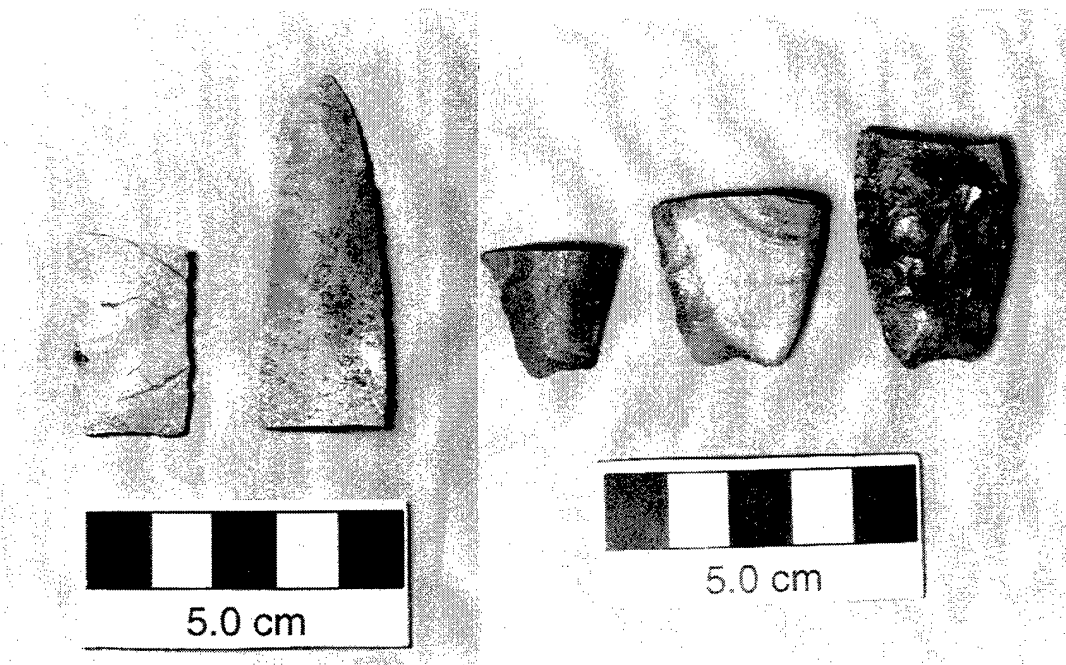


Figure III-27. Left: Unprovenienced artifacts. Left: lanceolate point base. Right: Frederick point.

Figure III-28. Right: Unprovenienced basally ground, concave base points.



Figure III-29. Endscraper from south side of lake.



Figure III-30. Spurred endscrapers -- unprovenienced. Left and Center: Alibates "flint".
Right: Permian chert. Bottom: translucent yellow chalcedony.



Figure III-31. Artifact found in Peorian loess.

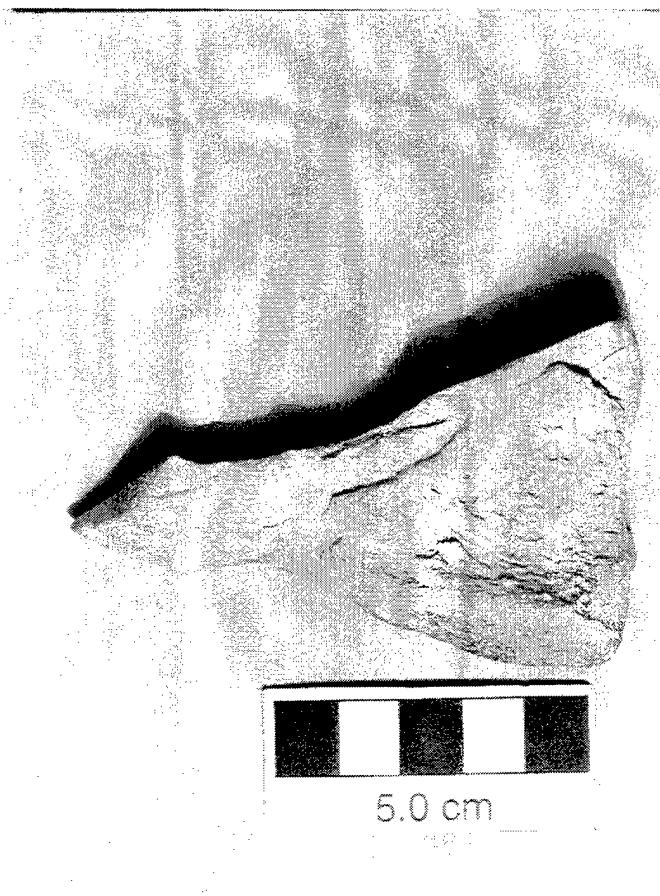


Figure III-32. High-velocity impact fracture on proboscidean bone, impact scar at top center.

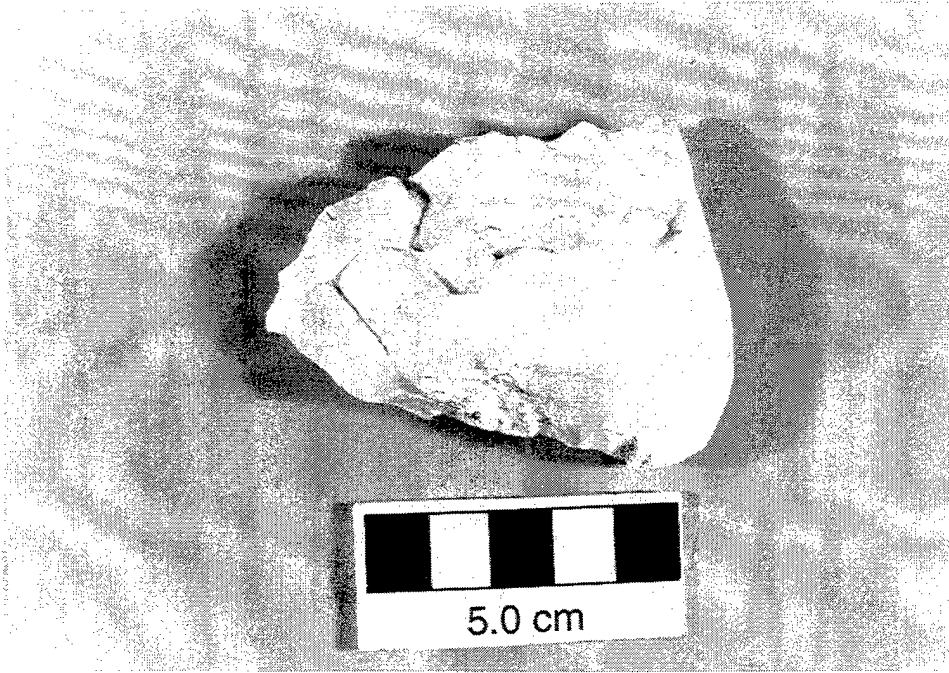


Figure III-33. Geofact with several flakes removed.

IV. RESULTS OF TEST EXCAVATIONS AT THREE SITES

Test excavations were planned for two sites, a potential Folsom site, 25HN178, on Tipover Creek and a fractured mammoth bone site on White Cat Point. No additional fractured mammoth limb bone could be found at the White Cat Point site, therefore, a site on the north side of the lake, 25HN183, was selected because of its potential to contain mammoth remains and human produced features. In addition, a brief report of the 1991 salvage excavations at the Prettyman Mammoth Site, 25HN185, is included.

Tipover Cove Site, 25HN178

Evidence of a potential Folsom Site on Tipover Creek led to the proposal to test this location. This evidence consisted of what was thought to be two Folsom point fragments found eroded out of place near bison bone on Tipover Creek. The problematical identification of one of these artifacts will be discussed further in the artifact description section. Before submitting a proposal to the Corps of Engineers, the senior author visited the site and viewed the bison bone. It was determined that an opportunity existed to find the first intact Folsom site in Nebraska.

Survey and Stratigraphic Trenches (Fig. IV-5)

An initial survey of the site yielded several bison bones and fragments, and one deer-sized limb bone shaft, at the location where the points had been found. This was named Area A which is south of a westward trending gully about 30 meters. On the north side of the gully, a bison metapodial was found *in situ* in gully fill below a buried soil horizon. Stratigraphic Trench #1, one meter wide, was excavated at the point where several bison bones had been found (Fig. IV-1). In this trench a green fractured limb bone fragment was found *in situ*. Stratigraphic Trench #2 was placed just north of the *in situ* bison bone at the north edge of the gully.

Farther north, at the mouth of a second gully, a bison bone was found which had possibly been modified by humans. Here, two one meter wide stratigraphic trenches were excavated into the gully fill (Fig. IV-2). Later, a third stratigraphic trench was excavated about 20 meters back into the gully (Fig. IV-3). Abundant charcoal was present in the first two trenches, however, no bone was found in any of these units.

Test Excavation

In Area A, Stratigraphic Trench 1, we found bison bone fragments in place. At this point we ceased excavation and set up a 3 meter wide excavation unit, with Stratigraphic Trench 1 being the center unit (Fig. IV-6). These units were 50-65 cm wide east/west. We excavated and 1/8 inch screened a 10 cm thick unit at the level where the *in situ* bone was found. One additional bone fragment was found in the 10 cm level in the south square.

Stratigraphy at 25HN178

Two stratigraphic sections, Area A, Stratigraphic Trench 1 and Area B, Stratigraphic Trench 2, were described at 25HN178 along the west side of Tipover Creek. These sections were described after first cleaning the bank with shovels to assure that only in

situ deposits were exposed. Depths were measured from the top of the vertical bank at each site.

Area A. The following description was made just south of three gullies that trend west up the west side of Tipover Creek valley.

Depth (cm)	Soil Horizon	Description
0-19	Ap	Very dark grayish brown (10YR 3/2) silt; moderate, very fine, subangular blocky structure; hard; clear and smooth boundary; much bioturbation by worms.
19-26	A2	Dark grayish brown (10YR 4/2) silt; moderate, very fine, subangular blocky structure; slightly hard; clear to abrupt and smooth to wavy boundary; much bioturbation by worms (2 mm-diameter worm casts filled with darker material from above).
36-55	2A1b1	Black (10YR 2/1) silt; weak to moderate, very fine, subangular blocky structure breaking to moderate, very fine, granular structure; slightly hard; gradual and smooth boundary; much bioturbation by worms (2 mm worm casts filled with lighter material from above).
55-89	2A2b1	Very dark grayish brown (10YR 3/2) silt; weak-to-moderate, fine, subangular blocky structure; slightly hard; slight reaction to 1N HCl; gradual to smooth boundary; much bioturbation.
89-125	3A1b2	Very dark gray (10YR 3/1) silt; moderate, very fine, subangular blocky structure; slightly hard; few, very fine, filamentous, carbonate concretions covering about 20-30% of peds; strong reaction to 1N HCl; smooth and gradual boundary; much lower bulk density than A2b1 above or A2b2 below; carbon-14 sample from 120-125 cm has total humate age of 1450 ± 70 yr B.P. (Beta-85932) (corrected, conventional, uncalibrated age).
125-145	3A2b2	Very dark grayish brown (10YR 3/2) silt loam; moderate, very fine, subangular blocky structure; hard; few, fine, filamentous carbonate concretions covering about 50% of peds; strong reaction to 1 N HCl; smooth and gradual boundary; common root tubules.
145-159	3A3b2	Dark grayish brown (10YR 4/2) silt loam; moderate, very fine, subangular blocky structure; hard; violent reaction to 1N HCl; smooth and clear boundary; contains several carbonate clasts (< 5 cm on c axis) and several feldspar granules.
159-228	3Bt1b2	Dark grayish brown (10YR 4/2) silt loam; weak, very fine, subangular blocky structure; slightly hard; few, thin, discontinuous, slightly darker argillans; violent reaction to 1N HCl; smooth and gradual boundary; many root tubules and a few bone fragments (screened to depth of 179 cm); few carbonate rock granules (not secondary soil carbonates).
228-263	3Bt2b2	Dark grayish brown (10YR 4/2) silt loam; moderate, very fine, subangular blocky structure; slightly hard; few, thin, discontinuous argillans; strong reaction to 1N HCl; smooth and clear boundary; many root tubules; becoming sandy with depth; carbonate granules in lowest 5 cm of this horizon; large krotovina.
263-293	3C1	Dark grayish brown (10YR 4/2) silt loam; weak, very fine, subangular blocky structure breaking to angular blocky structure; common, black, manganese mottles around root tubules; slightly hard; smooth and diffuse boundary.

293-426 3C2 Brown (10YR 5/3) silt loam; weak, very fine, angular blocky structure; common, prominent, dark yellowish brown (10YR 4/6) mottles; few, prominent, black (10YR 2/1) vertical manganese concretions; slightly hard; few pieces of weathered shale; lower part of this horizon described from Oakfield core.

426-436 3C3 Dark yellowish brown (10YR 4/4) and grayish brown (2.5Y 5/2) clay and weathered shale; described from Oakfield core; refusal on bedrock at 436 cm depth.

Area B. Stratigraphic section is just south of middle of three gullies along west side of Tipover Creek valley.

Depth (cm)	Soil Horizon	Description
0-16	Ap	Very dark grayish brown (10YR 3/2) silt loam; moderate, very fine, subangular blocky structure; few, fine, faint yellowish brown mottles; few, discontinuous organs; hard; smooth and clear boundary.
16-43	C	Brown (10YR 5/3) silt loam; moderate, very fine, subangular blocky structure; strong reaction to 1N HCl; hard; smooth and abrupt boundary.
46-81	2A1b1	Very dark gray (10YR 3/1) silt loam; weak, very fine, subangular blocky structure breaking to weak, very fine, granular structure; few, fine, faint yellow brown mottles; few, vertical, carbonate filaments; violent reaction to 1N HCl; slightly hard; smooth and gradual boundary; filled krotovina; lower bulk density than above horizons.
81-102	2A2b1	Black (10YR 2/1) silt loam with weak-to-moderate, very fine, subangular blocky structure breaking to weak, very fine, granular structure; common, vertical, carbonate filaments; strong reaction to 1N HCl; slightly hard; smooth and gradual boundary.
102-140	2A3b1	Very dark gray (10YR 3/1) silt loam; moderate, very fine, subangular blocky structure; discontinuous organs; many, thin, carbonate filaments on peds; strong reaction to 1N HCl; slightly hard; smooth and gradual boundary.
140-165	2B1b1	Very dark grayish brown (10YR 3/2) silt loam; moderate, very fine, subangular blocky structure; very dark grayish brown (10YR 3/1) continuous organs; slightly hard; smooth and gradual boundary.
165-217	2B2b1	Very dark grayish brown (10YR 3/2) silt loam; moderate, very fine, subangular blocky structure; very few, fine, faint, yellow-brown mottles; few, very fine, carbonate filaments in upper part of horizon; slightly hard; smooth and gradual boundary; many root tubules.
217-247	2Btb1	Dark grayish brown (10YR 4/2) silt loam; moderate, very fine, subangular blocky structure; common, fine, distinct, yellow-brown mottles; continuous organs and argillans; smooth to very slightly wavy and abrupt boundary.
247-280	3AB1	Very dark grayish brown (10YR 3/2) silt loam; weak, very fine, subangular blocky structure; common, fine, distinct, yellow-brown mottles; few, discontinuous organs; smooth and gradual boundary; texture slightly coarser than above horizon.
280-340	3Ab2	Very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/2) silt loam; weak-to-moderate, fine, subangular blocky structure; common, fine, faint yellow-brown mottles; few, discontinuous organs; smooth and gradual boundary; some charcoal in the lower 15 cm of this horizon; carbon-14 sample from 330-340 cm has total humate age of 2660 ± 80 yr B.P. (Beta-87493) (corrected, conventional, uncalibrated age).

340-414 3C1 Very dark grayish brown (10YR 3/2) silt loam; weak, fine, subangular blocky structure; described from Oakfield core samples; refusal at 414 on weathered shale bedrock.

Artifact Descriptions

After the survey and testing, the two "Folsom" artifacts (Fig. IV-4) were brought to the University of Nebraska State Museum for analysis and photography. Laboratory analysis of the first "Folsom" point indicates that this is actually a corner-notched point with the base broken off. The preliminary identification as a Folsom point is understandable because the point has a pseudo-flute on one face. The artifact is made from an exotic material, Knife River Flint, most commonly associated with Paleoindian lithic procurement patterns when found this far from the source.

The second artifact is definitely the lateral midsection of a Folsom projectile point fluted on both faces. This is a well-made artifact with a thickness of only 3.9 mm. It is made from Permian chert, which outcrops east of the site about 200 km.

Interpretation

Based on the radiocarbon age of $1,450 \pm 70$ BP on the base of the soil above the bone in Area A, and the radiocarbon age of $2,660 \pm 80$ BP deep in the alluvial gully fill of Area B, it appears certain that these fills do not contain an intact Folsom component. The presence of a corner notched point agrees well with the geomorphic situation and suggests that a Woodland or Late Archaic site is eroding out in this location. Proximity with the bison bone further suggests Area A may be a kill/processing site.

We have not been able to identify geological deposits of Folsom age at this site. It is possible that the Folsom point fragment eroded off the uplands, or out of an older gully fill, and into the late Holocene gully fill. At a much later date, the artifact eroded out again. A similar situation exists at the Cooper Folsom Site in Oklahoma, where a Folsom site is eroding out of a gully kill site into an aggrading floodplain deposit (Bement et al. 1995).

Mammoth Remains

North of Area B, there is a cutbank consisting of very old Gilman Canyon terrace fill. At the top of this alluvial fill, we found a thoracic vertebra of a mammoth. We left this in place until the end of fieldwork because we thought this mammoth probably predated the human occupation of the Plains. When we did salvage the specimen, another small fragment of green fractured cortical mammoth bone was found. This piece resembles those thought to be broken by humans at the La Sena site. Further test excavations and dating of this site are suggested.

Borrow Pit Site, 25HN183

When it was discovered that no additional fractured mammoth bone was occurring at site 25HN56 after the lake drawdown in 1995, we consulted with Corps of Engineers personnel to substitute another site for testing. The site chosen was a new site which had the potential for mammoth remains and cultural features. This site was assigned the number 25HN183, and named the Borrow Pit Site.

Prior to its use as a borrow pit, this site area consisted of a late prehistoric site, and a historic homestead site, situated on a terrace remnant. The site was a cultivated field for many years and late prehistoric Upper Republican artifacts were common on the surface. Sometime in the 1980s, a large portion of this terrace remnant was used as a borrow pit for fill to cover the old Alma sewage treatment facility about 300 meters to the west. Apparently, there was no cultural resource survey conducted prior to this construction activity. This borrow pit largely destroyed the Late Prehistoric component of the site. However, the activity did uncover other materials of potential interest. At the bottom of the borrow pit a partial mammoth tusk was exposed. Several school classes from the Alma school visited the site to view the mammoth tusk. In addition, a buried hearth containing fish bone was reported near the west end of the south cut in the borrow pit. Based on the presence of the mammoth tusk, it was evident that geological deposits dating over 11,000 years old were present in the borrow pit, since mammoths became extinct at that time. This area was chosen because of the potential to find features older than 11,000 years old, possibly in association with mammoth remains.

The first task was to clear the surface of the borrow pit of a healthy growth of tall weeds. Mr. Phil Bailey, of the Corps of Engineers, kindly provided the use of a large front end loader to accomplish this task. The approximately one acre cleared area was then carefully surveyed by two meter pedestrian transects to locate any features or artifacts.

Stratigraphy at 25HN183

Stratigraphy at 25HN183 was determined with an Oakfield soil probe. Two separate locations at the borrow pit were each cored to a depth of 3.25 m to develop a composite of the stratigraphy at the site. The uppermost 3.25 m of the fill was determined by coring an apparently undisturbed remnant of the original land surface at the southwest edge of the borrow pit. The stratigraphy of the fill from 2.53 to 5.78 m depth below the original surface was determined by coring a hole 131 cm northeast of Feature 1 at 25HN183. Thus, there was an overlap of nearly 75 cm to insure that no major disconformities existed in the sediment between the two sites. The sediment was sampled in 25 cm intervals.

Composite section

<u>Depth</u> <u>(cm)</u>	<u>Soil</u> <u>Horizon</u>	<u>Description</u>
0-25	Ap	Dark brown silt; structureless; hard.
25-55	A1	Dark brown silt; moderate, very fine, subangular blocky structure; few, very fine, distinct, orange-brown mottles at 47 cm.

- 55-80 AC Brown silt; moderate, very fine, subangular blocky structure; few, very fine, distinct, yellow-brown mottles; gradual boundary.
- 80-100 2Ab1 Dark brown silt; moderate, very fine, subangular blocky structure; carbonate filaments below 95 cm.
- 100-125 2acb1 Brown silt; weak to moderate, very fine subangular blocky structure; common 1mm diameter carbonate filaments and vertical nodules.
- 125-150 2C1 Brown to light grayish brown silt (below 140 cm); weak, very fine, subangular blocky structure; vertical 1mm carbonate concretions common; appears to be Peoria Loess.
- 150-250 2C2 Light grayish brown silt; structureless; few vertical 1 mm carbonate concretions; appears to be Peoria Loess.
- 250-578 2C3 Light grayish brown silt; structureless; few, very fine carbonate concretions become more common with depth, and slightly larger; this appears to be Peoria Loess.

The stratigraphy reveals that the features at site 25HN183 both occur within Peoria Loess. While it is possible that the silt is actually derived from erosion of Peoria Loess, and, therefore, represents a relatively massive valley fill devoid of buried soils, it is more likely, given the size of carbonate concretions and the consistence of the deposit, that it is *in situ* Peoria Loess mantling a deeply-buried alluvial fill. Thus, site 25HN183 is probably within the Peoria Loess mantle of Schultz *et al.* (1951) Terrace 2B fill or is within Peoria Loess of Terrace 3 fill where it has been vertically truncated by erosion during the Holocene.

Burned Features

Two burned features (Fig. IV-7) about two meters apart were found near the south cut of the borrow pit, near the area where the hearth with fish bone had been noted several years ago. These two burned areas were designated Feature 1 and 2. They are buried 2.39 m and 2.53 m respectively, below the surface of the terrace and about 1.8-1.9 m deep in Peorian loess. Feature 2 consisted of burned earth, the upper portion of the feature had no doubt been scraped away by borrow pit activity.

Feature 1 consisted of fine white ash within a distinct line of burned earth in a 70 cm wide semicircular pattern. The burned earth line is on the upper (south) edge of the feature on a sloping cut. Partial excavation of the feature fill found charcoal pieces, an unidentified burned thin plate-like material, and a fragment of burned bone. Laboratory analysis of an ash sample found additional pieces of the plate-like material and another small burned bone fragment. The bone fragments are unidentifiable to species, but appear to be from a small animal. No lithic material was found in the feature.

During excavation of the feature, it appeared that it might be a burned root from a tree, or some other type of natural burn in loess. Burned areas are common in Peorian loess along the south side of the lake, and all appear to be natural. Feature 1 is different because of the heavy concentration of white ash, which is lacking in the burned areas south of the lake. The burned areas on the south side of the lake do, however, contain charcoal. At present, two scenarios are possible to explain Feature 1. First, this may be a

natural burn, caused by a tree root burning into the subsurface loess. The bone fragment was present in the loess and was burned in place because of its proximity to the burning root. The second scenario is that Feature 1 is cultural in origin and that the bone fragments were placed in a hearth by humans. It is not possible to determine which hypothesis is more accurate at this time.

Test excavations around Feature 1 were conducted in an attempt to determine if a cultural horizon was present (Fig. IV-8). Three one meter square units were placed upslope from Feature 1, two to the east and one to the south (see Fig. IV-9). All three excavation units were excavated in 5 cm levels to a depth of 20 cm. The 20 cm depth extended the base of the excavation units well below the bottom of Feature 1. All material was screened through 1/4 inch screen. An attempt was made to screen through 1/8 inch screen, however, it was next to impossible to force the wet loess through the smaller screen.

One Smoky Hill Silicified Chalk flake was found in Test Unit 3. The lithic flake came from the 10-12 cm level, but was found in the screen. Careful troweling of the square at the 12 cm level indicated a soft rodent burrow in the center of the unit. Three other rodent burrows were also noted, although they contained a more compact fill. It is possible that the lithic flake was brought down to this level in a rodent burrow. A modern rodent burrow in the loess was found about 20 m east of the excavation units. This burrow contained charcoal, seeds, bone fragments, and lithic fragments, no doubt originating in the cultural horizon in the topsoil, prior to borrow pit activity. A similar situation exists at the La Sena Site, an 18,000 BP mammoth horizon at Medicine Creek Reservoir, where rodents are bringing lithics from a cultural horizon in the topsoil down over three meters into the mammoth bone level. Thus, the lithic artifact found in Test Unit 3 cannot confirm a human cultural level in association with the hearth. The burned bone in the feature is suggestive of possible human association, however, a natural origin of the burned bone cannot be ruled out.

The Prettyman Mammoth Site, 25HN185

In 1990, when the senior author was associated with the University of Kansas, I acquired an Antiquities Permit from the U.S. Army Corps of Engineers, Kansas City District and conducted salvage excavations on the Prettyman Mammoth site on the north shore of Harlan County Lake. These investigations were undertaken during two trips, September 23 and November 9-11, 1990. I was assisted during the first investigation by Cara Burren, a paleontology graduate student at Kansas, and by Paul Prettyman. During the second trip I was assisted by Bill Ranney, an anthropology graduate student at Kansas, and Paul Prettyman. A third salvage excavation was planned for the late summer of 1991, because a minimum of four additional highly fractured limb bone fragments were observed in shallow water. Unfortunately, when we returned to the site three weeks later to conduct salvage excavations the bone fragments had been looted (Fig. IV-12).

The Prettyman Mammoth Site is named for Paul Prettyman, who reported the mammoth remains to Steve Holen in 1990. During low water levels in September 1990, several fragments of mammoth bone were eroded out of place on the beach and several

others were *in situ* in Peorian loess. On September 23, we noted 14 bone fragments and removed all except a heavy concentration of bone and part of another fragment that was too large to excavate at the time. These elements include green fractured limb bone fragments, three partial vertebrae, and a fragment of pelvis.

We returned to the site on November 9-11 to salvage the concentration of bone and the other fragment. Upon excavation of these two areas, two concentrations of bone were apparent. The first concentration consists of a scapula, a rib, vertebrae and some fragmentary pieces (Fig. IV-10). The second consists of a partial mammoth skull in very poor condition and a vertebra (Fig. IV-11).

The poor condition of the mammoth skull precluded any attempt to salvage it. The molar was salvaged, and is identified as a maxillary third molar. Comparison with specimens in the UNSM collections indicates that the age of the animal is about 50 years old, possibly slightly older. The tooth is the same size as the third molars of two large, approximately 50 year old male mammoths in the UNSM collections, suggesting this individual was also a large male.

In the second concentration of bone, the scapula was taken out in a plaster cast. The other bones were also salvaged, except for one rib and one unidentified fragment left in place under the two vertebrae.

Green bone fractures on four limb bone fragments are very similar to the fracture patterns on the La Sena mammoth at Medicine Creek Reservoir. However, no impact points or bone flakes have been found yet at the Prettyman mammoth. The larger limb bone fragments that were looted probably would have resolved this problem. Based on the preliminary evidence it appears to be a site like those at Medicine Creek and Lovewell Reservoirs and probably represents a human association with mammoth remains.

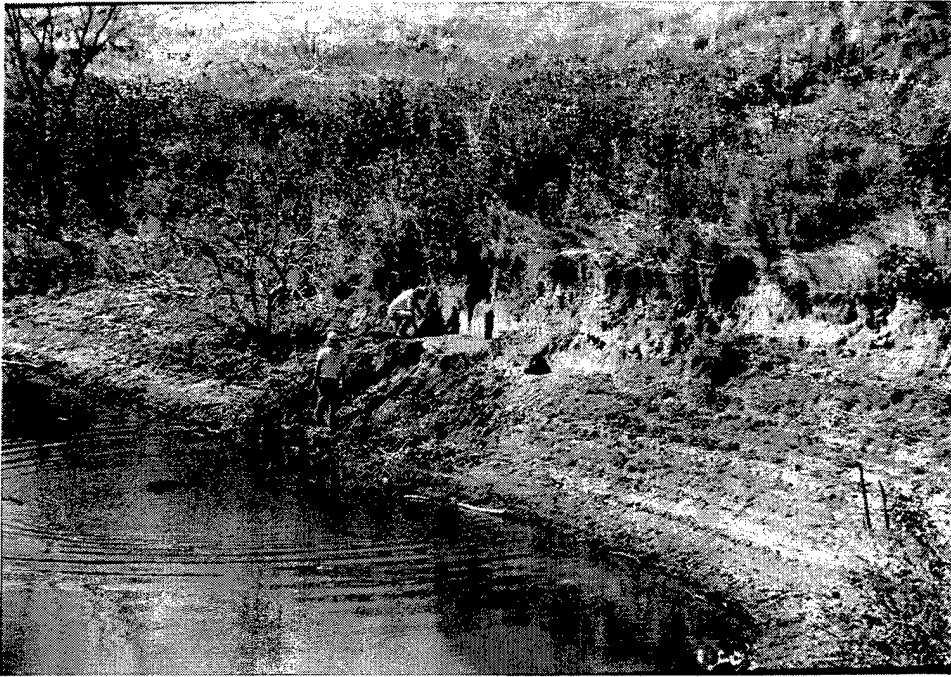


Figure IV-1. Tipover Cove Site, 25HN178. Area A, Excavation Unit, view to southwest.



Figure IV-2. Tipover Cove Site, 25HN178. Area B, Stratigraphic Trenches 1 & 2. Dave May and Paul Prettyman profiling trench. View to north.



Figure IV-3. Tipover Cove Site, 25HN178. Area B, Stratigraphic Trench 3. View to south.



Figure IV-4. Artifacts from Tipover Cove Site. Left: lateral midsection of a Folsom point. Right: corner-notched point, note pseudo flute.

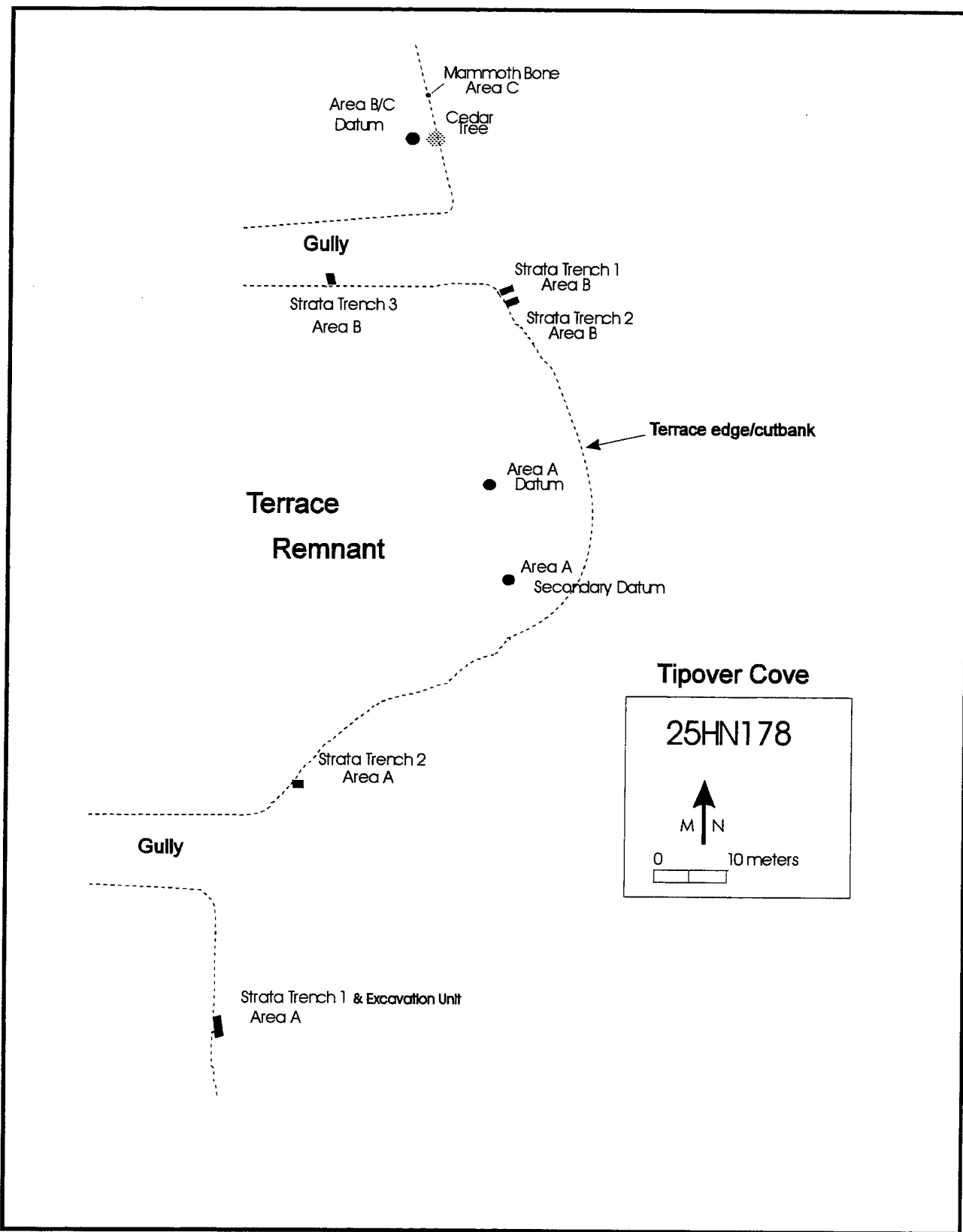


Figure IV-5. Planview of Tipover Cove Site, 25HN178.

25HN178

Area A -- Strata Trench 1

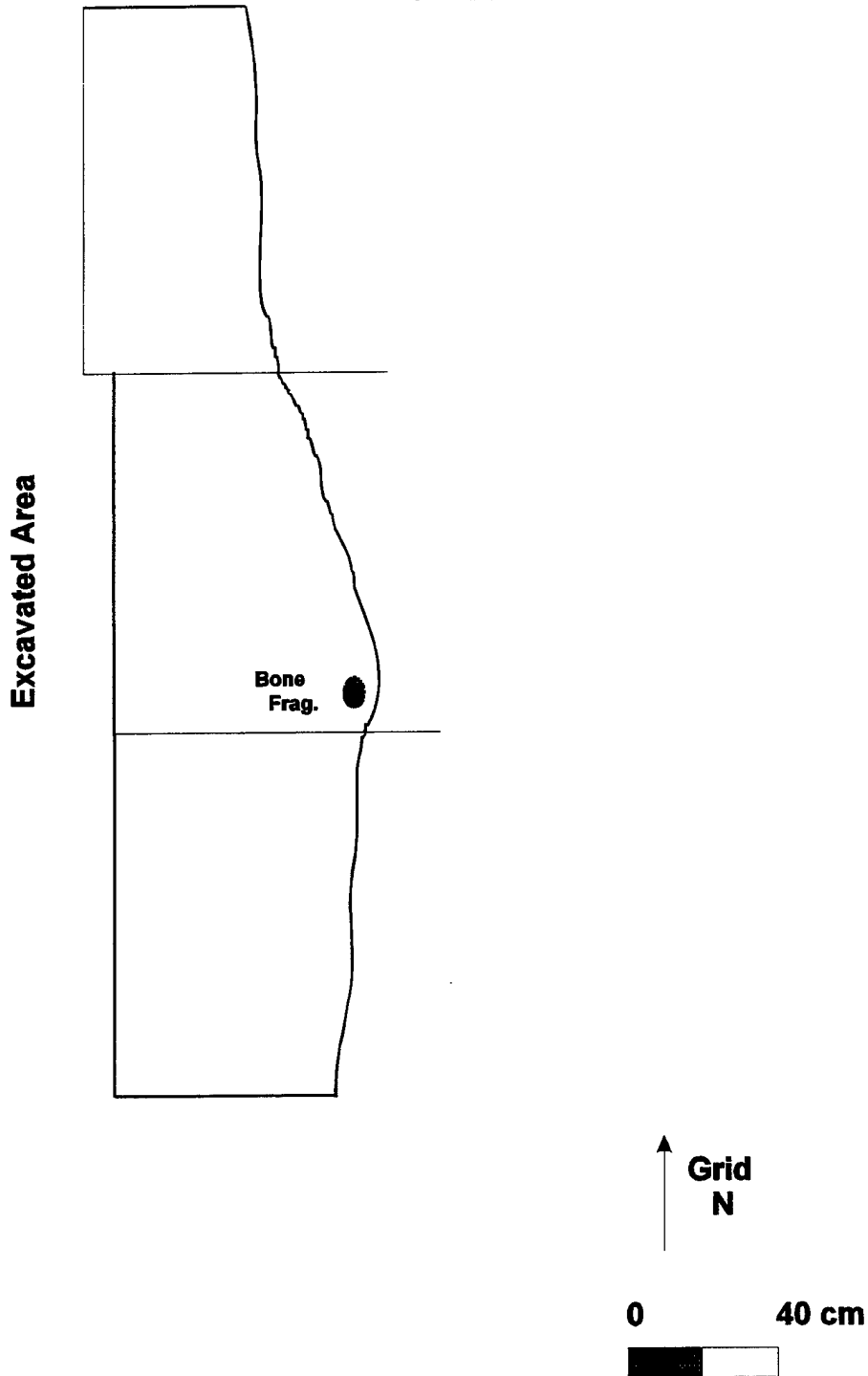


Figure IV-6. Tipover Cove Site, 25HN178. Planview of Excavation Unit 1.



Figure IV-7. Borrow Pit Site, 25HN183. Feature 1, upper left. Feature 2, lower right.



Figure IV-8. Borrow Pit Site, 25HN183, test excavations. View to east.

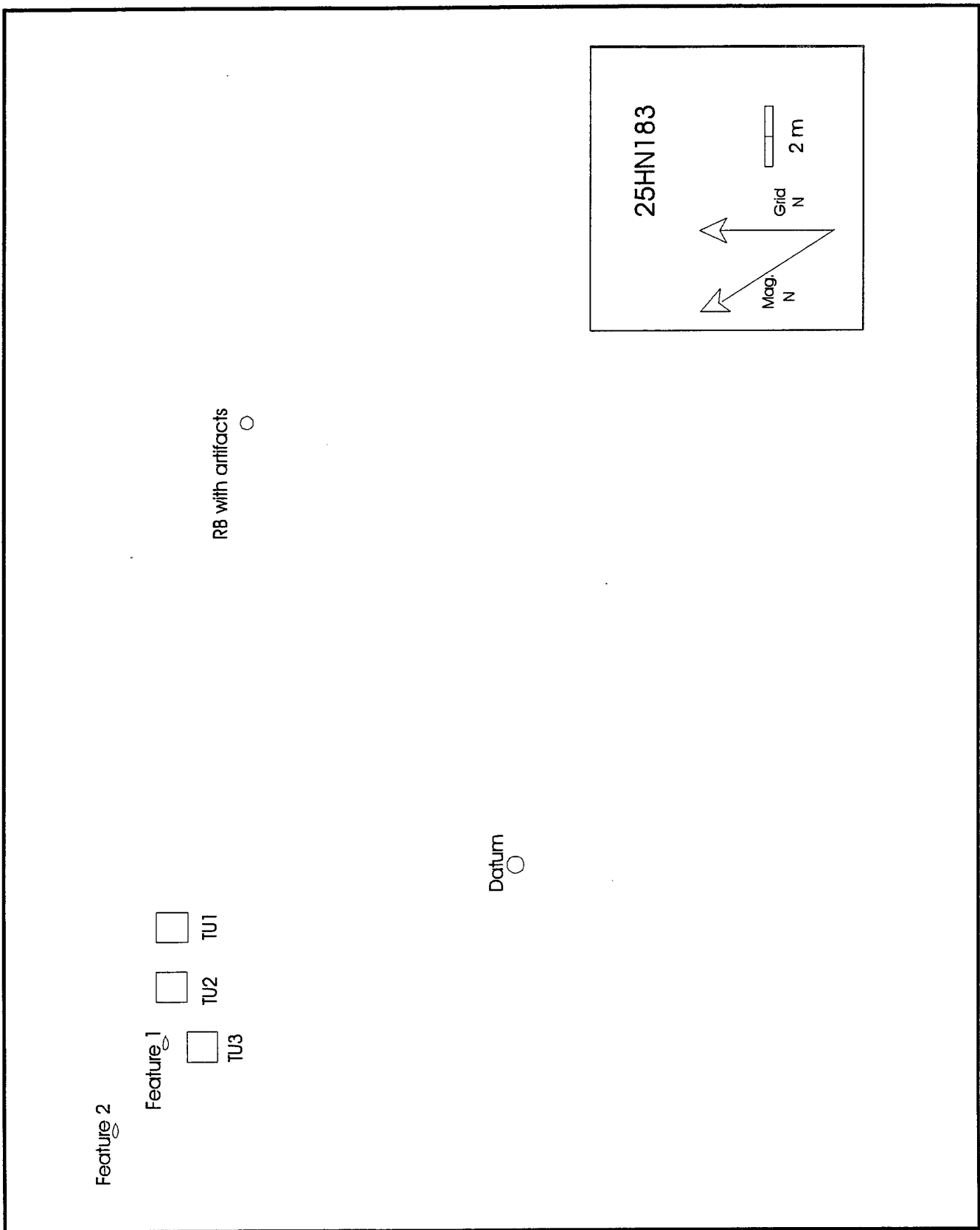


Figure IV-9. Borrow Pit Site, 25HN183. Planview of test excavation.



Figure IV-10. Prettyman Mammoth Site, 25HN185. Salvage excavation of scapula and vertebra.



Figure IV-11. Prettyman Mammoth Site, 25HN185. Salvage excavation of mammoth tooth.



Figure IV-12. Prettyman Mammoth Site, 25HN185. Looting holes at mammoth site, August 1991.

V. CONCLUSION AND RECOMMENDATIONS

This study has demonstrated a diverse and extensive Paleoindian occupation of the Harlan County Lake area. The full temporal range of the known Paleoindian occupation of the Central Great Plains is represented from Clovis dating 11,000-11,500 B.P., to Frederick dating about 8,000 B.P. (Holen 1995a). Within this temporal span, artifacts representing Clovis, Goshen, Folsom, possible Midland, Agate Basin, Eden and Frederick are represented. Other complexes which were not recorded include Hell Gap, and two common representatives of the Cody Complex, Alberta and Scottsbluff. Several projectile points described during the survey could not be classified to cultural affiliation at this time.

Lithic procurement patterns among Paleoindian groups in the Republican River valley have only been studied in a preliminary fashion. Sites at Medicine Creek exhibit a very localized procurement pattern based on the locally available Smoky Hill Silicified Chalk (Bamforth 1991). Clovis materials at Lovewell Reservoir largely demonstrate very long distance lithic procurement (Hoard et al. 1992, 1993, Holen 1991 and Holen and Eckles 1989). Harlan County Lake sites have both localized and long distance procurement patterns.

Two Clovis projectile points and one convex side scraper are made of Smoky Hill Silicified Chalk. Some color varieties of this material are locally available at the lake, however, the green variety used to make one Clovis point is not to be found locally and must have come from the west or south an unknown distance. One Goshen projectile point and one projectile point identified either as Goshen or Midland are both made of local material.

Folsom artifacts exhibit both localized procurement and long distance procurement. The three Folsom points from the south side of the lake are all made of Smoky Hill Silicified Chalk. On the north side of the lake long distance procurement is more common. At the Eagle Roost Site, 25HN179, one scraper and one point are made of Hartville Uplift chert, originating in eastern Wyoming. This material is found in gravels of the Platte River as far east as central Nebraska, but probably not in large enough pieces to make Folsom points and the large scraper. The Hartville chert artifacts found at Harlan County probably originated at or near the source area. One fluted point and the lanceolate unfluted point are made of White River Group chalcedony, the nearest and probable source being Flattop Butte in northeastern Colorado. The single Folsom point midsection from site 25HN186 is also White River Group chalcedony. The Folsom point fragment from Tipover Creek Site, 25HN178, is made of Permian chert occurring some 200 km to the east at the nearest source. The Folsom point from 25HN180 is made from a high-quality light gray chert, possibly from Edwards Plateau in Texas. One Folsom point base from 25HN179 is made of local Smoky Hill Silicified Chalk.

At present, there is no good explanation for the spatial differences in Folsom lithic procurement patterns between the north and south sides of the lake. However, it is a small sample size and this may be part of the explanation. Long distance movement by Folsom peoples based on lithic procurement patterns has been well documented on the southern (Hofman 1991) and northern Plains (Hesse 1995), and is also present at the very western edge of the Central Plains at the Lindenmeier Site in Colorado (Wilmsen and Roberts 1978). At Harlan County, two sites exhibit long distance west to east movement

of lithic materials. One site indicates a westward movement and another site has a possible long distance northern movement of a Folsom point made of exotic material.

Most Paleoindian projectile points younger than Clovis/Folsom are made from Smoky Hill Silicified Chalk, a pattern consistent with the evidence from the Medicine Creek sites. Exceptions include the mahogany obsidian Frederick projectile point fragment found on the south side of the lake, a Frederick point/drill made of Permian chert, and a partial Frederick point made of Pennsylvanian chert. Two of the three Frederick points are made of eastern lithic material. The Eden point fragment appears to be made of porcellanite, based on comparison with samples in the UNSM comparative collection from the Powder River Basin in Wyoming. The mahogany obsidian and porcellanite artifacts are examples of very long distance movement of lithic material.

Three possible Paleoindian spurred endscrapers can be identified as to source area. Two are Alibates "flint" from Texas and the other is Permian chert. One other possible Paleoindian endscraper is made of what appears to be a variety of Hartville Uplift chert.

Sites older than Clovis are not well-understood but apparently exist in the Republican River Basin (Stanford 1983; Holen 1995a&b). Based on a comparison with suggested pre-Clovis sites at Medicine Creek and Lovewell Reservoirs (Holen 1995b, 1996), several sites at Harlan County Lake are suggested to have pre-Clovis components. The best known is the Prettyman Mammoth, 25HN185, which was partially salvaged in 1990. Fracture patterns on full adult (probably an old male) limb bones suggest the same type of fracture patterns seen on the La Sena and Lovewell Mammoths. Other sites with green fractured limb bone include 25HN16, 25HN142, 25HN56, and 25HN85. An additional green fractured piece, bearing a distinct high-velocity impact fracture, was found between Tipover Cove and North Cove.

Site 25HN85 has surface lithic artifacts, including spurred endscrapers and a projectile point/knife lying on a Peorian loess beach next to *in situ* mammoth bone. This evidence, along with the presence of green fractured limb bone, is strongly suggestive of a human association. Site 25HN184 was observed by Paul Prettyman to have a hearth with burned rock, and a few years earlier lithics, eroding from about two meters deep in Peorian loess. An unusual lithic artifact was salvaged from a Peorian loess beach on the south side of the lake. This artifact is even better evidence than fractured mammoth limb bone that there is a Late Wisconsinan occupation of the Republican River valley. The burned feature at site 25HN183, may also suggest a pre-Clovis occupation although this feature may also be of natural origin.

The ephemeral nature of the Paleoindian resources at Harlan County Lake is evident throughout this research. Late Prehistoric peoples occupied sites for long periods of time as evidenced by sites like White Cat Village (Gunnerson 1960) and several Upper Republican sites (Roll 1968). These cultural resources are more common and extensive than Paleoindian resources because of higher population densities in the Late Prehistoric period and because these peoples were agriculturists living in semi-permanent villages. Thus, sites of this age are much more visible in the archaeological record.

Geomorphic reasons also diminish the visibility of Paleoindian sites. Many are deeply buried, for example some 9,000 year old components at the Lime Creek Site at Medicine Creek Reservoir are buried up to 14 meters deep in alluvium. Other sites have been destroyed by several thousand years of erosion. Deep burial and erosion help explain the paucity of Paleoindian sites investigated in the Central Great Plains.

Paleoindian sites are more difficult to find for another reason. First, Paleoindians were highly mobile and their sites tend to be small temporary camp sites. For this reason, highly visible sites like large bison or mammoth kills are overrepresented in the Paleoindian archaeological record. Small temporary campsites are underrepresented in the archaeological record, although this latter site type should be far more common. The Paleoindian occupation of the Central Plains is the least understood of any cultural period because of geomorphic considerations, low Paleoindian population densities, and a mobile settlement pattern with small temporary campsites which leave little archaeological signature.

In view of our limited knowledge of the Paleoindian occupation of the Central Plains, especially in the eastern two-thirds of Nebraska and northern Kansas, the Harlan County Paleoindian research offers new data in several areas. This research extends the range of several Paleoindian complexes, including Goshen, Agate Basin, Eden, and possibly Frederick, farther to the southeast. It also documents an extensive Folsom occupation farther east in the Central Plains than previously recorded. Also, this research has documented long distance movement of lithics during the Paleoindian period.

Harlan County Lake now has the most diverse Paleoindian occupation reported from any single project area in the Central Plains, including the extensive Paleoindian record from Medicine Creek Reservoir. This diversity of sites indicates the Harlan County Lake area was an important locality during several millenia during the Paleoindian occupation of the Central Plains.

Of special interest is the suggested pre-Clovis occupation of the Harlan County Lake area. While this had been suggested from previous research at the Prettyman Mammoth Site (Holen 1995), this survey has documented several new locations where fractured mammoth limb bone has been found eroded out of late Pleistocene Peorian loess. In addition, we report one definite artifact found deep in Peorian loess, and at another location, 25HN184, a hearth with burned rock, and earlier lithics, was observed eroding from Peorian loess. All of this evidence strongly supports the assertion by Holen (1995a&b) that there was a small human population on the Central Plains during the Wisconsin glacial period.

The most diverse and extensive Paleoindian record from any locality on the Central Plains is present at Harlan County Lake, in large part to the geomorphic situation. David May documents extensive outcrops of late Pleistocene and early Holocene geological deposits around the lake. There is no other place in the Central Plains which can match this impressive amount of exposed deposits of this age. Erosion of these deposits occurs not only on an annual basis with the lowering and filling of the lake, but on a daily basis as wave action exposes new deposits continually. We tested this concept during our survey of locations where Paleoindian artifacts had been found previously. In selected areas, we walked the same section of shoreline at intervals of two weeks to a month. Each time we walked an area at least one new bone or lithic piece was exposed, and sometimes several new pieces were found.

In addition to the extensive nature of the Paleoindian record at Harlan County Lake, and the high potential for additional significant discoveries in the future, the other important factor documented by this research is the ephemeral nature of Paleoindian record at Harlan County Lake. These resources show up for very brief periods and then are eroded away or flooded by lake waters. Thus, three factors, rapid erosion, flooding

and looting contribute to the destruction of Paleoindian resources at Harlan County Lake on an ongoing basis. Finding *in situ* evidence of the Paleoindian occupation at the lake under these present conditions is, therefore, very difficult since archaeologists visit the lake infrequently.

Paleoindian (and Archaic) resources at Harlan County Lake are the least understood of any Native American temporal occupations in the area. In this respect they offer the greatest potential for gaining significant scientific information concerning human adaptation on the Central Plains. Several recommendations, both specific and general, are offered to assist in planning efforts to mitigate the destruction of these resources at Harlan County Lake.

Other specific recommendations include additional testing at the Borrow Pit Site, 25HN183, to gain a better understanding of the hearth-like feature. Part of this feature was left in place for future research. Additional test units need to be excavated to determine if lithics are indeed occurring at this level or if the lithic found in Test Unit 3 came down a rodent burrow from above, as suspected.

Test excavations at 25HN85, the North Cove Mammoth Site is very highly recommended, if this site ever surfaces again at very low lake level. Hopefully, this potentially very important site has not eroded away by that time. Test excavations should also be conducted at the Tipover Cove Site, 25HN178, in Area C where mammoth bone was found. A green-fractured piece of cortical mammoth bone may be indicative of human association.

Test excavations and additional geomorphic work at the Patterson Creek Site, 25HN182, are recommended because of the potential for intact archaeological deposits. This recommendation is based on the previous find of an Agate Basin point eroded out near large bison bone. In addition, a biface with calcium carbonate encrustation and bison and mammoth bone were found on the beach during the present survey. Radiocarbon dating of the gully fill is recommended.

A complete survey of late Pleistocene and early Holocene deposits around the lake is recommended based on the evidence of an extensive Paleoindian occupation of the lake area. This should be completed by personnel trained in Plains Paleoindian archaeology, late Pleistocene vertebrate taphonomy, and late Pleistocene/early Holocene geomorphology/geoarchaeology of the Central Plains.

Continued monitoring of the constantly eroding shoreline of the lake should be a high priority. Paleoindian resources at the lake are very ephemeral and are lost in a very short time to erosion, flooding and looting. Areas of high potential for continued monitoring should be selected after the complete survey of the late Pleistocene/early Holocene deposits. High potential areas defined in this report should be monitored frequently.

Paleoindian resources at Harlan County Lake are very different than the more common late Prehistoric sites because a one-time survey will not locate these resources. In this respect the shoreline has not been adequately surveyed for Paleoindian cultural resources, because the shoreline erosion is always exposing new resources. New Paleoindian resources are showing up on a yearly basis, and they will never be found *in situ* unless there is a regular monitoring of the shoreline for these new resources.

It is the opinion of the authors of this report that the most significant cultural resources at Harlan County Lake are the Paleoindian sites. This position is based on the rarity of these sites, and the potential to add new scientific information about human

adaptation on the Central Plains. We know virtually nothing about late Pleistocene human adaptations, and adaptation to the severe climatic change circa 11,000 years ago at the Pleistocene/Holocene boundary. Information presented in this report, and the general experience of the authors in Paleoindian geoarchaeology in the Central Plains, indicates that Harlan County Lake has the highest potential of any single locality presently known in the Central Plains to add significant new information regarding these cultural resources.

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GLOSSARY

Farmdalian -- an interglacial period dating just before the last glaciation, the Farmdalian dates from 24,000 to 28,000 years ago

geomorphology -- generally, the study of the Earth's surface and how it was formed

Holocene -- the recent (post-glacial) geological period dating 10,000 years ago to the present

humate ages -- radiocarbon dates determined on the organic portion of the soil derived from the decay of plants

humus -- the organic portion of the soil derived from decaying plants

krotovina -- rodent burrows

late Wisconsinan -- the time of the last glacial advance and retreat dating ca. 24,000 to 10,000 years ago, the latest period in the Pleistocene

Pleistocene -- the glacial period beginning about 2 million years ago and ending 10,000 years ago

porcellanite -- a high-quality stone occurring in the Bighorn Mountains of Wyoming and the Pryor Mountains of Wyoming as the closest source to the survey area, this stone was commonly used by Native Americans for chipped stone tools

pre-Clovis -- cultures in the Americas which occurred before Clovis Culture, earlier than ca. 11,500 years ago; these sites are very rare and little understood

organs -- organic humus which is dislocated down through the soil

taphonomic processes -- any process, natural or cultural, which alters bone after the death of the animal

Woodfordian -- the period in the late Pleistocene which is equivalent to the late Wisconsinan, defined above