

PALEONTOLOGICAL AND GEOLOGICAL RESULTS FROM TWO FOSSIL PROBOSCIDEAN FINDS IN NORTHERN ILLINOIS

James Warren Springer
Department of Anthropology
Northern Illinois University
DeKalb, Illinois 60115

and

Ronald C. Flemal
Department of Geology
Northern Illinois University
DeKalb, Illinois 60115

ABSTRACT

Two new fossil proboscidean sites have been excavated in northern Illinois. These finds have implications for Late Wisconsinan glacial chronology and the habitat preferences of the animals, as well as the use of extinct fauna by early Indians.

INTRODUCTION

Two fossil proboscidean sites excavated by Northern Illinois University have yielded valuable new information on late Wisconsinan geochronology and paleontology. The location of the sites, their stratigraphy, their excavation and analysis, and their implications for late Wisconsinan history are presented in this article. Both sites were excavated by students from Northern Illinois University under the direction of James Springer. Ronald Flemal visited both sites during excavations and provided a stratigraphic analysis of the sites.

SITE 1

Site 1 was excavated in May and June 1976 and was assigned the survey number NIU-28 (Figure 1). It is located in the NW1/4 Section 11, T36N, R4E on the Sheridan 7 1/2 minute U.S. Geological Survey Quadrangle Map. Bones were initially exposed by the excavation of a drainage ditch along an intermittent stream. The property owner, Mr. Lorne Johnson, reported the find to Northern Illinois University. The intermittent stream drains into Little Indian Creek, and from there into Indian Creek and the Fox River. Elevation of the intermittent stream was approximately 665 feet above sea level prior to dredging. The

cultivated fields immediately adjacent to the channel range in elevation from 675 to 680 feet.

The field party from Northern Illinois University collected bones from the dredge spoils, removed bones by hand from the bottom of the newly excavated channel, and did primary excavation along both walls of the ditch using pumps and a sandbag levee. The in situ bones were below the water table and consequently very well preserved.

The stratigraphy of NIU-28 is shown in Figure 2. Unit 1 (bottom-most) is till of the Malden Till Member of the Wedron Foundation, which dates from the Woodfordian Substage of the Wisconsinan Glacial Stage (Willman and Frye, 1970). The Malden Till has been dated to ca. 15,000 B.P. (Frye and Willman, 1973; Frye et al, 1974), which sets a maximum date for the fossil materials. Unit 2 consists of stratified sands and gravels representing glacial outwash associated with the retreat of the Malden Glacier. A complete section was not exposed, so we can only estimate its thickness to be 5 - 10 feet. Unit 3 is a stratified, complex set of fluvial and lacustrine sediments which reach a maximum thickness of 4 feet. Marls, clays, peats, and sand lenses all occur, and the stratigraphy indicates a shift from a regime of permanent water flow to ponded water to marsh. Even in the later period, however, running water was occasionally present. Well preserved wood, pelecypod and gastropod shells, and mammal bones occur in this Unit. Beaver-chewed wood fragments are common in Unit 3 and in the Unit 5 spoil, and the remains of at least one beaver dam indicate that ponding occasionally occurred. Unit 4 consists of a gley and humic gley representing marsh deposits. It averages about 2 feet in thickness. Unit 5 is dredge spoil, consisting of redeposited Unit 3 material.

Mastodon (*Mammuth americanum*) bones occurred along the channelized stream reach for a distance of about 800 feet, although they were concentrated into the much smaller area chosen for excavation. The material from the excavation, the adjacent channel bottom, and the adjacent spoil contained loose teeth, both mandibles, and extensive postcranial remains of what is almost certainly a single animal. The skeleton was disarticulated, probably due to current action in the stream. The bones were very well preserved, with no sign of mineralization. Their surface color was grayish-brown: 10YR5/2 and 2.5Y5/2, following the Munsell Color Company (1954) book. The in situ remains occurred in the lower part of Unit 3 and occasionally as far down as the contact with Unit 2. We found a thin matrix of fine gravel (ca. 2 - 5 mm diameter) in contact with some of the mastodon bones, which we consider to be an original matrix which encased the bones before they became disarticulated by water movement.

Four radiocarbon dates are available for this site, all provided by the Illinois State Geological Survey (Note: due to a typographical error, the site was incorrectly reported to the ISGS as NIU-128). ISGS 498A and 489B are the apatite and total organic fractions, respectively, of a single mastodon bone sample. The dates are $10,890 \pm 210$ radiocarbon years B.P. and $10,995 \pm 110$ radiocarbon years B.P. The agreement is excellent. The third date (ISGS 483) is on wood from the fine gravel matrix which often occurred around the bones. It is $11,080 \pm 350$ radiocarbon years B.P., which also agrees with the bone dates. The fourth date (ISGS 482) is on wood from a clay layer in the lower part of Unit 3 at the same general stratigraphic position as the mastodon bones. It is $12,410 \pm 125$

radiocarbon years B.P. The greater age of the wood date suggests that the initiation of deposition of Unit 3 may have begun as much as 1400 years before the burial of the mastodon. This is consistent with the implied age of Units 1 and 2 and the general occurrence of the bones above the contact between Units 2 and 3.

The radiocarbon dates place the occurrence of the mastodon well within the earliest well-documented period of human habitation in North America, viz. the early part of the Paleo-Indian Tradition. NIU-28, however, provided no evidence of the presence of man.

SITE 2

The second site (NIU-123) was excavated in June and July of 1977. It is located in the NE1/4 of SW1/4, Section 22, T39 N, R9E on the Naperville 7 1/2 minute U.S. Geological Survey Quadrangle Map (Figure 1). The site occurs about 1/4 mile east of the West Branch of the DuPage River, which joins the DuPage River and then the Illinois River. Surface elevation is between 700 and 705 feet above sea level. The land is owned by the DuPage County Forest Preserve District. The bones were discovered accidentally by a crane operator who was producing barrow material. Officials of the Forest Preserve contacted the Department of Anthropology of Northern Illinois University, which conducted the excavation.

NIU-123 occurs atop an outwash apron located in front of the West Chicago Moraine (Figure 3) of the Valparaiso Morainic System of Woodfordian Age. The geological sequence at the site consists of bedrock overlain by outwash, in turn overlain by waterlogged blue-gray clays, with a ca. 1 foot thick organic plow zone on top. In the excavations the blue-gray clay was ca. 5 feet thick, with the uppermost 1 foot oxidized to brown. The color change probably resulted from drying after field tile was installed to improve the soil for farming. The outwash, consisting of stratified sand and gravel, was exposed at the bottom of the excavations. The most plausible interpretation of the sequence is that the site occurs in what was originally a kettle hole on the outwash, which subsequently became a small lake in which the blue-gray clay accumulated. Like NIU-28, this was a wet site, requiring excavation with the use of pumps.

Most of the skeleton of a single individual was present, although disarticulated. As at NIU-28, the bones were in a good state of preservation and not mineralized. Their surface color was 10YR6/2 (light brownish gray) in the Munsell classification. Unfortunately, only fragments of the skull and tusk were found, and no teeth. We believe that the skull was likely destroyed during the earlier field tiling operation. Bone occurred over an area 39 feet long by 21 feet wide. We established an arbitrary vertical datum at the approximate level of the modern ground surface. The bones occurred from 3.2 to 5.0 feet below the datum, although most were between 4.2 and 4.7 feet below the datum.

Although the most diagnostic elements (the teeth) are missing, we have identified the animal as a mammoth (*Mammuthus* sp.) using characteristics of the postcranial skeleton listed by Olsen (1972). These include the relative slenderness of the femura, the shape of the vertebral foramina in the cervical vertebrae, and the absence of a process at the proximal end of the patellae. We discussed the identification with Dr. Jeffrey Saunders of the Illinois State Museum who examined the bones and agreed with our identification.

Two radiocarbon dates are available, both done by the Illinois State Geological Survey. The first (ISGS 465) is on peat derived from the blue-gray clay at 4.25 feet below datum and immediately adjacent to the mammoth bones. It dates $15,240 \pm 120$ radiocarbon years B.P. The second (ISGS 485) is on a mammoth bone found in the spoil removed by the crane operator. Although disturbed, it had not been exposed to the air, since it was still embedded in its clay matrix. This date is $13,130 \pm 350$ radiocarbon years B.P. The date was done on the apatite fraction alone since the organic fraction was not sufficient for dating.

The older radiocarbon date is incompatible with the previously accepted age of the underlying West Chicago till and outwash of ca. 14,500 radiocarbon years B.P. (c.g., Frye and Willman, 1973). If our older date is to be accepted, it would require pushing back the date of West Chicago deposition in excess of 500 years. At present we prefer to conclude that our older date is for some reason spuriously old, and accept the younger date (i.e., ca 13,150 RCYBP) as the most reasonable age of the mammoth. This would place the mammoth in time and space very close to the ice margin.

As at NIU-28, there was no evidence of human occupation at this site.

CONCLUSIONS

The record of extinct Wisconsinan fauna from Midwestern United State and the associated floral data and carbon-14 dates was summarized in a useful article by Brown and Cleland (1968). We have consulted several other sources for the same area, including Dreimanis (1968), Kapp (1970), Camp (1981), Hansen et al. (1978), Ettensohn (1976), Davis et al. (1972), Anderson and Williams (1974), Williams (1957), Mehl (1966), Parmalee (1967), McMillan (1976), Palmer and Stoltman (1976), Bingaman (1980), Wilson (1967), Skeels (1962) and Graham et al. (1981) for mammoth and mastodon; Mills (1975) for ground sloth; Eschelman et al. (1972) and Palmer (1974) for peccary; West (1978) for caribou; Galbreath (1974) and Ray et al. (1968) for musk-ox; Parmalee (1967) for giant beaver and Pleistocene elk; and Agogino and Frankforter (1960) for Pleistocene bison. In addition, the complete late Wisconsinan fauna from several sites in Missouri is presented in Saunders (1977), Parmalee et al. (1969), King and Lindsay (1976), Mehl (1962), and Parmalee and Oesch (1972). Dorr and Eschman (1970:369-389) and Wilson (1967) summarize the Pleistocene fauna from Michigan, and Kurten and Anderson (1980) review the Pleistocene mammals of North America. Recent general discussions of the North American Proboscidea are available in Dragoo (1979) and Olsen (1972). The reader should also consult Bader and Techter (1959) for the older literature on Pleistocene mammals in Illinois.

The literature on late Wisconsinan fauna has dealt with three principal problems, which we propose to review in the light of our own field work and the recent publications cited above: 1) the time of extinction of the various animal species, 2) the habitat and diet of the animals, and 3) their association with early man. Our discussion will concentrate on the mammoth and mastodon.

With regard to extinction, Brown and Cleland (1968) have proposed that the North American mammoth became extinct approximately 2000 years before the mastodon. The evidence from the sites reported here is compatible with this thesis, but in a qualified way. Brown and Cleland's date for the extinction of the mammoth is 11,000 B.P. and for the mastodon 9000 B.P., whereas our dates are

approximately 13,000 - 15,000 B.P. and 11,000 B.P., respectively. The reader should also consult the collection of papers by Martin and Wright (1967) for the dating of Pleistocene extinctions. In an excellent survey of carbon-14 dated mastodons from the Midwestern and Northeastern United States and Southern Canada, Dreimanis (1968, Figure 2) shows that the number of dated finds increases rapidly at about 13,000 B.P., peaks at about 10,200 B.P., and drops rapidly after about 9500 B.P. He notes that a few late dates were excluded from his curve as suspect. (See Skeels 1962 and Wilson 1967 for some of these late dates.) Anderson and Williams (1974) report a mastodon from western Iowa dated 13,520 B.P., based on spruce wood. Mehl (1966) provides a date of 25,100 B.P. on charcoal associated with a Missouri mastodon. The Boney Spring site, also in Missouri, contains a stratum with 31 mastodons, which is dated to 16,450 B.P., 16,580 B.P., 16,490 B.P., 16,540 B.P. on wood from the lower part of the stratum and to 13,700 B.P. and 13,550 B.P. on organic debris in the pulp cavities of mastodon tusks from the upper part of the stratum (Saunders 1977; 69 - 71, Figure 17; King and Lindsay 1976). Eleven mastodons occurred in three strata at Trolinger Spring, with associated dates on peat and humates ranging from 34,300 B.P. to 4290 B.P. (Saunders 1977:21 - 25, Figures 5 - 7, King and Lindsay 1976). The late dates are almost certainly wrong, and the palynology (King 1973, King and Lindsay 1976) confirms the earlier dates to suggest a placement of the mastodons at ca. 34,000 - 23,000 B.P.

With these additional data in mind, we may return to a consideration of Dreimanis (1968). The interpretation of his curve (Figure 2) is crucial, since it shows an extremely rapid drop in mastodon finds, and presumably their extinction, at 9500 - 9000 B. P. The date cited by Brown and Cleland (1968) and their interpretation are similar to those of Dreimanis. If Dreimanis's Figure 2 were taken in the most straightforward way, it would indicate a very rapid late Wisconsinan increase in mastodon populations to a peak at 10,200 B.P., and then a rapid decline and extinction. It seems likely to use that the apparent peak is a product of geological processes, namely the rapid late Wisconsinan glacial retreat which created thousands of kettle holes and other wet depressions suitable for preserving mastodon bones. Note that the pattern of carbon-14 dates from unglaciated Missouri, cited above, would suggest a much earlier mastodon peak. Assuming such is the case, the apparent rapid decline at 9500 B.P. is due in part to the lack of new sites for preservation and to the filling in of the old ones. We should also note the evidence collected by Williams (1957) for the association of mastodons with artifacts of the Early Archaic Stage of 10,000 to 8000 B.P. While not conclusive, the associations are plausible and suggestive. This evidence, combined with the existence of later dates mentioned by Dreimanis, inclines us to extend the existence of the mastodon until about 8000 B.P.

It has generally seemed plausible to argue, as Brown and Cleland (1968) do, that the mammoth became extinct earlier than the mastodon, since distributional and pollen evidence suggests that it was basically a grazing animal adapted to grass and other herbaceous vegetation. This point is discussed in more detail below. The early postglacial forests of the Eastern Woodlands would presumably have been very unsuitable for such an animal. In addition to the Michigan mammoth dated to 11,400 B.P. cited by Brown and Cleland (1968), we have found dates of 24,000 B.P. on a mammoth from Michigan (Kapp 1970); 12,200

B.P. and 8200 B.P., also from Michigan (Dorr and Eschman 1970, Figure XIV-12; Wilson 1967); and 10,340 B.P. on a mammoth from Ohio (Hansen et al. 1978). We are inclined to see the mammoth persisting until about 10,000 B.P.

The second problem that has received substantial attention is the habitat and diet of the Pleistocene animals. Dreimanis (1968) presents extensive evidence that spruce, larch, and hemlock were common elements in the vegetation associated with mastodons and also provided food for the animals. However, both his pollen data (Dreimanis 1968, Table 4) and those collected by Brown and Cleland (1968, Table 1) show pine along with oak and other deciduous species as consistent elements in the pollen rain. King (1973) showed that mastodon finds in Missouri are associated both with pine and non-arboreal dominated spectra contemporaneous with the Farmdalian Interstade and with "spruce-with-deciduous-elements" during the latter part of the Woodfordian Stade. The Kimmswick site in Missouri produced mastodon bones with a mammalian fauna that the investigators interpret as representing a "deciduous woodland with open grassy areas" (Graham et al. 1981: 1116). However, all the animals they mention were also found with mastodons at the Boney Spring site (Saunders 1977) and were associated with the "spruce-with-deciduous-elements" mentioned earlier. The spruce and deciduous combination for the late Woodfordian is also documented for Battaglia Bog in Ohio (Shane 1975). The mastodon from NIU-28 probably lived in a forest dominated by spruce, with fir and oak as secondary elements, to judge by the pollen sequence from nearby Volo Bog (King 1981). In contrast to Dreimanis, however, we must conclude that the evidence for an association of mastodon with the pine, birch, and deciduous zone of ca. 11,000-9,000 B. P. in the Midwest is also strong. This zone is discussed by King (1981), Shane (1975), Kapp (1977), and Wright (1971), and the carbon-14 evidence reviewed above suggests that the mastodon survived through the time of pine dominance. We suggest that, rather than the spread of pine at the expense of spruce being the cause of the mastodon's demise, the mastodon did well in both spruce and pine dominated forests and died out only after the deciduous forest became well established.

The mammoth is generally thought to have been a grazing animal, living on grass and other herbs, based upon its common occurrence in the Plains of North America and its scarcity in the East (Kurten and Anderson 1980: 343-354, Skeels 1962). In western Iowa, Anderson and Williams (1974) report 70 mammoth finds and 26 mastodon finds, each of which evidently represents a single individual. Since western Iowa throughout the Holocene had much more prairie than the adjacent areas to the north, east, and south (Wright 1968, Kuchler 1975, Van Zant 1979), one might reasonably expect more prairie in the late Wisconsinan also. The recently deglaciated section of the northern Midwest might have provided an herbaceous habitat favorable to this animal, and indeed Oltz and Kapp (1963) point out that one mammoth and two mastodon finds from Michigan show the mammoth associated with a higher percentage of spruce and fir pollen, as well as a higher percentage of grass and marsh plants. The existence of a periglacial zone of tundra or other herbaceous vegetation has been a subject of discussion among North American palynologists, with most of the evidence suggesting only a very narrow herbaceous zone (Kapp 1977; Wright 1971, 1981). A pollen core from Lake West Okoboji in northwestern Iowa shows in its lowest

levels about 10% each of grass, sedge, and sagebrush, the rest being largely spruce (Van Zant 1979, Figure 2). Since the lake is on the edge of the area of Woodfordian glaciation, the spruce-herb zone shows that the glacial retreat did produce a shortlived herbaceous habitat. A similar phenomenon is found in the lowest level of Battaglia Bog (Shane 1975, Figure 3), although Shane does not interpret it as a tundra zone.

The evidence from our site NIU-123 is relevant to this problem, since it suggests that the mammoth lived close to the ice margin. If we accept the date of ca. 13,000 B.P. for the find, the contemporaneous ice margin lay astride Lake Michigan, perhaps as far south as the latitude of Milwaukee (Evenson et al. 1976). If the date of ca. 15,000 B.P. is accepted, the distance to the glacier would have been much less, perhaps just a few miles. In either case, the late Woodfordian glacier was fluctuating so rapidly that a zone of irregular and poorly drained ground, supporting a great deal of herbaceous vegetation can reasonably be proposed. Thus our data tend to support the hypothesis of a glacially disturbed habitat as attractive to the mammoth.

The final problem to be considered here is the relationship of extinct Pleistocene fauna to early humans in North America. There is an enormous literature on the cultures of the Pleistocene and early Holocene. The reader is referred to recent reviews and summaries in Bryan (1978), Newman and Salwen (1977), Johnson (1977), and Volume 8, No. 2 (1971) of the journal *Arctic Anthropology*. While the association of man with several extinct animals has long been established for the North American Plains, the situation in the East is less well documented. Mastodon has recently been found in good association with spear points in Missouri (Graham et al. 1981), and several less certain but plausible human-mastodon associations are reported by Williams (1957) and Palmer and Stoltman (1976). See also McMillan (1976) for a criticism of one of these claimed associations. Tools have been found associated with peccary (*Platygonus* sp.) in Wisconsin (Palmer 1974), with caribou in Michigan (Cleland 1965), and with Pleistocene bison in Iowa (Agogino and Frankforter 1960). Avery Island in Louisiana has produced an abundant Pleistocene fauna, including mastodon and horse, in the same levels with artifacts (Gagliano 1967, 1970). In Graham Cave, Alabama, peccary (*Mylohyus* sp.) has been found associated with artifacts (Griffin 1974: 82). The same site produced porcupine, which is locally extinct from the Southeastern United States. The most numerous finds of extinct fauna with man occur in Florida, usually in spring deposits, of which the best documented are Little Salt Spring and Warm Mineral Springs. At Little Salt Spring, artifacts occur with extinct giant tortoise, ground sloth, mammoth or mastodon, and Pleistocene bison (Clausen et al. 1979). At Warm Mineral Springs, human bones occur with ground sloth and sabretooth cat (Cockrell and Murphy 1978: 6). Excellent paleontological documentation is available for Devil's Den, in which a rich and apparently very late extinct fauna is found with human bones (Martin and Webb 1974). Unfortunately, no detailed report of the human remains is available. Some additional likely, but less well established human-extinct animals associations from Florida are discussed by Sellards (1952: 90 - 94), Neill (1964), Weigel (1962), and Dolan and Allen (1961).

The evidence just reviewed suggests that man entered North America ca. 30,000 B.P. and that at least occasionally he hunted extinct or locally extinct game

until ca. 8000 B.P. Furthermore, we can say that the man-animal associations and possible associations just mentioned tend to fall into two broad types: 1) kill sites, usually of mastodon, in which a substantially complete skeleton of a large animal is found with very few tools and 2) camp sites, in which a large quantity of tools and other cultural remains is associated with a very few bones of extinct or locally extinct fauna.

In northern Illinois, two prehistoric cultural traditions were contemporaneous with the extinct fauna discussed here, namely the Paleo-Indian (11,500 - 8000 B.P.) and the Early Archaic (10,000 - 8000 B.P.). These have been the subject of intensive surface surveys in the basin of the South Branch of the Kishwaukee River, which occurs just north of NIU-28 and just west of NIU-123 (Harrison et al. 1977, Springer et al. 1978, Springer n.d.). The artifacts tend to occur at relatively high elevations, in upland and headwater situations, often associated with large bogs and sloughs. Surveys in other parts of Illinois have produced generally similar findings (Luchterhand 1970, Henry and Nichols 1963, Munson and Downs 1968, Winters 1962, Klippel and Maddox 1977). These bog and slough environments were very likely exploited for small game and emergent vegetation, and the fact that they continued to be exploited in the Kishwaukee Basin until the end of the Archaic (ca. 3000 B.P.) suggests that Pleistocene game was not their principal attraction. Nonetheless, the situation of many of these sites is strongly suggestive of the situation in which so many Pleistocene animals have been found. For our area, it is still speculative, but we suggest it is plausible that early man was attracted to the wetlands by the opportunity to trap or ambush large Pleistocene fauna.

ACKNOWLEDGMENTS

We would like to thank Mr. Lorne Johnson for permission to excavate NIU-28 on his farm. Funds and services to aid in the excavation of NIU-28 were provided by the following: Mr. Willard Lee, President of Somonauk Farmers State Bank; Mr. James McInnes and board members of the Sandwich State Bank; Mr. Harold Healey, Commonwealth Edison Company; Mr. and Mrs. Rufus Butler, Somonauk; Mr. Howard Bonnell, Reliable Excavating Company, Mendota; Mr. Lyle Hyatt, Hyatt House Movers Company, Sandwich; Mr. William Leiser, Mendota Reporter, Mendota; and Mr. Mel Brooking, Chief of the Somonauk Fire Department.

Similarly, we thank the DuPage County Forest Preserve District for permission to excavate NIU-123 and for much aid and assistance. Mr. Robert "Dan" Gooch, Superintendent of Conservation, was especially helpful. NIU-123 was excavated through volunteer labor provided by students from Northern Illinois University and nearby schools.

Both finds reported here were accidental, and their excavation required rapid logistical and financial arrangements. For these, we would like to thank Professor Ronald Provencher, then chairman of the Department of Anthropology, Northern Illinois University.

Jeffrey Saunders of the Illinois State Museum provided assistance with the bibliographic work and two anonymous reviewers for the *Transactions* suggested modifications which have been incorporated into the paper.

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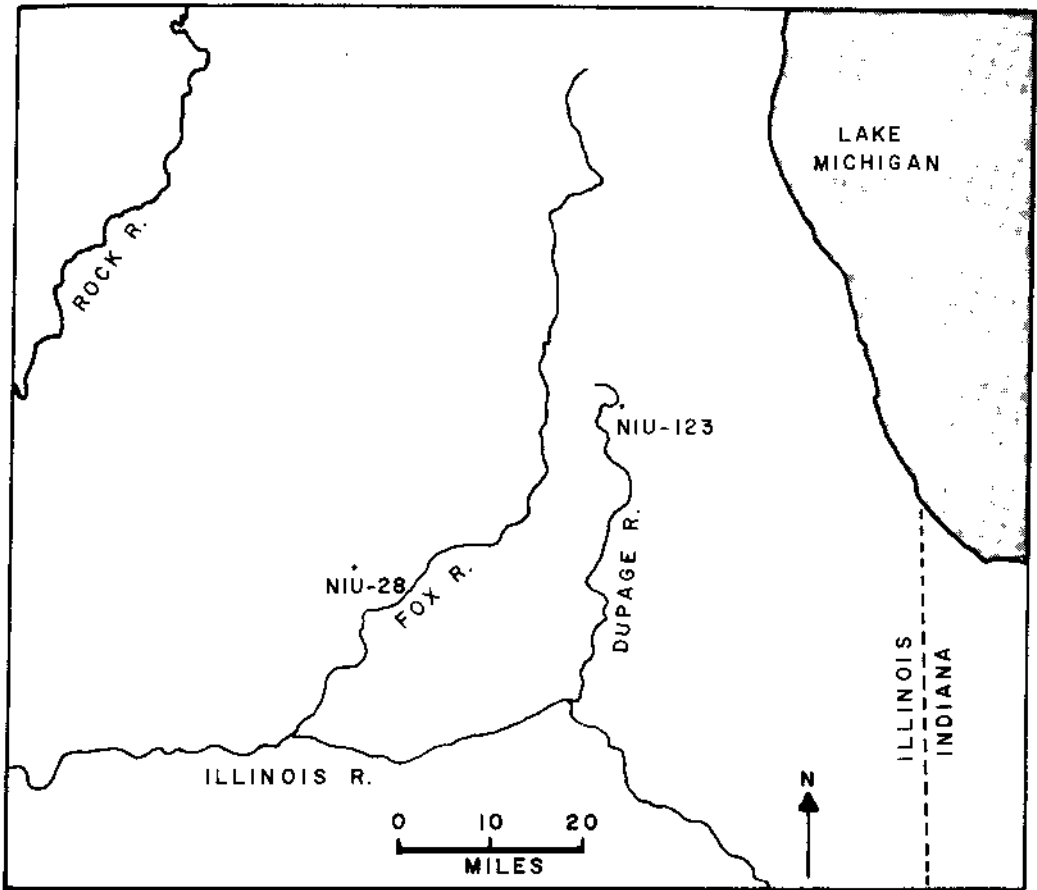


Figure 1. Location of NIU-28 and NIU-123.

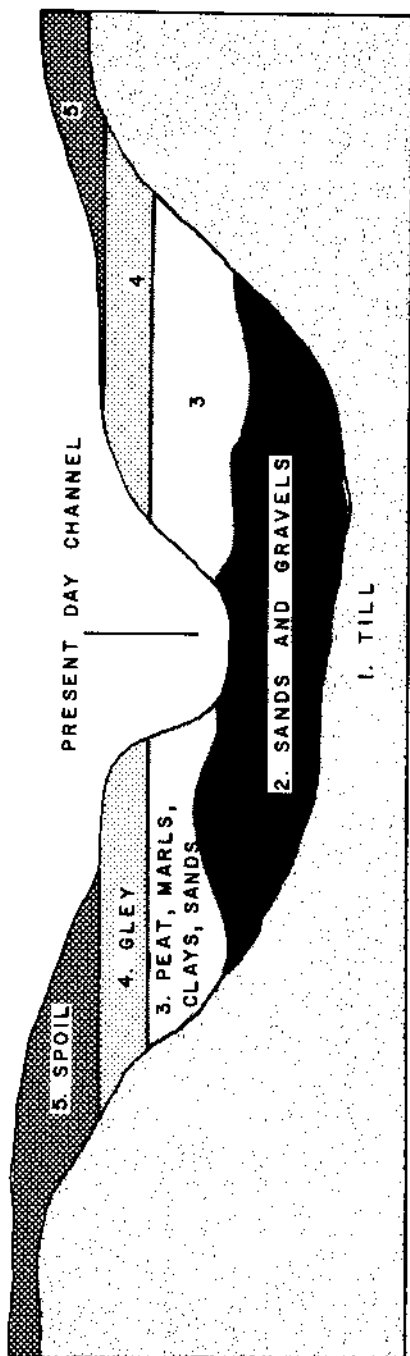
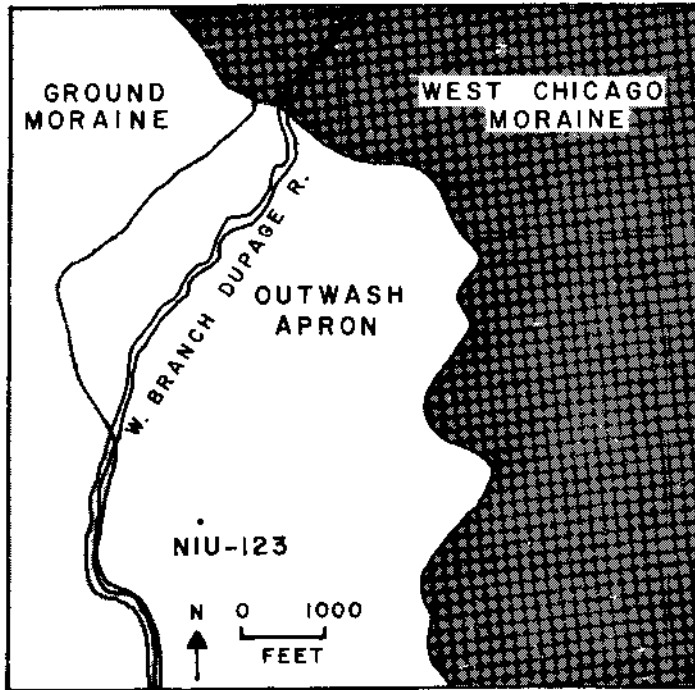
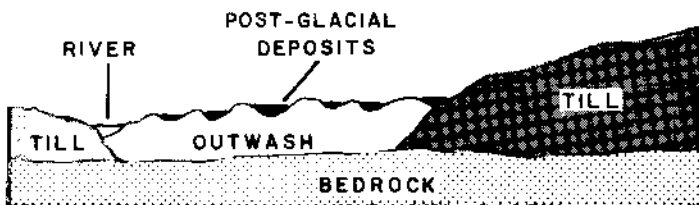


Figure 2. Diagrammatic section of NIU-28.



3a



3b

Figure 3. Geology of the NIU-123 locality.
(a) Plan.
(b) Diagrammatic section.