The archaeology and ecology of the Brassica Bench Site (13PK251), Polk County, Iowa

by

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A Thesis Submitted to the
Graduate Faculty in Partial Fulfillment of
The Requirements for the Degree of
MASTER OF SCIENCE

Department: Sociology and Anthropology
Major: Sociology (Anthropology)

Iowa State University
Ames, Iowa

1979

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF PLATES

CHAPTER 1.

INTRODUCTION

General Background

In 1958, the planning and construction of the Saylorville Dam and Reservoir was authorized by the Flood Control Act of Congress. The primary goal of this legislation was to provide flood control protection for the city of Des Moines, and -- in conjunction with other reservoirs -- flood control for the central Mississippi River valley. The United States Army Corps of Engineers began land acquisition and construction activities in the reservoir area in 1965, and the dam was completed in 1975. The reservoir was impounded shortly thereafter, in the late summer of 1977.

The Saylorville Dam is located in central Iowa on the Des Moines River approximately 11 miles upstream from the city of Des Moines. The permanent conservation pool of the reservoir lies at an elevation of 833 feet above sea level, and extends some 17 miles upstream from the dam to a point between Polk City and Madrid, inundating about 5,500 acres of land. The flood control pool, which will be allowed to fill only during periods of maximum flooding, will rise to an elevation

of 890 feet above sea level, inundating approximately 16,700 acres of the valley extending some 54 miles upstream to the town of Fraser in Boone County.

It was apparent that the Saylorville project would destroy or adversely affect a large but unknown number of archaeological sites. Fortunately, the Federal Antiquities Act of 1906, the Historic Sites Act of 1935, and other enabling legislation provided a way to meet the emergency and mitigate the destruction. Consequently, the first archaeological surveys of the area began in the early 1960s, sponsored by the National Park Service and involving personnel of the University of Iowa archaeological laboratory and the Smithsonian River Basin Surveys. In 1967, the Iowa State University Archaeological Laboratory (ISUAL) began a more extensive program of investigation as the result of cooperative agreements between Iowa State University and the National Park Service, the State Historic Preservation Program, and the United States Army Corps of Engineers. The program provided for more intensive surveys of the area, as well as the testing and excavation of selected archaeological sites. The excavation of the Brassica Bench site (13PK251)[1]

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[1]Following the procedure of the Smithsonian Trinomial System, the Brassica Bench site was designated 13PK251: 13 is the number for Iowa in an alphabetically-arranged list of states, PK indicates that the site is located within Polk County, and 251 designates the number of the site within Polk County.

took place in 1975 as part of this program. Located within the flood control pool limits of Saylorville Reservoir (see Figure 1), the site is the subject of the present study.

The author did not participate in the excavation, although he was able to visit the site both during and after its excavation, in the course of his duties as an ISUAL field assistant and archaeological monitor in the Saylorville Reservoir project. A general interest in Woodland cultural manifestations of the Prairie-Plains, and a desire to produce an archaeologist's "basic document" (Hole and Heizer 1973: 416) dealing with the subject, led to the undertaking of the present study.

Statement of Purpose

It is the intent of this study to describe in a systematic manner 1) the investigation and the analysis of materials from Brassica Bench site, and 2) the ecological setting of the site. This study is meant to be a site report, concentrated on the description and interpretation of the prehistoric manifestations, which consist essentially of a Woodland occupation area. The secondary emphasis of the study centers on the regional "ecosystem" within which the occupants of the site operated. The goal is to describe the ecological setting in terms of exploitive potential and prehistoric subsistence-

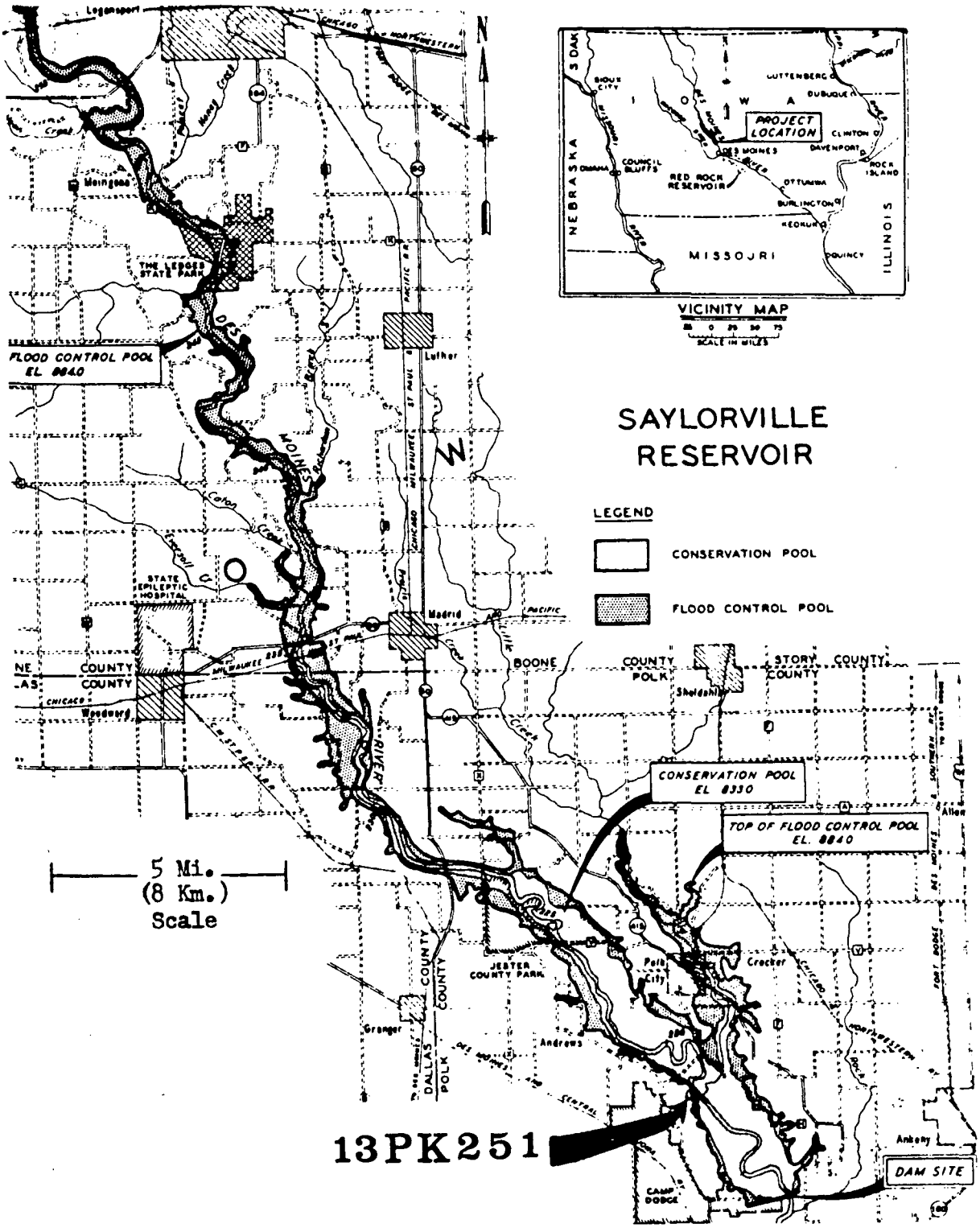


Figure 1. Map showing location of the Brassica Bench site within Saylorville Reservoir (Modified from a map provided by the U.S. Army Corps of Engineers)

settlement patterns. The study is considered justifiable in that it contributes needed documentation to the culture-historical record of the region and provides a potentially better understanding of prehistoric adaptation within the central Des Moines River Valley region.

Methodology

Standard archaeological field procedures, as described by Hester, Heizer, and Graham (1975), were employed during the discovery and excavation of the Brassica Bench site. These procedures are discussed further in Chapter 3, but basically included location of the site by means of surface collections, testing by means of test pits and trenches, setting up a locational grid, excavating the buried cultural zone, and documenting the location of artifacts and features. In addition, heavy emphasis was placed on investigation of prehistoric subsistence resources by means of soil sampling and the water flotation technique.

Standard archaeological analytical procedures were employed as a means of introducing order into the mass of data. The remains have been described in terms of categories, divided into smaller classificatory units, which correspond to a variety of natural, formal, and functional attributes.

The classifications are intended to simplify the comparison of these remains with those of other sites. In line with the goals described by Hole and Heizer for archaeological site reports (1973: 416-418), an attempt has been made to provide clear and complete description of the data presented apart from interpretation of the evidence, hopefully enabling other archaeologists to interpret the data in their own way and for their own purposes.

The analysis of the ecological setting, however, has necessarily and purposefully been interpretive as well as descriptive. The subject has been approached from the theoretical standpoint of cultural ecology, a subfield of anthropology which views the workings of cultural systems in ecologic terms. As Sanders and Price describe it,

> The cultural ecologist sees the culture of a given people as a subsystem in interaction with other subsystems. He argues that the key to understanding the developmental processes of the cultural subsystem lies in this interactive relationship. The total network of relationships between subsystems has been called the "ecological system" or "ecosystem." It includes three subsystems--culture, biota, and physical environment (1968: 171).

Of course, the problem with this approach as applied to the present case is obvious: since no direct ethnographic or historic evidence is available, our knowledge of the cultural subsystem of the Brassica Bench inhabitants is limited to inference drawn from their material remains and the culture-

history of the region. Despite Binford's suggestion (1962: 218) that the material culture and the material by-products of living relate in a systematic way to the structure of the total culture, certain aspects of the cultural subsystem can never be fully known. Drawing upon Hawkes's (1954: 161-162) model for the reconstruction of sociocultural activities from archaeological evidence, it is assumed that technology and economy can be determined with a high degree of validity, while the socio-political and magico-religious aspects are impossible or at least difficult to reconstruct. Similarly, interrelationships involving the Brassica Bench inhabitants and other cultural subsystems can be determined only inferentially, primarily through reference to what is known of the culture-history of the region. Procedurally, the latter has involved drawing upon archaeological and historic documentation.

While the cultural subsystem can be only imperfectly known, the rest of the ecosystem can fortunately be described with some certainty due to the wide range of scientific studies which can be used to pursue the matter, and this the present study intends to do. Procedurally, this has involved drawing upon data produced by botanists, zoologists, physiographers, geologists, and soil scientists, among others. Both the macro-cosmic and micro-cosmic aspects of the

ecological setting have been emphasized, the latter aspect being examined primarily in terms of site catchment analysis, which assumes that..."other things being equal the further the land is from the site the less likely it is to be exploited from it" (Jarman, Vita-Finzi, and Higgs 1972: 62). This analytical approach is based on studies of modern agricultural and hunting and gathering economies, which have shown that the territory exploited from a site (that is, the site catchment) tends to lie within certain well-defined limits. Based on these studies, the distance covered in two hours' walking time (ca. six miles, or eight to ten kilometers) is postulated as the "critical threshhold" for hunting and gathering economies, and one hours' walking time for agricultural exploitation (Jarman, Vita-Finzi, and Higgs 1972: 63). Beyond these limits, the costs of exploitation rise to oppressive heights and the home base has to be moved.

Plan of Presentation

The discussion of this study is presented in the following manner. The ecological setting is examined in Chapter 2, which focuses on the environment and the culture-history of the site and the region. Chapter 3 presents an account of the investigation and excavation of the site.

The excavated data are described in Chapter 4, while Chapter 5 reports on the material recovered by means of the water flotation technique. Chapter 6 briefly summarizes the data, and presents interpretive comments.

CHAPTER 2.

THE ECOLOGICAL SETTING

Environmental Considerations

In describing the environmental setting of the Brassica Bench site, this section deals with three separate but interrelated subjects. First, the macro-cosmic setting is described, focusing on the significance of sub-units within the central Des Moines River Valley region. Second, the micro-cosmic setting is examined by means of site catchment analysis. Finally, the environment of the site is considered in terms of its impact on the preservation of the archaeological remains as discovered and retrieved by the excavators.

The Region

The Brassica Bench site is located near the center of an archaeologically-defined spatial unit known as the central Des Moines River Valley region (Gradwohl 1974: 90). The region stretches along the Des Moines River from the Red Rock Reservoir Dam near Pella, Iowa, north to the upper reaches of Saylorville Reservoir near Fraser, Iowa, encompassing a distance of some 76 miles, or 123 river miles as the river flows today. In terms of larger distinctions, the region

lies within and near the western border of the Central Lowlands Province of North America as defined by Fenneman (1938). The most important environmental factor affecting the region is, of course, the Des Moines River, which has a gradual gradient and a meandering course. A tributary of the Mississippi, it is the largest river in Iowa.

Climatically, the region is located within an area known as the Prairie Peninsula (Transeau 1935), which constitutes a geographically unique climatic formation characterized by seasonal extremes, temperature and precipitation variation, and frequent local, rapid changes in the weather (Sawyer and Lindsay 1963). The climate is classified as subhumid (Trewartha 1954: 330). At the city of Des Moines in the center of the region, the yearly temperature ranges from -30^{o} to 110^{o} F, with the annual precipitation averaging between 30 and 32 inches and occurring mainly during the growing season. Despite minor fluctuations in the weather over the past five or six millennia, the climate of today is apparently much the same as that which occurred during the last two thousand years within which the prehistoric human occupation of Brassica Bench occurred (Ruhe 1969: 194).

Drawing upon historical data (Dick-Peddie 1955), soil survey data (Oschwald et al. 1965), and botanical studies (Aikman and Gilly 1948; Pammel, Weems, and Lamson-Scribner

1901), the prehistoric vegetational pattern of the region can be described as primarily tall grass prairie, interfingered by riverine deciduous forest. The forest vegetation consisted of mainly oak and hickory on the uplands bordering the valleys, and maple and linden on the slopes, with willow and cottonwood scattered throughout the bottomland of the valleys. Outside of the major river valleys the forest was mainly confined to willow and cottonwood located along small stream courses. The prairie vegetation, which was found on terraces within the major river valleys as well as on the uplands, consisted mainly of big blue stem, little blue stem, wild dennet, grama and fescue grasses. In contrast to the "climax" vegetation of those areas, the prairie-forest interface was dominated by shrubs producing a variety of edible fruits and berries, including wild plums, currants, raspberries, blackberries, gooseberries, strawberries, and wild grapes. These shrubs were also scattered throughout the forest in occasional, lightly-shaded areas.

Outside of the prairie-forest interface area, a number of other floral food resources were also available. On the upland prairie, the prairie turnip (Psoralea esculenta and P. agrophylla) provided a dependable and dietetically valuable source of sustenance (Kaye and Moodie 1978). Forest resources included various edible fungi and nuts from such trees as the walnut, hazelnut, butternut, and beechnut. In the portions

of the valley bottomland subject to flooding, edible and highly productive plants such as sunflower, lambsquarter, smartweed, pigweed, ragweed, and marsh elder could be found.

The vegetation of the region also provided a wide variety of items useful in more utilitarian ways. Basswood, nettle, and Indian hemp fibers, for example, were available for the manufacturing of cordage, while mats for shelters could have been made from cattails. The forest probably provided, among other things, wooden shafts for arrows and darts, saplings and posts for structures, and fuel for fires.

The main fauna of the region, in terms of aboriginal exploitation, included the bison, pronghorn antelope, and wapiti or American elk on the prairie; deer, bear, opossum, and raccoon in the forested area; and beaver, muskrat, and otter in riverine locations. Several other species of mammals were also present, including the shrew, mole, bat, rabbit, fox, squirrel, gopher, mouse, nutria, weasel, skunk, ermine, badger, and mink, accompanied by such predators as the wolf, coyote, mountain lion, lynx, and bobcat (Bowles 1975). Various migratory waterfowl, turtles, and fish were also present in the riverine area, along with edible molluscs.

The prehistoric resources of the region were not confined to the animate realm. A wide variety and unlimited supply of lithic materials, for example, were present as part of stream

gravels and within the glacial till and limited bedrock strata. Even a minimal listing of the lithic resources would encompass all the kinds of stone found at the Brassica Bench site, including various forms and grades of chert, as well as argillite, quartzite, quartz, silicified silica, sandstone, hematite, granite and basalt.

Clay for the making of pottery was also readily available, from at least four possible sources: in alluvial deposits along the rivers, in upland sloughs, in natural horizons in the soil, and in the bedrock "coal measures." Bain, in fact, described the situation in Polk County as being one of "inexhaustible quantities of clay of ...widely varied adaptabilities" (1897: 368). Historically, the coal measures have been the source of most of the clay worked commercially in the county. According to Bain, these "abound in clays and shales which vary greatly in composition, texture, and adaptabilities" and "have been proven by careful experiment to be well adapted to the manufacture of certain classes of terra cotta and pottery" (1897: 368). Prehistorically of course, as at present, the best access to coal measures clays within the region was afforded within the Des Moines River trench, where the bedrock formations were exposed by the cutting action of the river and associated erosion.

Subregional distinctions

While the data listed above are common to the entire region, a strong case can be made for regarding the region as being composed of two distinctive subregions, based on physical, biological, and cultural criteria. While the lack of homogeneity within the region has been briefly acknowledged in passing by previous archaeological researchers (cf. Gradwohl 1967, 1974; Osborn 1976), elaboration of the matter is required if the regional ecosystem is to be fully understood. Since the subject has a direct bearing on various aspects of the Brassica Bench site, the subregions will be provisionally defined and described within the present study, although no criticism is intended of the spatial boundaries of the region as presently defined. The original definition was influenced to a large degree, as is often the case, by the "vagaries of archaeological history" (Gradwohl 1974: 90; Willey and Phillips 1958: 19). In this case the "accidental factor" was the construction of Red Rock, Saylorville, and Big Creek reservoirs, and the resulting concentration of archaeological research in those area. Rather, this discussion is meant to explicate and elucidate the nature of the ecosystem, and to point out the variety of choices that were available to the occupants of Brassica Bench and all other inhabitants of the region because of the diversity of the environment.

Drawing primarily upon observations derived from physiographic studies (Lees 1916, Bain 1897, Ruhe 1969, and Prior 1976), the central Des Moines River Valley region can be divided into a northern subregion lying above the mouth of the Raccoon River at the city of Des Moines and a southern subregion, located below the mouth of that river (see Figure 2). The pricipal element of differentiation is the presence of the Des Moines Lobe in the northern subregion (see Figure 3). The Des Moines Lobe is a relatively unweathered landform consisting of a thick mass of glacial drift, occasionally up to 150 feet thick, deposited by the Cary advance of the recent Pleistocene Wisconsin glaciation. The landscape of the Lobe is less than 12,000-13,500 years old (Oschwald et al. 1965: Figure 12). The southern subregion lies within a sharply contrasting area known as the Southern Iowa Drift Plain, a geomorphic surface which derives primarily from the Kansan glaciation of ca. 500,000 years ago. While the heavily-weathered Kansan drift has since been covered by a mantle of loess, the topography is essentially that of the pre-Wisconsin landscape. In Lees' words, we have "the unique phenomenon of a young valley being attached to a mature valley" (1916: 463).

The difference in the maturity of the landscape manifests itself in numerous ways. For example, the surface topography

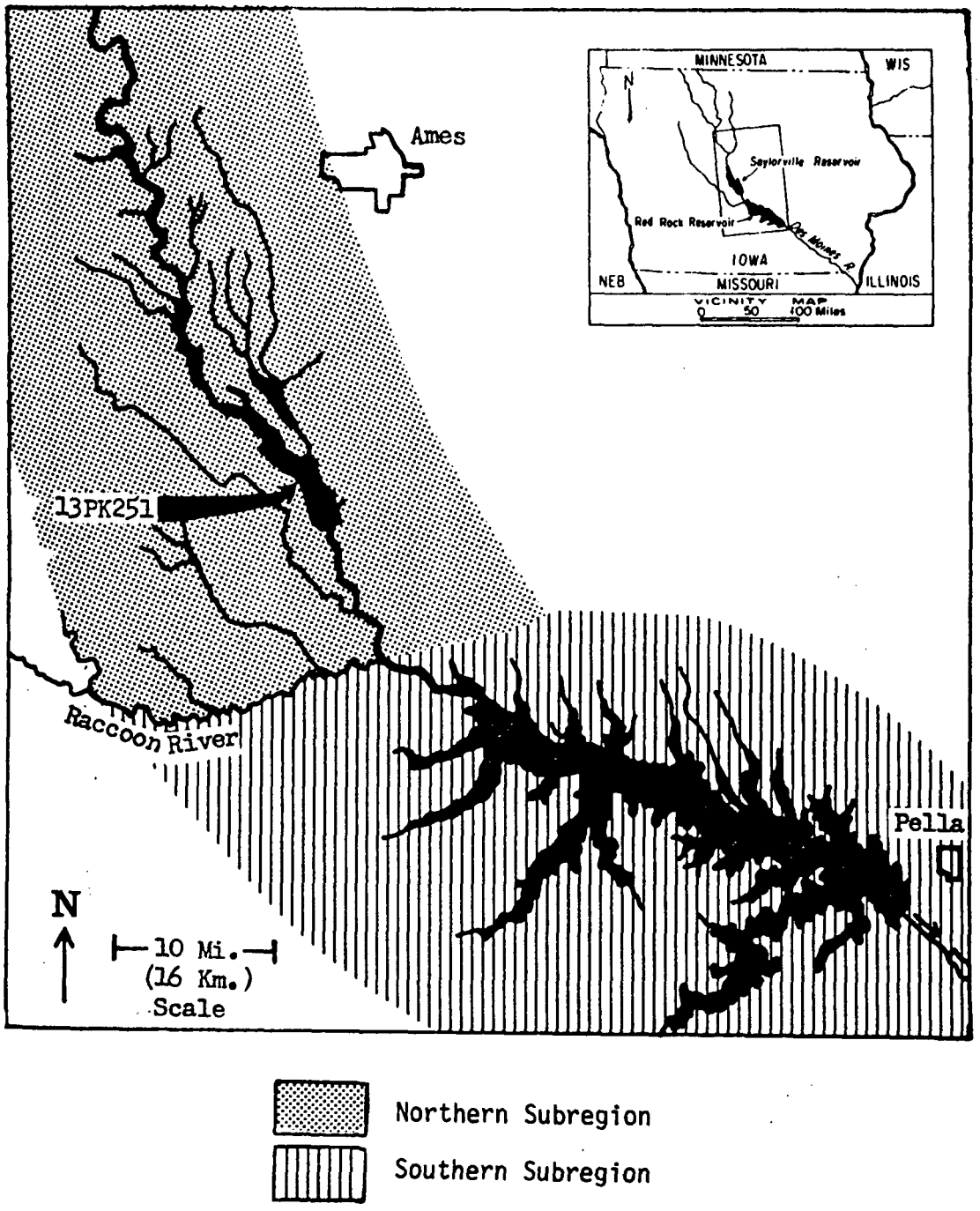


Figure 2. Map of the archaeological region (Lateral boundaries of subregions have been roughly approximated. Map is adapted from Gradwohl 1974: 91)

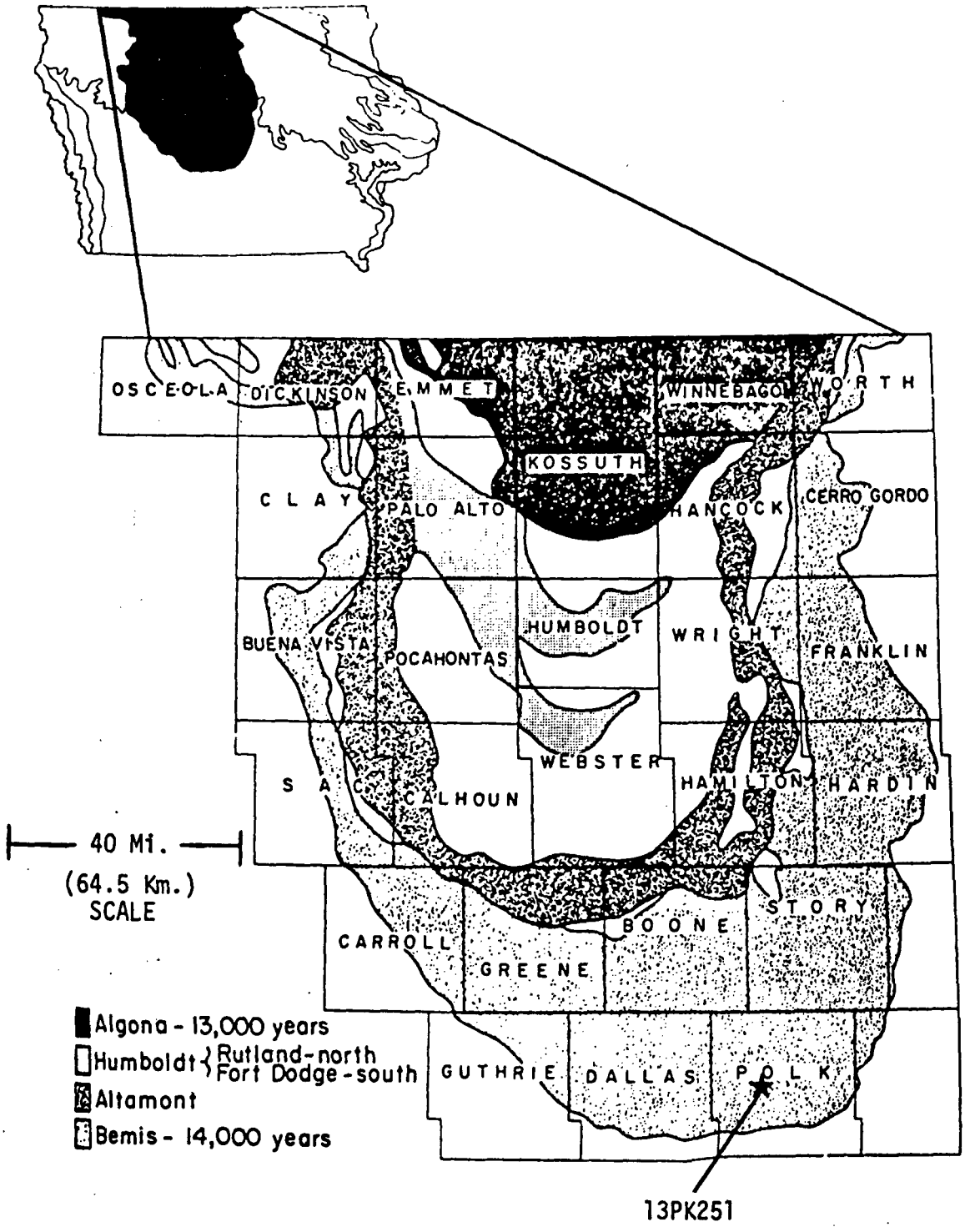


Figure 3. Map showing location of the Des Moines Lobe in Iowa (Map is adapted from Ruhe 1969: 55)

of the Des Moines Lobe is one of monotonous flatness, punctuated only by small swells, swales, and occasional morainic hills. The divides are broad and have little slope. South of the Lobe in the southern subregion, the topography is one of steeply rolling hills and long, narrow, upland divides, with the largest percentage of the land surface being sloping. Concomitantly, the northern subregion displays an undeveloped drainage pattern characterized by the presence of swampy areas and ephemeral ponds -- "prairie potholes" -- in the uplands, and a narrow, steep-walled, comparatively V-shaped river valley. The Des Moines River here has but few tributaries, most of them issuing from little more than short, steep-walled ravines, or conversely, broad glacial sags. In the southern subregion, the effect of the river and its tributaries is very noticeable, having resulted in a highly dissected topography with a well-developed drainage system. Here the Des Moines Valley is generally broad and U-shaped, with a wide floodplain and low, flat, alluvial silt terraces. Numerous tributaries, with similar morphological features, extend far into the prairie.

Other differences of a lesser nature are also observable. Benches and high, narrow gravel terraces are common in the northern subregion but missing in the southern, where wide, low, silt terraces are the common sight. The walls of the upper valley occasionally rise up to 260 feet above the floodplain

of the Des Moines River and generally average about 100-150 feet in height, while the relief in the lower subregion is much less pronounced. Moreover, the upper valley constricts in places to widths of only a quarter mile or less from upland to upland, while broadening up to six to ten miles wide in the southern subregion. The slopes of the valley walls also differ. The slopes of the upper valley, while comparatively V-shaped, generally consist of steep bluffs on the western (right bank) walls, facing occasionally-terraced, less steep eastern walls. By contrast, the valley walls in the southern subregion have no uniform relationship to one another, with shallow, smooth slopes being most common.

The vertical stratigraphy as exposed in cut banks along the valley constitutes another distinctive difference. In the upper valley, great masses of gravel and rock-laden till, sometimes up to 150 feet deep, overlie the darker clay, shale, and coal beds of the coal measures. In the southern subregion, the common scene is the fine-textured, featureless loess mantle, only 30 to 40 feet or less in thickness, overlying the prominent reddish "stone line" of the Kansan till. The rocks of the two tills also differ, those of the Kansan till being smaller and more frequently flattened and striated than those of the Cary till (Bain 1897: 338).

The transition between the two subregions is easily evident, even though the terminus of the Des Moines Lobe is

not particularly prominent in the eastern portion of Polk County. The valley changes "abruptly and markedly" (Lees 1916: 558) in both character and direction, the river leaving the Lobe through a narrow, steep-walled valley with seventy-five-foot high bluffs and entering a broad plain two to three miles across, turning at the same time from a southerly to an easterly course.

These physiographic differences are significant in terms of the ecosystem in two main ways. First, they are easily observed, thus serving to clearly differentiate the two subregions in terms of visual impact. Second, and more importantly, these differences greatly influence the biome of the region; the main difference in this respect being one of degree rather than kind. Simply put, the northern subregion had a much smaller forested and riverine area than the southern subregion (see Figure 4), and hence would have supported much smaller populations of the flora and fauna which depended on such conditions. In the southern subregion, the forest extended far from the main river valley along the many tributaries, and even occurred in the form of scattered oak-hickory groves out on the prairie.

These distinctions would obviously have been of great significance in terms of prehistoric ecosystems of the region. Woodland-oriented hunter-gatherer economies, for example,

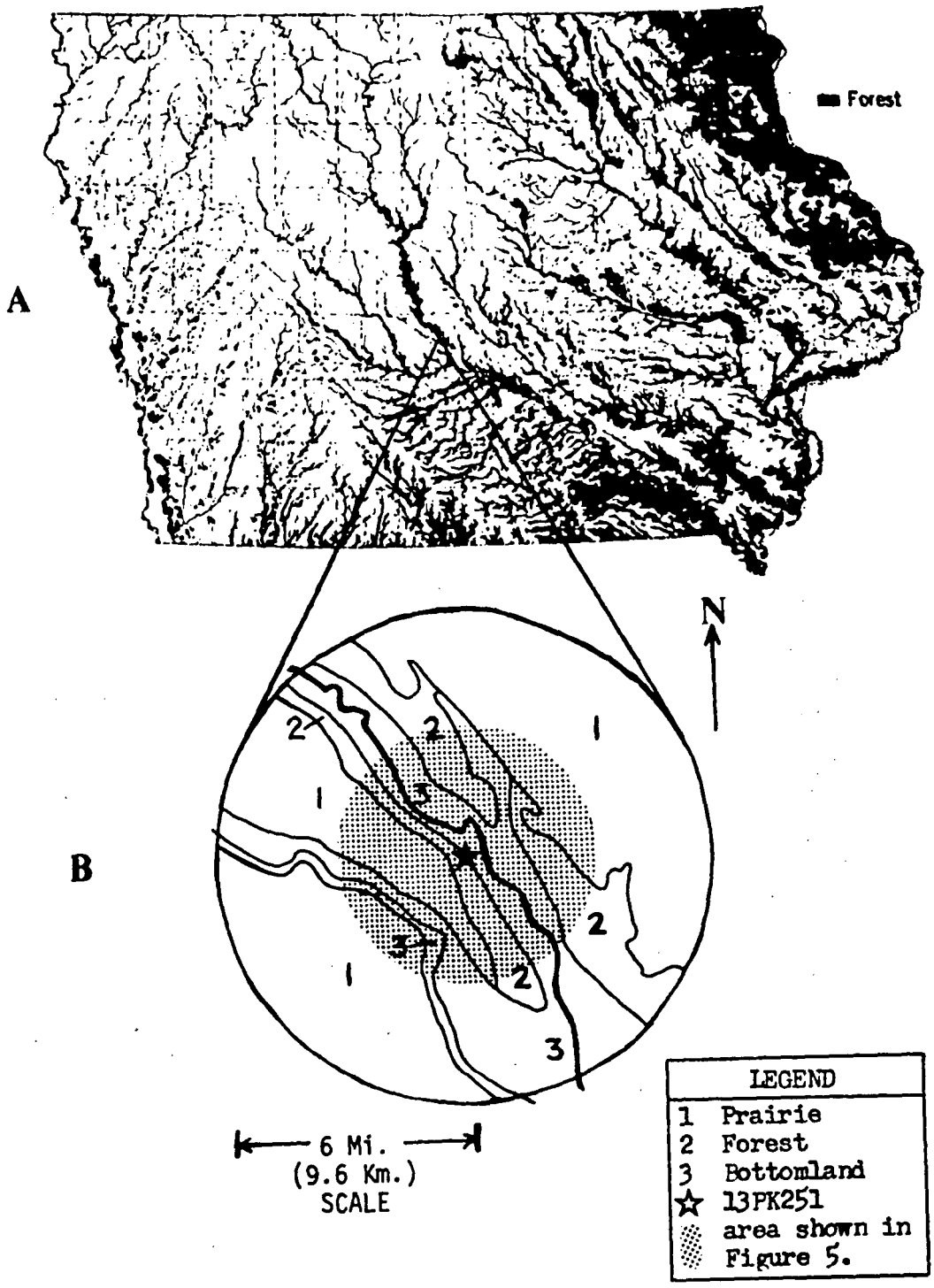


Figure 4. Vegetational map of Iowa and the site catchment (A: the state, adapted from Oschwald et al. 1965: 9; B: the site catchment, modified from McCracken et al. 1953: 7)

faced far fewer exploitive possibilities in the northern subregion as compared to those in the southern subregion. At the same time, the northern subregion offered distinct advantages in terms of accessibility to prairie resources, and winter shelter. Prehistoric agriculturalists would have similarly found these distinctions to be important, since the southern subregion, with its fertile, open, easily-cultivated terraces and ready water supply, offered "an ideal setting" (Osborn 1976: 12) for the kind of agricultural activities occurring throughout the Prairie-Plains in late prehistoric and early historic times. In the northern subregion, good agricultural locations are far fewer and more limited in size. Judging strictly from the physiographic and biotic aspects of the ecosystem, the central Des Moines River Valley region can with good reason be regarded as having significant intra-regional variation.

The site catchment

In terms of the provisional definitions just stated, the Brassica Bench site is located in the northern subregion (see Figures 2 and 3); more specifically, it lies on a small "bench" (Ruhe 1969: 158) nestled against the west wall of the Des Moines River Valley opposite the mouth of Big Creek. The legal provenience of the site is the NE 1/4 of the SW 1/4 of the SW 1/4 of Section 13, T 80 N, R 25 W. The site lies at

an elevation of 35 - 45 feet above the floodplain, or 855 - 865 feet above sea level, while the uplands bordering the site on the north and west rise 50 - 100 feet higher than the site.

The bench is rather small -- only about 3,200 square feet (294.4 square meters) in area -- but the site seems optimally located in several respects. The elevation of the site, for example, ensures safety from floods and enables visual scanning of a large portion of the valley floor (see Plate 1). Topography and forest cover protect the site from the northwesterly-prevailing winter winds, while providing shade and ventilation in the summer. Water is always close by, since the confluence with Big Creek forces the river to the west side of the valley at this point.

In terms of site catchment analysis (Jarman, Vita-Finzi, and Higgs 1972), the exploitive potential of the site catchment exploited by the Brassica Bench occupants can be estimated by reference to Figures 4 and 5, which depict the prehistoric vegetational pattern as inferred from soil survey data (cf. McCracken et al. 1953). Due to the problems in reducing the soil survey map to a size appropriate to the present manuscript, only the immediate site catchment area (ca. three miles or five kilometer radius) is shown in detail (see Figure 5). Probably the most notable factor within the site catchment is the confluence of the Des Moines

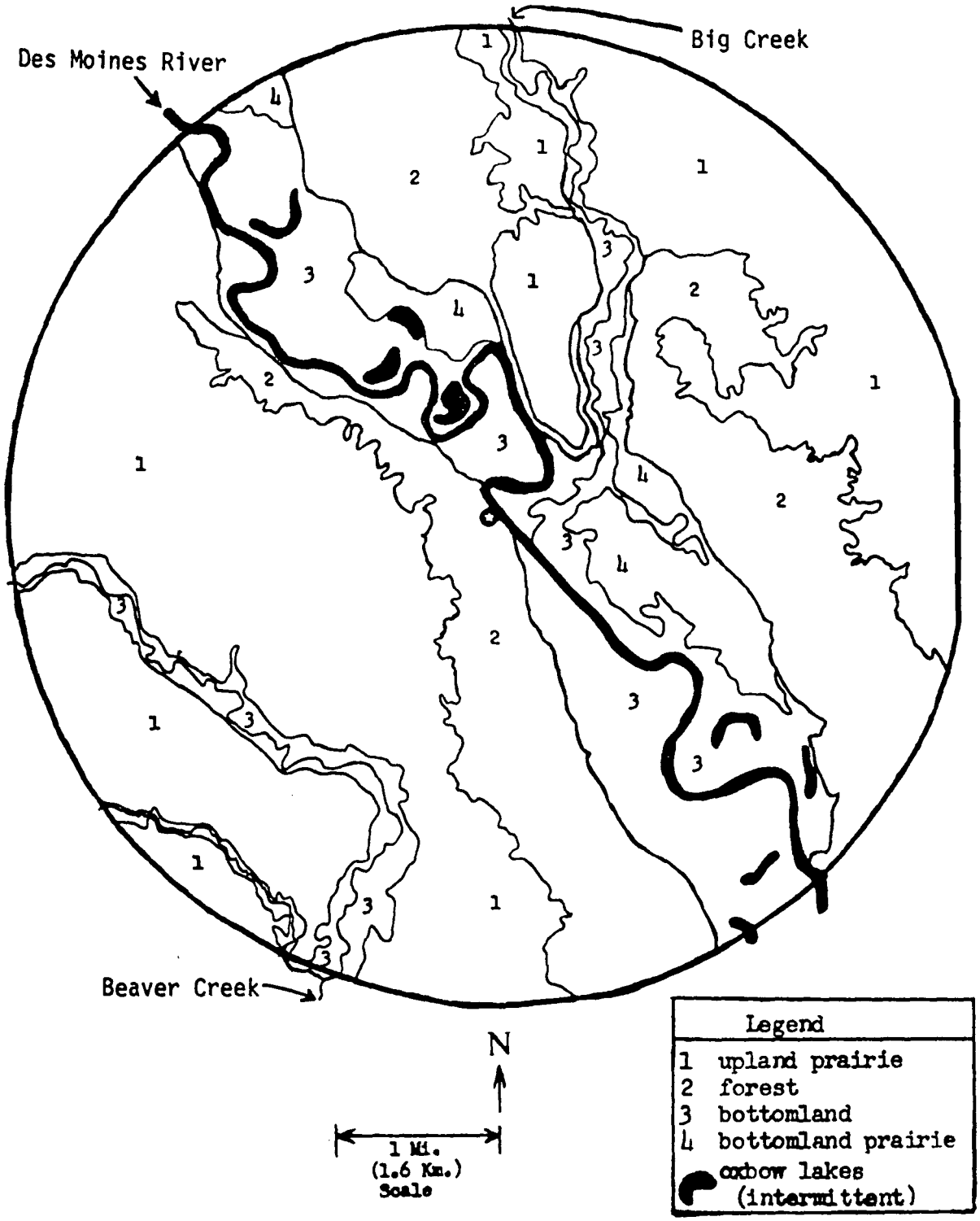


Figure 5. Vegetational map of the local site catchment (Map modified from McCracken et al. 1953: Sheet No. 1, 5, and 6)

River with Big Creek, the largest tributary within the site catchment. Annual spring floods would have forced water to back up along the river and into the Big Creek drainage, ensuring silt deposition and creating an ideal habitat for lambsquarter, marsh elder, and other such plants. The same floods would have left fish stranded in oxbow lakes, and the lakes in turn would have provided a habitat for migratory wildfowl and molluscs. Beaver Creek, which meanders through a broad, glacial-sag valley to the west of the site, may also have been of some importance, although the soils along this watercourse indicate that very little forested area was present, other than bottomland flora consisting mainly of willow and cottonwood. The confluence of Beaver Creek with the Des Moines River lies just outside of the site catchment, but flooding -- and associated resources -- would have been plentiful in that location.

In terms of forest resources, the right bank of the Des Moines River was relatively depauperate, with only a narrow, clearly delineated strip of forest border. The left bank had a slightly larger forested area, but apparently the forest cover was either transitory or sparse, or recent, since about half of this area was mapped as prairie-forest transition soils by the soil surveyors (McCracken et al. 1953: Sheets No. 1, 5, and 6). Elsewhere, it is explained

regarding these kinds of soils that "Centuries ago, the native vetetation was prairie grass; later trees encroached" (Oschwald et al. 1965: 37). One assumes that the growth of fruit and berry-producing shrubs was facilitated by this situation, and that deer, who apparently prefer forest edges of this sort (Struever 1968a: 310), would also have been quite plentiful in the area. On the right bank, by contrast, these transition soils occupy much less area and are found only at the prairie-forest interface. This suggests that the interface here was more clearly delineated, with a narrow but fairly continuous zone of shrubs located only a few minutes walk from the site.

The same short walk would, of course, have brought one to the prairie, thus facilitating access to prairie resources. As is apparent from Figures 4 and 5, the prairie was by far the predominant form of vegetation in the site catchment. Prairie fauna, moreover, would have been found not only on the upland to the west and east, but also on the riverine prairie located to the east of the site on the terraced left bank of the river, below the mouth of Big Creek. Herds of these animals would likely have used Big Creek as a means of egress, making their movements easily visible from the site.

To conclude, a large complex of potentially harvestable resources were available to the occupants of the Brassica

Bench site within the site catchment. While prairie resources were the most widespread, forest and bottomland resources were substantial and close at hand. Foot access to all of these resources would have been hampered only by spring floods; the river at other times of the year providing a means of maritime transportation.

The environmental impact on the archaeological remains

As Hole and Heizer have pointed out, "Accurate reconstruction of prehistory depends on the preservation of artifacts" (1973: 88). Unfortunately, it can be assumed that the environmental conditions at the site have adversely affected the preservation of the Brassica Bench archaeological remains in several ways.

Most importantly, the site conditions would not have been conducive to the preservation of organic remains. As mentioned, the site is located on a bench. The soil is mapped as Hayden loam, a soil formed by forest vegetation (McCracken et al. 1953: 32, and Sheet No. 5). Forest soils are usually very acidic, and tests conducted by E.A. Bettis of the Iowa State University Department of Agronomy confirmed that the pH value of the Brassica Bench soil, at least in one centrally-located excavation unit, ranged from 5.9 to 6.6, a level of acidity which would virtually ensure the destruction of bone artifacts and other osteological remains (Biek 1963: 181). Climatic variation can be assumed to have resulted in

destruction of plant remains, unless they were carbonized (Western 1969: 178, Hole and Heizer 1973: 89).

In addition, the nature of the soil cover would have contributed to the "smearing and blending" (Ascher 1968: 50) of archaeological materials deriving from different occupations of the site. Tree falls and the activity of burrowing animals and worms, for example, can be assumed to have moved artifacts about the site both vertically and laterally. Rain, occurring directly or as sheetwash, undoubtedly moved some surface materials downslope. Since the former living surface sloped slightly to the south and east, archaeological remains may have shifted somewhat in that direction. Unfortunately, forest soils are quite slow in terms of buildup of the surface, as opposed to the situation in floodplains, where sites become deeply buried and stratified by frequent alluvial deposition. While Brassica Bench did receive slopewash deposits from the uplands, erosion probably rendered this factor somewhat negligible in terms of burial of archaeological remains. Generally speaking, it is assumed that the larger the artifact, the better chance it had of remaining in situ.

These same environmental conditons would also have contributed to the human impact on the site. The recycling of tools and source materials left at the site by its earliest inhabitants was undoubtedly facilitated by the thin

soil cover, since these artifacts would have been located on or at the surface of the site and hence would have been easily found. Artifacts from the earlier occupations may have been removed from the site as a result, but it is more likely that they were simply reused and again discarded. It is likely, therefore, that the Brassica Bench site has gone through a process observed in several ethnographic studies (e.g., Ascher 1968, Stanislawski 1973), where "In general, those materials that are adaptable, or potentially adaptable, tend to contract in space-time and to accumulate in the more recent areas of the community (Ascher 1968: 51).

Culture-Historical Considerations

Prehistoric and protohistoric occupations of the region

Archaeological evidence indicates that members of several distinct cultural traditions have participated in the regional ecosystem, although at present, occupation prior to the Christian era "cannot be demonstrated on the basis of contextually excavated data or radiocarbon dates" (Gradwohl 1974: 93). The following section discusses the evidence relating to prehistoric human presence in the region, employing the cultural affiliations outlined for Iowa by Keyes (1927) and McKusick (1964); unless stated otherwise, dates given here for these cultural units are approximate, generalized from the

temporal boundaries described variously by Griffin (1967), McKusick (1964), Willey (1966), and Stoltman (1978). The discussion concentrates on the two prehistoric traditions -- Woodland and Oneota -- whose remains are found at the site; a more complete account of regional prehistory is available in Gradwohl (1974).

Paleo-Indian Evidence for occupation of the region by Paleo-Indian groups is scanty, resting primarily on a few surface finds of projectile points resembling such types as Agate Basin and Angostura (Gradwohl 1974: 93). The Paleo-Indian tradition is considered, on the basis of evidence garnered from throughout the Prairie-Plains and the East, to have centered on big game hunting, first of the pleistocene fauna and later of modern bison (Macgowan and Hester 1962: 143-205, Davis and Wilson 1978), although a more generalized subsistence base has been postulated by Griffin (1967: 176). Temporally, the tradition was in existence for an unknown number of years prior to 7,000-8,000 B.C. It is interesting to note that Paleo-Indian groups may have observed the region at the time of its greatest degree of differentiation, that is, during and immediately after the Wisconsin glaciation.

Archaic Evidence for occupation of the region by Archaic groups is similarly scanty, resting on surface finds of projectile points resembling such lanceolate types as

Meserve and Nebo Hill; although the presence of medium-sized side-notched projectile points with ground bases is also considered suggestive of early occupations in the region (Gradwohl 1974: 93). The Archaic tradition is generally thought to span a time range from ca. 7,500 - 1,000 B.C., a time period which saw the beginning of a warming trend culminating in "the time of the prairie in Iowa" (Ruhe 1969: 194), which has carried through to the present. The Archaic subsistence pattern is believed to have centered on foraging, that is, "the collection and utilization of every food resource available in the area" (Fowler 1971: 392), and it is possible that Archaic groups were cultivating such plants as sunflower and marsh elder (Fowler 1971: 393, Yarnell 1976: 266). A seasonally shifting subsistence-settlement system, more regionally oriented and thus assumedly less nomadic than the Paleo-Indian way of life, apparently constituted the chief mode of exploitation, although excavated evidence from western Iowa indicates that bison hunting remained an important part of the subsistence base for Archaic groups on the Plains (Anderson and Shutler 1978: 133-136, Frankfurter and Agogino 1960: 65-70).

Woodland A great deal of archaeological evidence, including both excavated data and surface finds, attests to a widespread and relatively intensive occupation of the region

by the Woodland cultural tradition (Gradwohl 1974: 93-95). Radiocarbon dates indicate an occupation between A.D. 250 to 570 (Gradwohl 1974: 94). The tradition is believed to have lasted well into the protohistoric period, although it has been suggested that the Woodland tradition on the Plains ends around A.D. 950 (Brown 1967: 73). Three Woodland developmental stages are currently recognized: Early Woodland, Middle Woodland (ca. 200 B.C. to A.D. 400-600) and Late Woodland.

Judging from ceramics, which appear during the Woodland period, there is little evidence for Early Woodland occupation of the region; ceramics for the most part being "recognizably Middle Woodland" (Gradwohl 1974: 95). Cord-impressed ceramics from the Saylorvillage site (13PK165), located about two miles downstream from the Brassica Bench site on the left bank of the river, are regarded along with other evidence from the site as proof of a substantial Late Woodland occupation (Osborn, Gradwohl, and Thies 1978: 94), but there is little other such ceramic evidence from the rest of the region (Gradwohl 1974: 95).

Evidence of the inclusior of the inhabitants of the region within the Middle Woodland "Hopewellian Interaction Sphere" (Struever 1964) was manifested quite strikingly in the Boone Mound, an elaborate mortuary earthwork now unfortunately destroyed, located in Boone County, Iowa (Van Hyning 1910). In Gradwohl's view, the Hopewellian and other Middle Woodland

manifestations in the Des Moines River Valley "would seem to parallel" the better-known westward extension of Hopewell up the Missouri River to the Kansas City locality (1974: 94). In light of the subregional distinctions discussed earlier, it is interesting to note that "...specific Hopewellian (ceramic) elements appear to be stronger in the northern sector of the region than in the southern" (Gradwohl 1974: 95).

No direct information has been forthcoming concerning the subsistence base and economy of the Early Woodland and Middle Woodland inhabitants of the region, although generalized hunting and gathering can be inferred from the artifacts. Elsewhere, it has been inferred that a marked change in ecological adaptation occurred, at least in the lower Illinois Valley, between Early and Middle Woodland times (Struever 1968a). Struever describes the shift as moving from diversified collecting of riverbottom fauna, and perhaps plant foods, to "Intensive Harvest Collecting," a term denoting an adaptation centered on the intensive "harvest" collecting of five main resources: nuts and acorns, the seeds of various river-bottom plants, white tail deer, migratory waterfowl, and certain species of fish (1968a: 305). Accompanying the shift in subsistence was a change in the settlement pattern, basically involving a move from temporary and shifting "Shoreline Settlements" on the valley floor, to long-term "Base Settlements"

situated at the base of steep bluffs at the edge of the valley, usually on the west side of the valley and usually at the junction of a secondary stream with the main river (Struever 1968a: 303, 307).

Concerning the subsistence base of the Late Woodland populations of the region, direct evidence is confined to that provided by the Saylorvillage site. Although little other evidence was forthcoming, the seeds of several cultigens were found, including 15 kernels of corn (Zea mays), and one squash, gourd, or pumpkin seed (Cucurbitaceae family), thus providing the earliest documented example of agriculture within the region (Osborn, Gradwohl, and Thies 1978: 88, 103). Archaeological evidence from elsewhere in the Prairie-Plains further confirms the move to agriculture during this period (Kivett 1952: 57-58, Strong 1935: 268, Hurley 1975: 393), although it has been suggested that this move began in Middle Woodland times (Griffin 1967: 183).

Great Oasis Substantial evidence exists to document an extensive occupation of the region by this cultural tradition. Radiocarbon dates from three excavated sites range from A.D. 975 to 1080 (Gradwohl 1974: 97). The dates and the material from these sites are quite similar to those known for other Great Oasis sites, which are found over a wide area including most of southern Minnesota, eastern South Dakota, northeastern

Nebraska, and northwestern and central Iowa (Henning 1971). The excavated evidence from within the region indicates that hunting, gathering, and agriculture were all employed as part of the Great Oasis subsistence system (Gradwohl 1974: 97, Mead 1974). The standard corn-beans-squash agricultural pattern so common to the late prehistoric period was probably in full swing at this time.

It has been argued that Great Oasis developed out of a Woodland base, retaining basic Woodland qualities especially in terms of pottery decoration styles (Henning 1967: 130). The possibility has also been advanced that Great Oasis, at least in western Iowa, was one of several, distinct Late Woodland cultures existing at the same time (Tiffany 1977: 108). The exact nature of Great Oasis-Woodland relationships within the central Des Moines River Valley region remains uncertain.

The distribution of Great Oasis sites within the region is most interesting in light of the subregional distinctions presented earlier. According to Gradwohl (1974: 96-97, and Figure 2), the known Great Oasis sites are almost entirely confined to Boone County in the "northern part" of the region. Moreover, no Great Oasis sherds have been found south of the city of Des Moines, in Red Rock Reservoir, although considerable numbers of such ceramics have been observed in private collections from the lower Raccoon River drainage (Gradwohl 1974: 97).

Oneota A large body of data, including excavated data from four sites, points to an extensive occupation of the region by this cultural tradition. On the basis of this evidence, Gradwohl (1967) has proposed that Oneota manifestations within the region be regarded as constituting a distinct, separate phase of the tradition, designated the Moingona phase, representing a local variant of the late prehistoric and protohistoric Oneota tradition. The Moingona phase is assumed to be a prehistoric rather than a protohistoric manifestation, since no historic trade goods have been found in primary context within Moingona phase sites. The lack of historic contact is also indicated by the available radiocarbon dates, which cluster within the 11th through 13th centuries A.D. (Osborn 1976: 106-107).

Subsistence activities are represented by a wide variety of evidence, indicating a reliance on agriculture combined with hunting and gathering (Gradwohl 1974: 95, Osborn 1976: 126-127). Cultigens which have been identified include the corn-beans-squash triad common to the late prehistoric. A broad-spectrum meat diet, including deer, bison and elk as well as smaller animals and molluscs, was apparently involved.

Oneota archaeological manifestations are found over a wide area, including much of Iowa and southern Minnesota, and portions of South Dakota, Nebraska, Kansas, Missouri, Illinois,

and Wisconsin (Osborn 1976: 17). It has been suggested that most, if not all, of the Oneota groups in Iowa were Chiwere Siouan speakers (Keyes 1927, Griffin 1937, Mott 1938). More recently, M. Wedel (1976) has reinforced this tentative identification, demonstrating that Oneota manifestations of the Orr Focus, primarily located in northeastern Iowa, correspond to archivally- and cartographically-known positions of the Ioway tribal group.

The spatial distribution of the Moingona phase is equally significant with that of the Great Oasis tradition, being approximately confined to the limits of Red Rock Reservoir (Gradwohl 1967), in the area provisionally defined here as the southern subregion. Attempts to locate Oneota sites in the Saylorville Reservoir have proven "totally unsuccessful," although a few isolated shell-tempered sherds have been found, and a complete lack of Oneota materials in private collections observed from the lower Raccoon River drainage has also been reported (Gradwohl 1974: 96).

Protohistoric groups Unfortunately, little archaeological evidence exists within the region which can be linked with certainty to this period of Iowa's past. Knowledge of the Native American groups of this era is almost entirely drawn from analysis of early written records. The earliest information concerning the region is found in the maps of Marquette and Joliet, published in 1673 and 1674. The map places a group

known as the Moingwena in the Des Moines River Valley area, although it is possible that the river referred to is the Iowa River (Mott 1938: 233). The Ioway were reported in the region prior to the 1760s (Woolworth 1956: 33, Mott 1938: 274), although documentary evidence indicates that they were concentrated earlier in northeastern Iowa and southeastern Minnesota (M. Wedel 1976: 24). Other documents indicate that the Sauk and Fox were living on the Des Moines River, north of the Raccoon-Des Moines fork, around 1735 (Mott 1938: 274). By 1830, the Ioway had been forced to cede their land in Iowa and remove to the west, with the Sauk and Fox following suit in 1845, except for one Sauk-Fox group which hid out in southern Boone County until 1846, and another group which remained in hiding along the Iowa River Valley (Gradwohl 1974: 98-99). The latter group, now more correctly known as the Mesquakie, eventually bought land and formed a settlement in Tama County which continues to the present day.

Historic occupations of the region

The Euro-American invasion of the region was initiated by fur traders and trappers, of whom little direct evidence is present. In 1843, Fort Des Moines was established by Federal troops at the fork of the Raccoon River and the Des Moines,

and two years later, the area was officially opened to general white settlement (Gradwohl 1974: 99). Pottery-making was one of the first industries practiced in the area, and several of the early stoneware and earthenware kilns have received archaeological attention (Reynolds 1970, Gradwohl 1974: 100).

CHAPTER 3.

INVESTIGATION AND EXCAVATION OF THE SITE

Previous Investigations

Prior to the discovery of the Brassica Bench site in 1976, two archaeological surveys had been conducted in the general area as a part of the development of Saylorville Reservoir. The first of these was conducted by University of Iowa personnel in 1962, and reported by Ashworth and McKusick (1964). In this survey 15 sites were designated in Polk County. Two of these sites were located in the uplands within half a mile of Brassica Bench. The second survey was conducted by Lionel Brown of the Smithsonian Institution River Basin Surveys, and resulted in the locating of one additional site in Polk County (Brown 1966).

More intensive survey of the Saylorville Reservoir took place between 1967 and 1970, and from 1973 to the present, as a part of the investigative program undertaken by the Iowa State University Archaeological Laboratory (ISUAL). The main goal of this program was to locate, test, and excavate archaeological sites, in an attempt to mitigate the expected adverse impact of the reservoir project on the cultural

resources of the area. By 1974, numerous sites had been located and documented within Polk County. Twelve of these sites were located near Brassica Bench in the uplands on the right bank of the river, between the mouth of Big Creek and the Saylorville Dam (Gradwohl and Osborn 1974: Figure 4).

Part of the archaeological activity called for under the program involved the monitoring of all areas undergoing tree clearing or road and building construction. The monitors were expected to inspect all such areas, in an attempt to mitigate the impact of the disturbance on known sites and to discover new sites exposed by the construction activities.

Tree clearing involved the removal of most trees in the valley up to an elevation of 875 feet above sea level. Within the conservation pool, all trees were to be "cleared and grubbed." The flood control pool area, which includes the Brassica Bench site, was to undergo "selective tree removal" in which only the largest trees were to be removed, usually by cutting rather than grubbing. Concomitant with the tree clearing, access roads had to be built, by leveling and expanding old roads or by bulldozing new ones.

At Brassica Bench, the former situation prevailed: an old farm road, which "stepped" from the uplands down to the bottomland via Brassica Bench, and which had been used "as is"

during the clearing of the trees in the conservation pool, was to be expanded and used extensively during the summer of 1976.

Consequently, the farm road was traversed by ISUAL monitors during the spring of 1976, resulting in the finding of prehistoric artifacts on the surface of Brassica Bench. At that time no site number was given, since the material was thought to be derived from 13PK241, a site in the adjacent uplands. It was assumed that the artifacts had been deposited secondarily as the result of slopewash associated with the erosion of the roadway.

In May, the bench was re-examined by a small ISUAL field crew, resulting in the finding of more artifacts on the surface, and the suspicion that a site existed on the bench itself, quite separate from the upland site. This suspicion was subsequently confirmed by a series of 11 three-foot-square (ca. 0.9 meter) test pits, which yielded more artifacts and indicated that a partially-buried prehistoric site was indeed present. Feature 3, interpreted at that time as a small hearth, was also located as a result of these efforts. On the basis of these investigations, the site was designated as 13PK251, using the Smithsonian Trinomial System, on 12 May 1976.

Excavation of the Site

Rationale

Several factors prompted a decision for full-scale excavation of the site. First, it was certain that the site would be partially or largely destroyed by road construction and tree clearing operations. At the same time, it was possible by means of then-existing agreements to delay road construction and tree clearing in the area and to provide the necessary funding for the project. In addition, access to the site was facilitated by the old farm road, and guaranteed by previous purchase of this and adjacent land by the federal government.

Second, and perhaps more important, the site was unusual enough archaeologically to warrant intensive investigation. It was obvious that the site was at least partially buried, and possibly in "pristine" condition where it was protected by its cover of overburden. The presence of a hearth suggested that the prehistoric occupation may have been of some intensity, and the materials collected from the site indicated that a Middle Woodland component was present. The

geomorphic setting was unique, since no other sites had been reported at that time in a similar bench location within Saylorville Reservoir.

Third, a capable field crew was available: eight members of the ISUAL field crew and supervisory staff, and nine Iowa State University archaeological field school students.

Excavation methods

After the decision to excavate had been made, work began by clearing the site of undergrowth, which included small trees, brush, and poison ivy. A control grid, based on north-south and east-west axes, was established to facilitate the mapping and measurement of artifacts and features. The alpha datum was designated N1000/W1000 (see Figures 6 and 7).

Initial excavation efforts were aimed at ascertaining the stratigraphy of the site. Three staggered trenches were dug (see Figure 7 and Plate 2) by shoveling in arbitrary 0.3 foot (9 cm.) increments down to depths of 3.6 feet (1.08 meters), 4.8 feet (1.44 meters), and 5.5 feet (1.65 meters), respectively, the differing depths owing to the varying amount of overburden. The trenches were rectangular in shape, measuring 20 feet (6 meters) long, and 2.5 feet (75 cm.) wide. Excavation primarily involved shovel-skimming, although trowelling was employed when cultural material was encountered. All trench fill was screened through half-inch steel mesh.

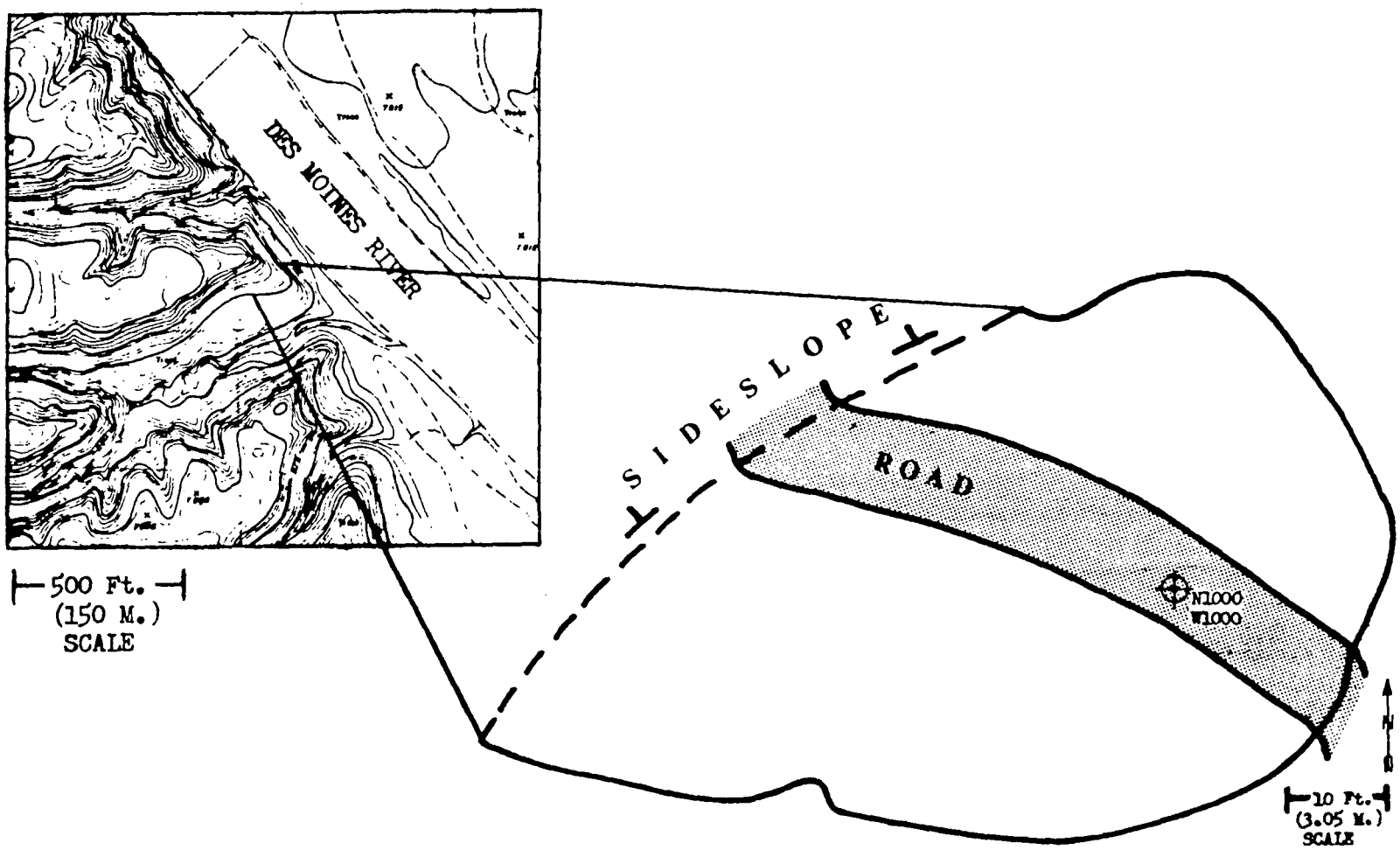


Figure 6. Generalized map of Brassica Bench (Limit of bench lies at approximately 855 feet above sea level. Inset map is a segment of U.S. Army Corps of Engineers Five-Foot Contour Map Series 3/18)

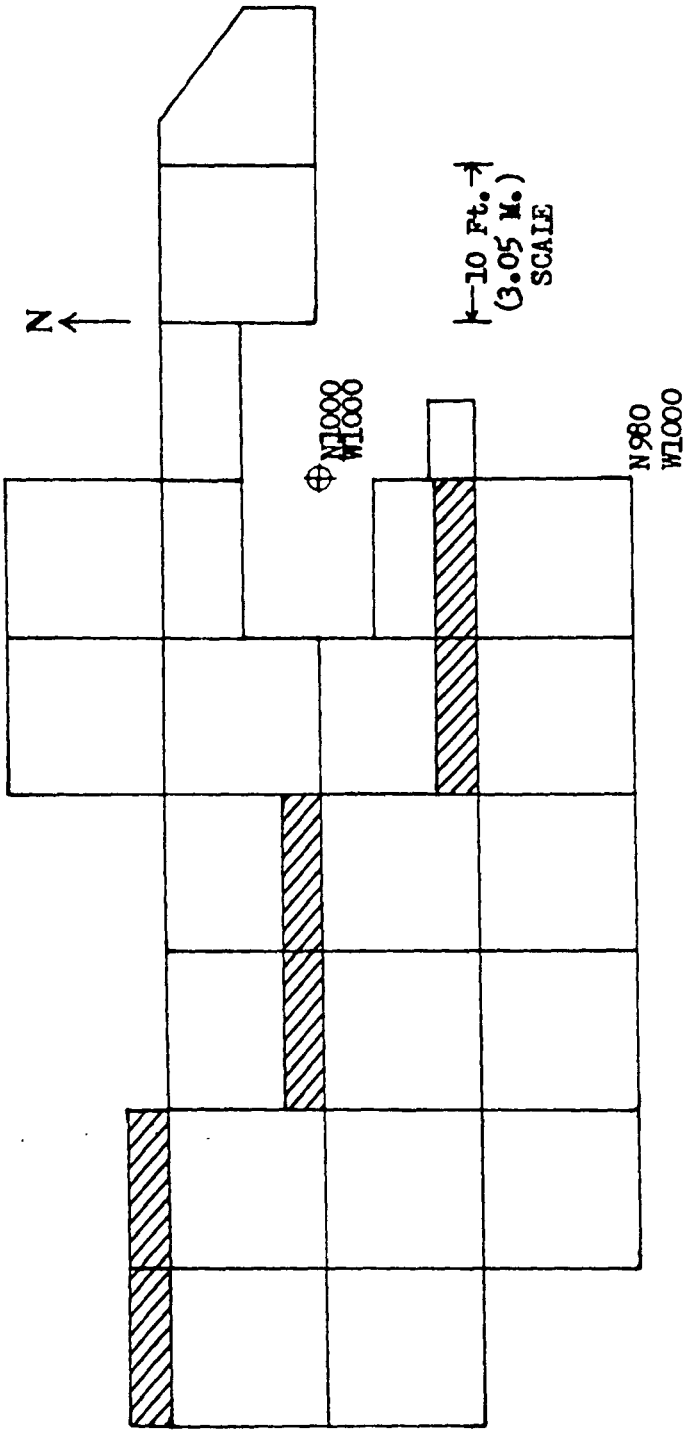


Figure 7. Map showing control grid and excavation units at 13PK251 (Trenches are indicated by the oblique lines)

The trenches yielded three important bits of information. First, they resulted in the finding of four more features, confirming that the remains of a relatively substantial occupation were present. Second, they revealed that only a small portion of the site was exposed at the surface by the road. Third, and more important, they revealed the vertical stratigraphy of the bench, which was essentially made up of seven depositional units (see Figures 8 and 9). The first five units, moving down from the surface, consisted of recent slopewash from the adjacent uplands. These units (Roman numerals I to V in Figure 9) were generally thickest to the west at the base of the uplands and thinned towards the edges of the bench on the east. By contrast, Depositional Unit VI consisted of a fully developed forest soil formed in older slopewash and glacial till. This unit was also thickest at the base of the uplands, and thinned towards the edges of the bench, where it merged with the present-day forest soil on the eastern third of the bench. Underlying this pedogenic unit was glacial till, laid down as part of the Des Moines Lobe during the Wisconsin glaciation. Of these seven depositional units, prehistoric remains were found only in Depositional Unit VI, primarily in the upper 2 - 3 feet (60 - 90 cm.) of that unit. Historic artifacts were found at the base of Depositional Unit V and in all five of the upper depositional units.

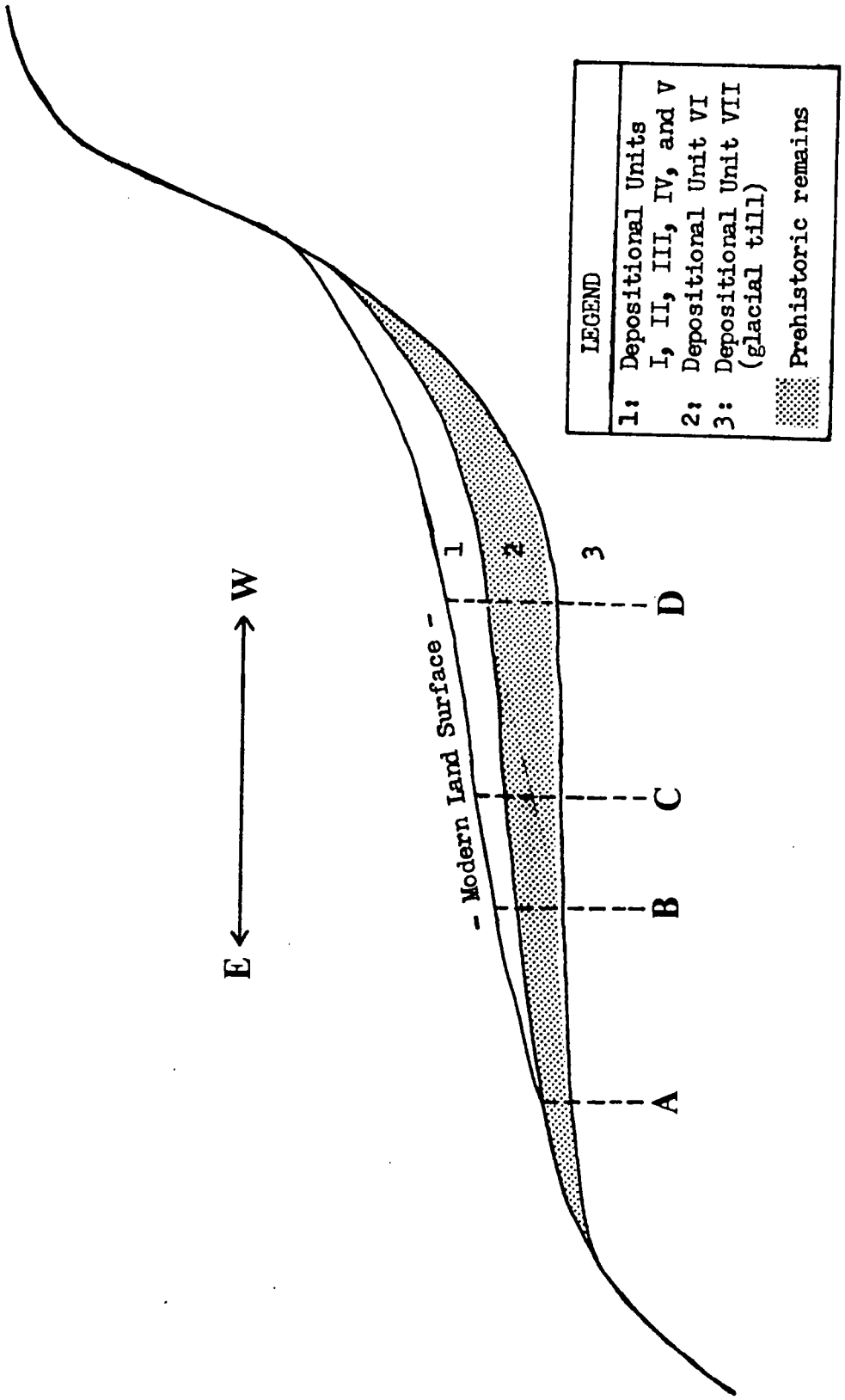


Figure 8. Idealized cross-section of Brassica Bench (Not to scale. Transects A-B and C-D are shown in Figure 9)

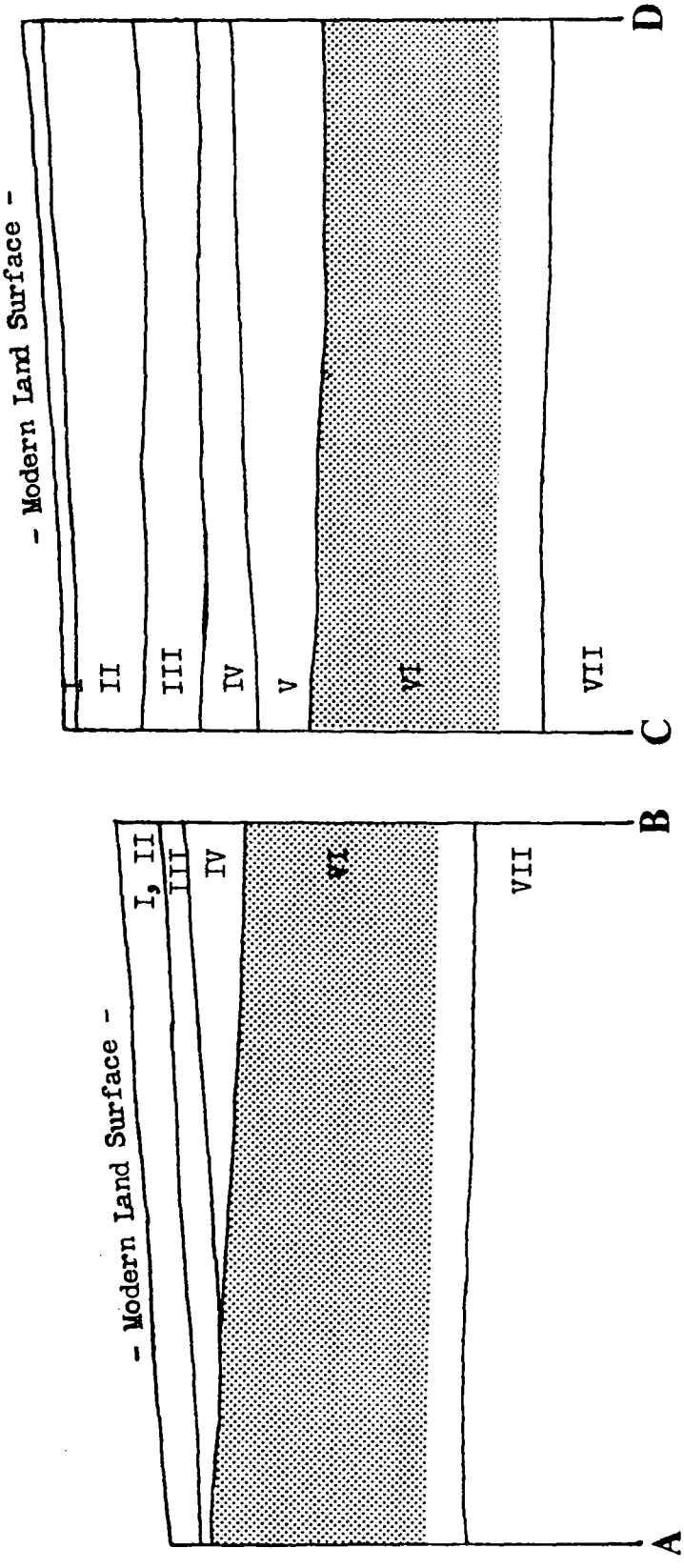


Figure 9. Idealized cross-sections, transects A-B and C-D of Figure 8 (Not to scale. Depositional units are indicated by Roman numerals)

The information gained from the trenches enabled the rest of the site to be dug in a more efficient and reasoned manner. In the excavations that followed, the sterile overburden was summarily shoveled away and removed without being screened. Similarly, no attempt was made to excavate Depositional Unit VII, when it was reached. Depositional Unit VI, on the other hand, was hand-trowelled beginning at its surface, and carefully shovel-skimmed towards its base. All fill from this unit was screened, usually through half-inch steel mesh, occasionally through quarter-inch. Since no clear-cut cultural stratigraphy was apparent at that time, the excavation units were dug in arbitrary 0.2 foot (6 cm.) increments, or "levels," horizontally oriented to conform to the natural slope of Depositional Unit VI. Proveniencing of material was facilitated by numbering the levels sequentially, the first 0.2 foot level being designated as level VI-1, the next as level VI-2, and so on. Thus, level VI-5, for example, was located between 0.8 - 1.0 foot (24 - 30 cm.) below the surface of Depositional Unit VI.

In all, a total of 17 ten-foot-square (3.05 meters) excavation units, and five smaller and more irregularly-shaped units, were excavated in this manner (see Figure 7, and Plates 3 and 4). Features were treated separately from the excavation units, although sometimes dug more-or-less

concurrently, and were entirely hand-trowelled. All features and artifacts were mapped and otherwise documented. Major artifacts were "piece-plotted" whenever possible and bagged separately with exact provenience.

It became apparent during the course of the excavation that the construction and use of the road had adversely affected the site in several ways. Where the road crossed the edge of the bench, for example, the edge had been cut away, thus truncating the depositional units at that point. Use of the road by heavy machinery, probably during a muddy season, had resulted in compaction of the depositional units and an indeterminate amount of mixing of artifacts in the upper surface levels of Depositional Unit VI. The degree of disturbance was variable, and rather difficult to determine in an exact way.

Fortunately, these conditions were not present throughout the entire site. The excavation units in which they were most pronounced were located east of the W1020 line, between N980 and N1010. And since the road fill was light-colored and gravelly, it was usually fairly easy to locate the darker, more humic surface of Depositional Unit VI. West of the W1020 line, where the overburden was thickest, very little disturbance was noted. That part of the site had simply been buried by fill pushed down from the edge of the adjacent upland, and had apparently not been affected by vehicular traffic.

Soil sampling and water flotation

One additional archaeological technique was employed during the excavation of the site, which deserves special attention here. This technique is the water flotation technique, which is designed to recover small plant and animal remains, as well as small artifacts, that would otherwise not be be noticed using conventional excavation procedures. Investigation of this sort helps to eliminate two major sources of error in the investigation of prehistoric subsistence practices: the tendency to select for larger bones or bone fragments, and the tendency to select for bone as against plant remains (Struever 1968b: 353). The technique has received increasing attention in recent years, largely because of favorable results reported by Struever from Illinois River Valley sites (Struever 1962, 1968a, 1968b).

Water flotation works on the principle that different substances have different porosities and therefore settle in water at different rates. The flotation process basically involves the use of water turbulence to carry away the silt of the soil sample. In the method described by Struever (1968b: 354), soil samples are poured into a washtub whose bottom has been replaced with a fine-mesh (sixteenth-inch) screen. The bottom of the tub is submerged a short distance below the surface of the water, preferably in a shallow stream with a gentle current, and the tub is gently rotated back and forth to allow the

silts and sands to escape. The various materials within the soil sample settle at different rates, with the lighter materials tending to stay near the surface where they can be scooped off with a strainer. The technique thus yields two products: 1) small bones and carbonized plant remains, retrieved with the strainer, termed the "light fraction," and 2) stone, burnt clay, small pottery sherds, etc. recovered from the tub bottom, and termed the "heavy fraction" (Struever 1968b: 355). The fraction units are usually placed separately in cardboard containers for drying prior to analysis.

In the summer prior to the excavation of Brassica Bench, ISUAL efforts at water flotation involved the method just described, using Big Creek as a source of moving water. It was found that the procedure was somewhat laborious, and relatively time-consuming. It was also subject to the vicissitudes of weather -- no processing could be done during a rain or on cold spring days, for example.

In 1976, a better method was at hand: a water flotation device built by Kent Mehl, a graduate student in the Iowa State University Department of Sociology and Anthropology and a member of the ISUAL field crew. This device, constructed along the lines described by Watson (1976: 77-100), is essentially a large, watertight wooden box with an easily-regulated water inlet-outlet system which provides an optimum, consistent, and controlled degree of water turbulence and

movement. The light fraction is retrieved by means of a strainer and a screen placed across the water outlet, while a screen within the box captures the heavy fraction. The initial operation of the device in Spring, 1976, indicated that it was easier and quicker to use than the "Big Creek method." At the same time, it appeared to provide effective recovery of artifacts. By arrangement with the University, it was possible to set up the device in an abandoned shed at the Iowa State University Swine Testing Station in Napier, Iowa, thus providing shelter from the elements and enabling "non-stop" processing. The efficiency and availability of the device, combined with the possibilities of plant and animal remains being present within the features at Brassica Bench, prompted a decision by the ISUAL staff to emphasize the water flotation technique in the investigation of the site that summer.

It was further decided to obtain soil samples in two ways. Thus, within features all fill, excluding large rock, was removed for processing, while within the remaining portion of the site, randomly located samples (see Figure 10) were taken from every level of each excavation unit.

Random sampling was accomplished by means of a simple sample design suggested by Dr. Louis St. Peter of the Iowa State University Department of Sociology and Anthropology.

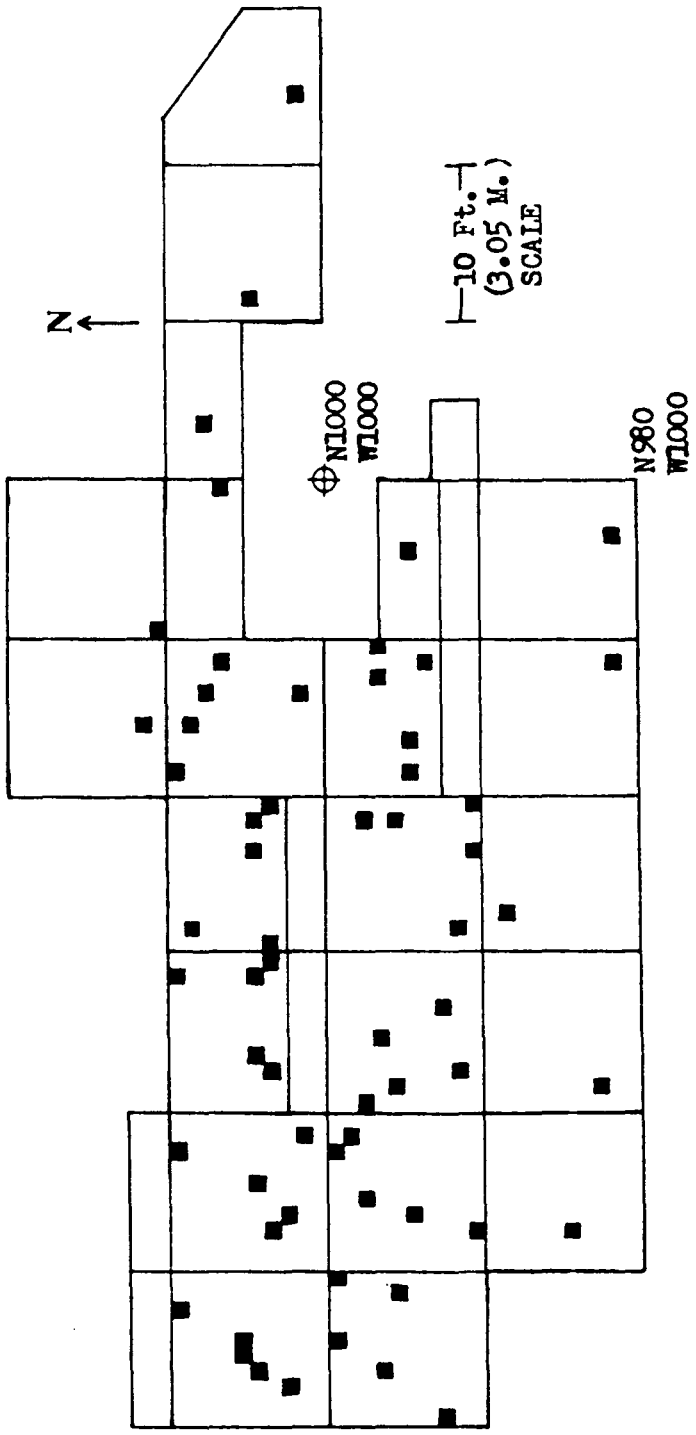


Figure 10. Map of soil sample locations at 13PK251 (Soil sample units are shown in black)

Essentially, the design consisted of assigning numbers to each of the square feet within an excavation unit, and then selecting from those on the basis of random numbers provided by a calculator with a random number generator. The square-foot-sized sample units thus selected were removed for water flotation from each level as the excavation proceeded downward.

In the first ten excavation units that were dug, a 5% sample was taken. By midsummer it had become apparent that this sample size was too ambitious, having resulted in a back log of samples at the flotation station. Collection of the samples, at the site, also seemed to demand an inordinate amount of time. Since the major portion of the site had been so thoroughly sampled, it was decided to go to a 1% sample in the remaining excavation units that were to be dug.

Whenever possible, all soil samples were "chunked" out, rather than thoroughly trowelled, in an effort to minimize destruction of the potential plant and animal remains. Samples were then bagged in plastic bags and taken to the flotation station for processing. In all, 753 soil samples, or around 150 cubic feet of fill, were taken from the site and processed at the flotation station.

Following the processing of the samples into heavy fraction and light fraction units, investigation continued in

the laboratory. All heavy fraction units were visually inspected under good lighting by the author and ISUAL laboratory personnel. Light fraction units were examined by the author, using a microscope at 10X, 20X and 30X magnification. Artifacts, seeds, and other items were collected from both types of samples with the use of tweezers. Analysis of the material recovered by means of the water flotation technique is presented in Chapter 5 of the present study.

Final Days at the Site

Excavations ceased at Brassica Bench on 2 August 1976, primarily due to the end of field school and the need for the remaining crew at another site. All equipment was removed from the site the following day by ISUAL personnel. Shortly thereafter, the bench was extensively bulldozed into shape and subsequently used as an access road for tree clearing operations during the next few months. The site was inspected by ISUAL monitors both during and after the bulldozing, and occasionally in the years since, but very few additional artifacts have been found. At present, since vehicular traffic is prohibited, the site is unused except by occasional hikers and is again becoming grown over with vegetation.

CHAPTER 4.

ANALYSIS OF THE EXCAVATED DATA

The material from this site belongs to two distinct cultural patterns: prehistoric American Indian (Woodland and Oneota), and historic Euro-American. Description begins with the primary focus of the present study, the prehistoric remains.

Prehistoric Artifacts

Ceramics

The cultural affiliations of the archaeological manifestations at the site were primarily identifiable on the basis of ceramics. A total of 412 grit-tempered pottery sherds and four shell-tempered pottery sherds was recovered from the site, all from within Depositional Unit VI, none from within features (see Figure 11). The sherds are assumed to be the remains of domestic cooking and storage vessels. The general attributes of this ceramic assembledge correspond to those reported for Woodland and Oneota manifestations throughout the Prairie-Plains. Woodland ceramics have been discussed in depth by Benn (1978),

	SHERD CATEGORY	Number of sherds	Minimum number of vessels
GRIT-TEMPERED	RIM SHERDS AND DECORATED BODY SHERDS	31	8
	Horizontally cord-impressed	1	1
	Patterned cord-impressed	13	2
	Incised, punctated and embossed	1	1
	Punctated and embossed	13	1
	Punctated (only)	1	1
	Tool-impressed interior	1	1
	Miscellaneous (undecorated)	1	1
	BODY SHERDS	381	0
	Total	412	8
SHELL-TEMPERED	RIM SHERDS	1	1
	HANDLES	1	0
	BODY SHERDS	2	0
	Total	4	1
	Total	416	9

Figure 11. Tabular summary of ceramic sherd categories from 13PK251

Griffin (1952), Hall (1950), Hurley (1975), and Logan (1976); and Oneota ceramics by Hall (1962), Henning (1961), Orr (1914), and Osborn (1976). No other ceramic objects were found at Brassica Bench.

Woodland pottery Grit-tempered pottery sherds overwhelmingly constitute the bulk (99%) of the ceramics recovered from the site. Their grit tempering, along with decoration produced by cord impression, embossing, punctation, and incising, clearly suggests an affiliation with the Woodland ceramic tradition. The grit used in tempering this pottery is characterized by angularity and heterogeneity, and appears to be crushed or decomposed granite. Using Colton's (1953) terminology, the grit is of medium to very coarse grain size and of moderate abundance. Surface textures of the sherds are predominantly rough, with sherds from one punctated vessel having a granular exterior surface texture. Paste is compact. Color of the sherds, determined by the use of Munsell Soil Color Charts (Munsell Color Company 1973), ranges from red (2.5YR 4/6) through strong brown (7.5YR 5/6) to yellow (10YR 7/6), with a predominance of yellowish red (5YR 5/6). A very few sherds were very dark grey (10YR 3/1), and firing clouds and abrupt color gradations were also an occasional occurrence. Hardnesses were consistently within the 3.2 to 5.5 range on Moh's scale of hardness.

Although no complete vessels were recovered, the remains of at least eight separate vessels could be distinguished on the

basis of differences in decoration of the 31 rim sherds and decorated body sherds (see Figure 12). Decoration further provided a basis for differentiation of these vessels into two major groups, representing the two basic decorative practices of the Woodland potters: in one, cord was impressed into the plastic clay, and in the other, a tool was used to punctate and incise. Numerical relationships of these sherds are presented in Figure 12.

Cord-impressed vessels At least three vessels are represented by 14 cord-impressed sherds. All were decorated by fine-gauge cord impressions of 1 - 1.5 mm. thickness, but a different cord was used on each vessel. Using Hurley's (1975) analytical methodology, the cords can be identified as follows:

$$S\overset{Z}{Z} \qquad Z\overset{Z}{\underset{Z}{S}}\overset{Z}{Z} \qquad \text{and} \qquad S\overset{S}{\underset{S}{Z}}\overset{S}{S}.$$

Two decorative styles were present, one involving parallel horizontal impressions encircling the rim, the other involving alternating horizontal band of parallel left-vertical-oblique and parallel horizontal cord impressions (see Figure 13). The horizontal decoration was produced using the simplest of the three cords.

The horizontally-decorated vessel also differed in having a thicker, flatter lip and a larger rim thickness than the

Vessel element / Decoration	Rim sherds with lips	Rim sherds without lips	Decorated Body sherds	TOTALS	%	TOTALS	%
Horizontally Cord-Impressed	1	0	0	1	3.2	14	45.2
Patterned Cord-Impressed	5	4	4	13	41.9		
Incised, Punctated and Embossed	1	0	0	1	3.2	16	51.6
Punctated and Embossed	10	2	1	13	41.9		
Punctated (only)	1	0	0	1	3.2		
Tool-Impressed (interior)	1	0	0	1	3.2		
Undecorated (Miscellaneous)	1	0	0	1	3.2	1	3.2
TOTALS	20	6	5	31		31	

Figure 12. Tabular summary of decoration found on grit-tempered sherds from 13PK151

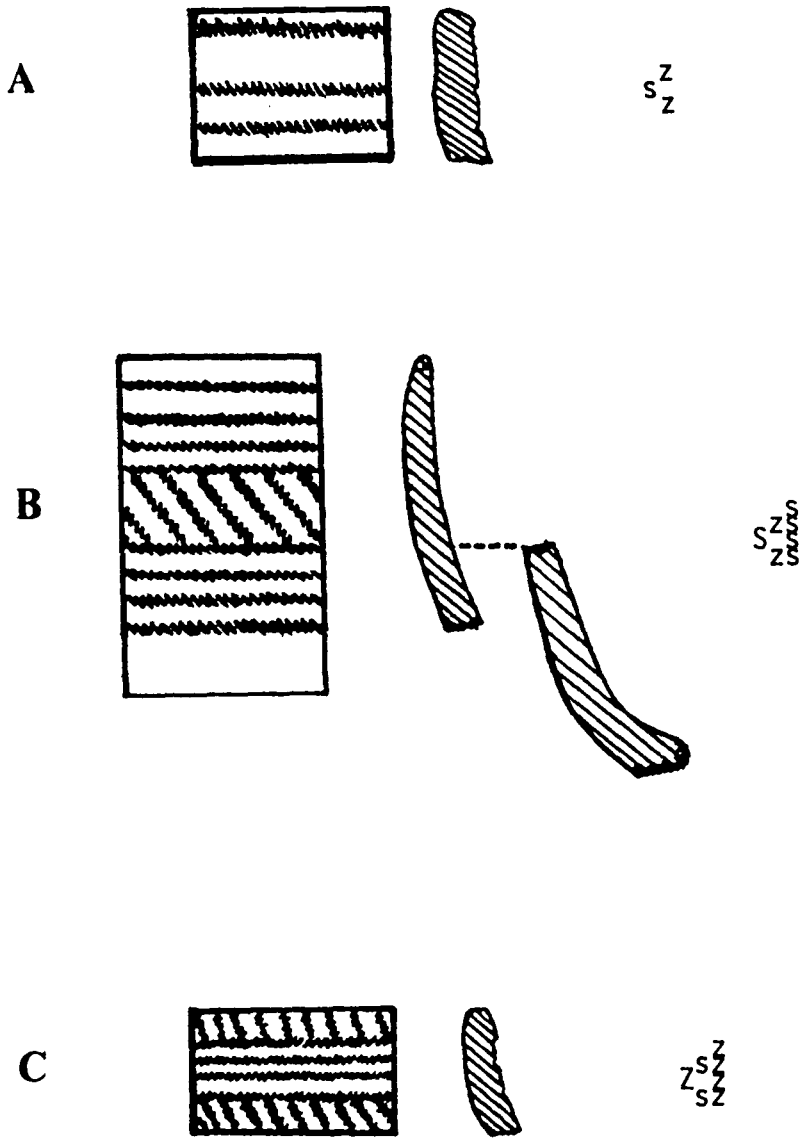


Figure 13. Selected cord-impressed sherds from 13PK251 (L-R: Design schematic, cross-sectional view, and cord twist. A: rim sherd 1335; B: rim sherd 1428 and rim-sherd-without-lip 1412; C: rim sherd 94. Actual size)

two vessels with complex-patterned decoration. All, however, display a smoothed, plain surface on which the cord was impressed. Interior surfaces are also plain, with no evidence of scraping. Shoulder treatment was available for only one vessel, which exhibited vertical cord-roughening on its exterior. Sherds from that vessel also indicate a well-defined neck and expanding shoulders (see Figure 13, B). Rims on all vessels are fairly straight, but slightly concave towards the exterior. Rim heights appear to be variable but determination is uncertain due to the fragmentary nature of the vessels. Rims were relatively thin, ranging from 3.5 - 6.0 mm. with an average of 4.1 mm.

In terms of distribution, the cord-impressed sherds were primarily located in the southwestern and extreme northern portions of the site (see Figure 14). Eleven body sherds could be confidently associated with one vessel (Figure 13, B); when these are also considered, the majority of that vessel was located in the two extreme northern excavation units at levels VI-4 to VI-8. The presence of the two "stray" cord-impressed sherds in the centrally-located square N990/W1010, in close proximity to Features 1 and 4 (see section on Features), is also notable.

In terms of typological similarities, the cord-impressed vessels bring to mind such Iowa pottery types as Madison

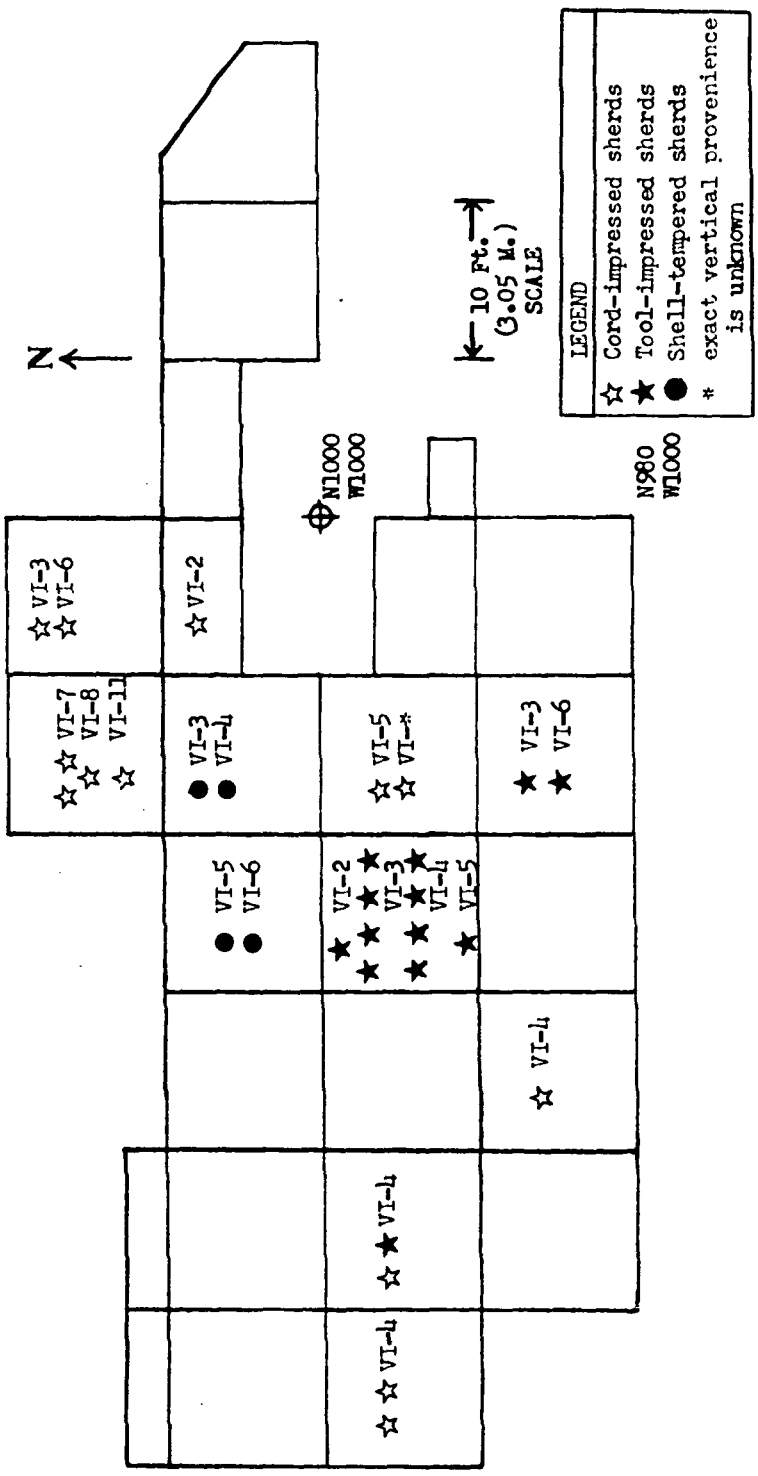


Figure 14. Map showing distribution of diagnostic sherds at 13PK251

Cord-Impressed of northeastern Iowa (Logan 1976), and Minott's Cord-Impressed of central eastern Iowa (Logan 1976), and Missouri Bluffs Cord-Impressed of southwest Iowa (Keyes 1949), as well as similar types of the upper Midwest as Maples Mills "Corded Design" of Illinois (Cole and Deuel 1937) and Feye Cord-Impressed of Nebraska (Kivett 1952). Cord-impressed decoration is at present considered a generalized horizon style confined for the most part to Late Woodland times. In central Iowa, this view has been strengthened by recent excavations at the Saylorvillage site, 13PK165, which yielded cord-impressed pottery, including the newly-defined Saylor Cord-Impressed type, in thoroughly Late Woodland context (Osborn, Gradwohl, and Thies 1978). While the Brassica Bench pottery differs significantly from the Saylorvillage pottery in its lack of squared orifices and noded and castellated rims, it can be regarded as equally indicative of Late Woodland. While the Saylorvillage site could not be dated by absolute dating techniques, a time span of A.D. 700-900 is considered likely for Late Woodland occupations in the central Des Moines River Valley region (Osborn, Gradwohl, and Thies 1978: 94).

Tool-impressed vessels At least four vessels are represented by 16 rim sherds and decorated body sherds, with punctation being the predominant decorative technique used.

Three vessels exhibit bands of external punctates, located on the rim a short distance (9 - 14 mm.) below the lip (see Figure 15). All punctates are 3 - 4 mm. in diameter and appear to have been produced by a blunt, round punch or dowel. Horizontal spacing between punctates is variable, ranging from 7 - 14 mm. On two of the vessels, the punctates were applied with sufficient force as to result in small internal bosses and sometimes clear-through punctations, but the latter appear to be derived from erosion and breakage rather than from purposeful intent on the part of the potter. On one of these embossed vessels a band of thinly-incised, open-spaced cross-hatching is present immediately below the punctates (see Figure 15, A). The fourth, non-punctated vessel is decorated by a blockish, steeply-angled tool impression on the lower rim interior. The exterior has an undecorated, vertically cord-roughened surface.

The tool-impressed vessels differ from the cord-impressed vessels in terms of morphology, spatial distribution, and typological affiliation. First, rim and body sherds from three of the former group exhibit very distinct, unsmoothed, vertical cord-roughening on their exterior surfaces, while one appears to display smoothed-over-cord-roughening, although the "smoothing" could simply be the result of erosion. The continuous nature of the cord or twine impressions on the former three vessels' exteriors suggests that they were

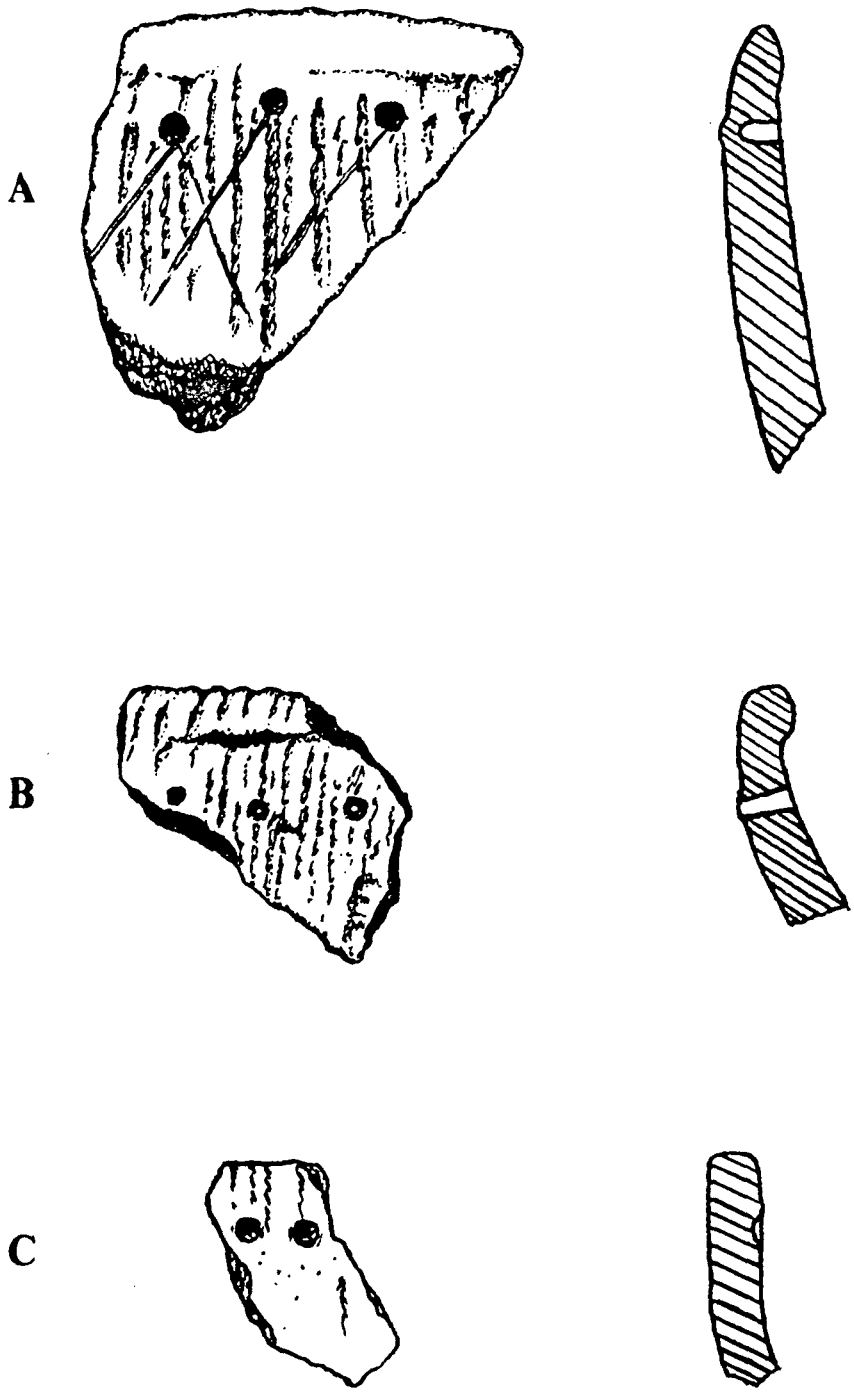


Figure 15. Selected tool-impressed sherds from 13PK251 (Exterior and cross-sectional views are shown. A: incised, punctated and embossed rim sherd 370; B: punctated and embossed rim sherd 355; C: punctated rim sherd 624. Actual size)

produced by cord-rolling (cf. Hurley 1975: 91), rather than cord-roughening with a paddle, and may thus be decorative rather than functional. Both conclusions are most compelling when one considers the most complete of the 13PK251 tool-impressed vessels (partially illustrated in Figure 15, B), to which 54 body sherds could be assigned. Here the cord-rolled surface treatment extends from the lip to the shoulder, where it is then abruptly replaced below the shoulder by a haphazard "criss-cross" pattern of less distinct cord-roughening. Interior surfaces of all vessels are smoothed but somewhat "lumpy", with no evidence of scraping.

Second, sherds from these vessels average twice as thick as those of the cord-impressed vessels, with rim thicknesses ranging from 4 - 11 mm. and averaging 7 mm.; and the sherds themselves vary, with greatest thicknesses being attained at the shoulders of the vessels and least at the necks. Lip thicknesses range from 4 - 7.5 mm., averaging 6.6 mm.

Third, the tool-impressed vessels display several differences in their treatment of lips. While two vessels have smoothed, round lips, another has a squared lip and the fourth has had its lip somewhat flattened and cord-marked, apparently by the same cord-wrapped instrument which produced the cord-rolled surface treatment of the upper exterior.

Fourth, the tool-impressed vessels display much more elongation in their morphology. Rim-neck junctures are vaguely defined; shoulders are steeply sloping and slowly-expanding. While no complete bases were found, the rapid thickening of four body sherds suggests that at least one vessel, identifiable as the one vessel decorated by external punctation without embossing (see Figure 15, C), had a conoidal or subconoidal base.

Fifth, the distribution of these vessels differs from the others (see Figure 14); all but one of the tool-impressed rim sherds and decorated body sherds coming from two south central squares, N980/W1010 and N990/W1020, at levels ranging from VI-2 to VI-6. When the 57 body sherds assignable to one vessel (Figure 15, B) are considered, the majority of that vessel was confined to the latter excavation unit at levels VI-1 to VI-5. Sherds in this square were in close association with Feature 12, and Feature 4 in the adjacent square to the east (see section on Features). The one rim sherd (Figure 15, C) not associated with the others was found in square N990/W1040 at level VI-4, and the majority of the 67 body sherds assigned to this vessel were found in the excavation unit to the north at even lower levels (VI-4 to VI-10).

Sixth, the tool-impressed vessels can be ascribed to quite different typological relationships than the cord-

impressed vessels. In terms of decoration, punctation and nodes are usually regarded as characteristic of Middle Woodland Havana Ware and pre-Havana types (Griffin 1952, Logan 1976, Benn 1978). The incising on one of the three punctated vessels (Figure 15, A) suggests affinities with the Spring Hollow Incised type, which often displays incised-over-cord-roughening as a principal exterior decoration along with exterior and interior punctation and bosses (Logan 1976: 91). The other punctated and embossed vessel (Figure 15, B) is reminiscent of Havana Cordmarked, while the punctated, non-embossed vessel (Figure 15, C) resembles the Havana Plain type. The blockish tool-impression on the interior of the fourth vessel does not bring to mind any particular Havana decoration, but given the possibility that it resulted simply from inadvertent paddle use during construction of the vessel (only one impression is present, on only one sherd), affinities can be seen with Havana Cordmarked, or, judging from the rounded, relatively thin lip, more likely with the slightly more recent Linn Ware Spring Hollow Cordmarked type.

The elongated morphology of the 13PK251 vessels corresponds closely to Benn's description of "bag-shaped" Havana Ware vessels (1978: 228), while the distinctly-differentiated surface treatment visible on one vessel further corresponds with his observation that many Havana Ware vessels have sharp boundaries between the cord-roughened

lower vessel body and plain upper vessel body. Although in this case the upper body is cord-rolled rather than plain, such types as Havana Cordmarked commonly exhibit cord-roughened exteriors up to the lip. On only two of the four vessels, however, does lip treatment correspond with the flat facets found on Havana Ware lips. The 13PK251 vessels, except for the incised vessel, further differ by having slightly thinner walls than the thick-walled Havana sherds, which average 8 - 9.5 mm. thick (Benn 1978: 228). In sum, however, these vessels all seem ascribable to the Havana ceramic tradition.

Temporal boundaries for central Iowa Havana ceramics remain uncertain. Havana Ware in northeastern Iowa dates from approximately 250 B.C. to A.D. 350, while the Linn Ware/ Spring Hollow types date from A.D. 250 to 750 (Benn 1978: 249). Spring Hollow Incised would date up to 150 years earlier than these, if one accepts Benn's designation of pre-Havana. Logan presents stratigraphic evidence, on the other hand, indicating that "...the preponderance of Spring Hollow Incised probably occurred late within the local Middle Woodland" of northeastern Iowa (Logan 1976: 90).

Miscellaneous vessel To this category was relegated one small rim sherd, which is undecorated and could not be satisfactorily associated with any of the other vessels. It is cord-roughened on its exterior, but the roughening is

horizontally oriented and rather indistinct. The lip is rounded and somewhat pointed, and may have been finger-pinched, although it is impossible to state this with any certainty due to the small size of the sherd. It is relatively thick (7 mm.), and could for this reason be ascribable to the tool-impressed group, but it was found in square N1010/W1010 at level VI-8, in direct association with cord-impressed sherds.

Undecorated body sherds The bodies of Woodland vessels are generally cord-roughened or smoothed-over cord-roughened, and not surprisingly, cord-roughening proved to be the predominant surface treatment found on the 381 undecorated grit-tempered body sherds recovered at Brassica Bench. The "criss-cross" effect ascribable to one vessel (Figure 15, B) could further be distinguished from more generalized cord-roughening, at least on larger sherds, and could be identified on 33 sherds. Undecorated body sherds were found to vary little in color, hardness, and texture from the rim sherds and decorated body sherds already discussed.

Sherd thickness provided the major means of differentiating the body sherds. Figure 16 illustrates the fact that two main groupings were present, centering around 3 - 4 mm. and 6 - 8 mm., respectively. As mentioned, the cord-impressed vessels, as evidenced by rim sherds and decorated body sherds, are distinctly thinner than the tool-impressed vessels. It

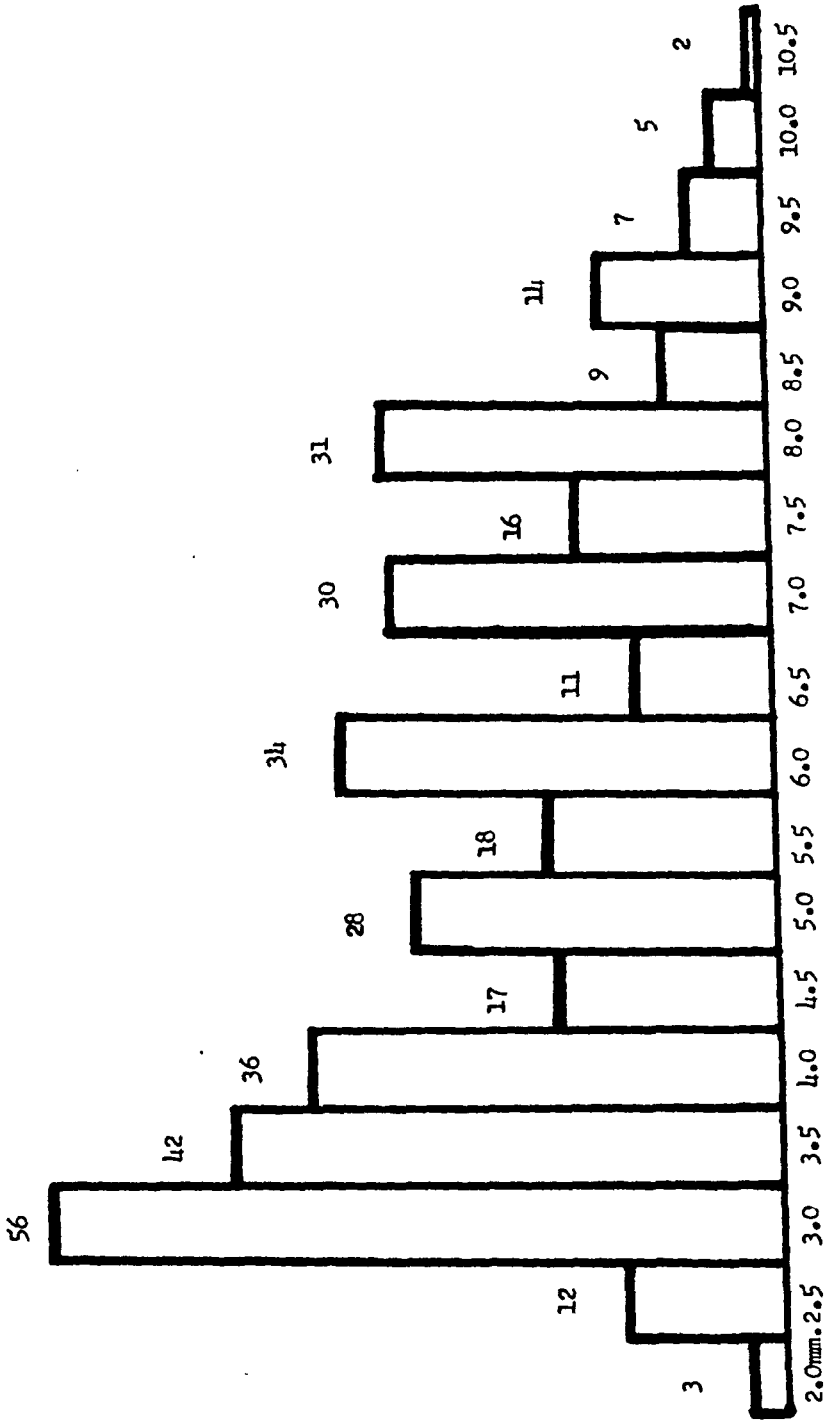


Figure 16. Histogram of grit-tempered body sherd thicknesses, 13PK251 (Thickness categories, in millimeters, are shown along horizontal axis; number of sherds in each category is shown along vertical axis)

is assumed that the two body sherd groupings reflect this dichotomy, the thinner group deriving from cord-impressed vessels and the thicker group from tool-impressed vessels. This assumption was strengthened by the thicknesses of the body sherds which were assignable, on the basis of similarities in color, temper, texture, etc., to particular vessels. Eleven body sherds were assignable to a cord-impressed vessel (Figure 13, B); these were found to range in thickness from 3 - 6 mm., with an average of 4.4 mm. Fifty-four body sherds were likewise assignable to a tool-impressed vessel (Figure 15, B), and ranged from 5 - 10 mm. in thickness, averaging 6.8 mm. A total of 67 body sherds, including four base sherds, could be assigned to another tool-impressed vessel (Figure 15, C); these exhibited an identical range with an average of 7.9 mm. In terms of spatial distribution, however, there was no significant clustering of sherds according to this attribute, other than the sherds which could be associated with particular vessels. The possibility should not be overlooked that the differentiation in thickness derives from the varying location of the sherds on the vessel -- for example, base sherds are usually thicker than shoulder sherds -- rather than from genuine differences in vessel morpnology.

Oneota pottery Shell-tempered pottery comprised the smallest amount of pottery found at the site. One rim sherd,

a handle, a neck sherd, and one body sherd were found (see Figure 17), grouped fairly close together in adjacent squares N1000/W1010 and N1000/W1020, at levels VI-3, 4, 5 and 6 (see Figure 14). Judging from their similarities in temper, color, and texture, they probably represent the remains of only one vessel. The general characteristics of these sherds clearly indicate an affiliation with the Oneota pottery tradition, and are quite similar to those reported for the Moingona phase ceramics at the Clarkson site, 13WA2 (Osborn 1976).

Decoration of the rim sherd consists of vertically-oriented tool impressions on the lip and upper rim interior. The tool impressions are rounded, 3 mm. wide, and spaced 3 mm. apart. The angle of their application has resulted in a crenelated internal lip edge. The lip is rounded and has a thickness of 3 mm. where the crenelations do not occur, while the rim expands downwards from the lip to a maximum thickness of 6.5 mm. Rim height is 17 mm. The handle is a loop type, undecorated, and ovoid in cross section with a breadth of 14 mm. and a thickness of 10 mm. The bore of the handle does not appear large enough to pass a finger through it.

These decorative/functional attributes are quite consistent with those of the Clarkson Site ceramics, where there were no instances of any lip decoration occurring on the outer surfaces

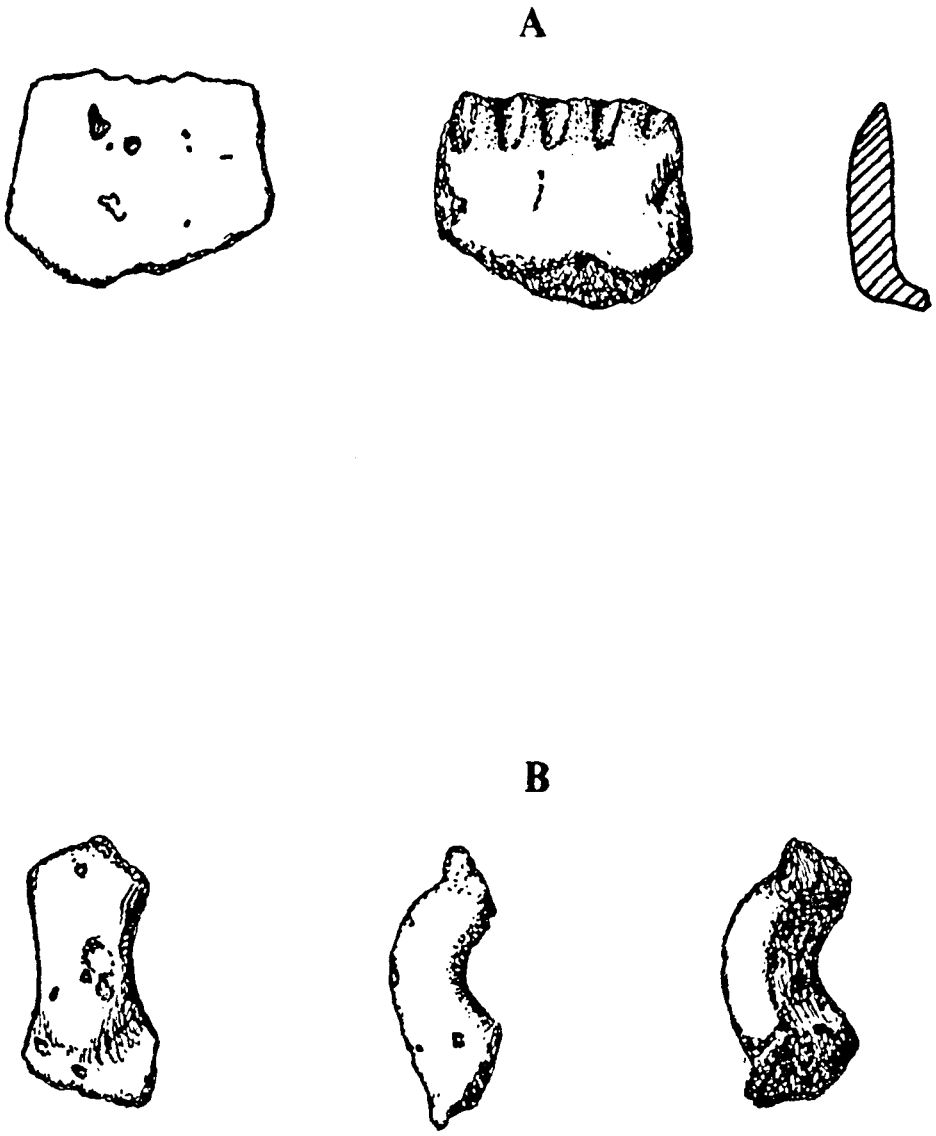


Figure 17. Selected shell-tempered sherds from 13PK251 (A: exterior, interior, and cross-sectional views of vessel rim 861A; B: top, side, and three-quarters' views of vessel handle 860. Actual size)

of the rim and 58.7% of the decorated lips had "short, vertical tool impressions inside and below the lip," where loop handles were common and usually undecorated, with breadths ranging from 9 - 29 mm. and thicknesses ranging from 7 - 22 mm., and where rim heights ranged from 7.5 - 59 mm. with medial rim thicknesses centering at a mean, mode, and median of 7 mm. (Osborn 1976: 30-55). The presence of internal rim decoration has also been noted by Gradwohl (1974: 95) as a characteristic of Moingona phase ceramics.

Other characteristics likewise correspond to those reported by both Gradwohl and Osborn. Hardness of the Brassica Bench shell-tempered sherds is at the lower range of 3.2 - 5.5 on Moh's scale, color ranges from pink (5YR 7/4) to light brownish grey (10YR 6/2), and the paste is relatively fine. Several of the "cells" which commonly occur in shell-tempered pottery are present; in fact, they provide the only evidence of the use of shell as the tempering agent, since leaching has apparently destroyed the shell itself, at least where it might be observed on the surface and broken cross-sections of the sherds. Surface treatment consists of smoothed, plain surfaces. Interior surfaces are smoothed plain with no evidence of cord-roughening or scraping. The morphology of the vessel is uncertain due to the paucity of material, but a distinctly-defined rim/neck juncture and sharply-expanding or flaring shoulders are indicated.

One interesting characteristic of the Clarkson site ceramics which is also present in the 13PK251 shell-tempered sherds but not the grit-tempered sherds is the occurrence of hematite flecks in the paste. All four of the shell-tempered sherds from Brassica Bench had hematite inclusions. At the Clarkson site, 50% of the decorated body sherds and 40.6% of the undecorated body sherds exhibited this characteristic (Osborn 1976: 42).

Chipped stone

The majority of the artifacts recovered at the Brassica Bench site consists of chipped stone tools, cores and debitage. Heterogeneous cherts were the source materials from which most of these artifacts derive. The chert is variable in quality and color. At least 16.4% of the chert appears to have undergone heat treatment, presumably in an attempt to enhance the flaking quality (cf. Collins and Fenwick 1974, Mandeville 1973, Mandeville and Flenniken 1974). Nearly 14.9% of the chert was fossiliferous, while 32.3% was non-fossiliferous and homogeneous in color within the single artifact itself, the remainder being heterogeneous and occasionally banded.

A large proportion of the chert is a distinctive, white-banded, bluish-grey chalcedony of apparently good flaking quality. This kind of stone is called "cold water agate" by local gem collectors, who find it as a common occurrence in

the glacial till. The material also occurs in chert outcrops along the Skunk River in Story County, Iowa, and has been reported from several archaeological sites in that area (Gradwohl and Osborn 1972: 7-9, 28-29). At the Brassica Bench site, this material comprised 31.5% of the debitage and was used for 35.1% of the tools, primarily for those with scraping functions.

Also present but in very small amounts were specimens of quartz, quartzite, jasper, agate, "Knife River" brown chalcedony, Tongue River Silica (Anderson 1978), hematite, and argillite. All these kinds of stone are available in local glacial till and stream gravels, and heterogeneity of the chert suggests that these were indeed the sources from which the chipped stone material was derived. Given the high percentage of grey chalcedony, however, it is clear that some selection was employed during procurement.

Projectile points In terms of temporal and cultural inference, the most diagnostic of the chipped stone tools are the projectile points. Following the analytical procedures set out by Gradwohl and Osborn (1972: 30), objects which are bifacially chipped, comparatively small and symmetrical, pointed in shape, and relatively thin in cross-section have been classified as projectile points.

At Brassica Bench, 24 projectile points were found, of which seven are complete specimens, seven are nearly complete,

and ten consist only of fragments of the original tools. All but two of the points were produced on blank chert flakes, and those two retain only traces of lithic cortex. Only two were made of grey chalcedony, while eight were fossiliferous chert, and the remainder heterogeneous cherts. Seven displayed the characteristics of heat treatment.

Five formal categories of projectile points were discernible. Selected projectile points from the first three categories are illustrated in Figure 18, and points from the last two categories in Figure 19. Projectile point data are summarized in Figure 20, and discussed below by category.

Category 1. Small, plain, triangular projectile points (2). These projectile points resemble Strong's (1935: 88-89) categories NBa and NBb. They are unnotched, with straight to subconcave bases measuring 16 mm. wide. Although their tips are missing, it was possible to estimate their average length at 25.8 mm. Their average thickness was 3.5 mm. Both points were produced by pressure flaking. Both are made of chert.

These kinds of points are a common occurrence in post-Woodland archaeological manifestations throughout the Prairie-Plains. They are commonly referred to as Mississippian triangular points, and are known in the southern Plains as Fresno points (Bell 1960: 44, Plate 22). In the central Des Moines River Valley region, these projectile point forms

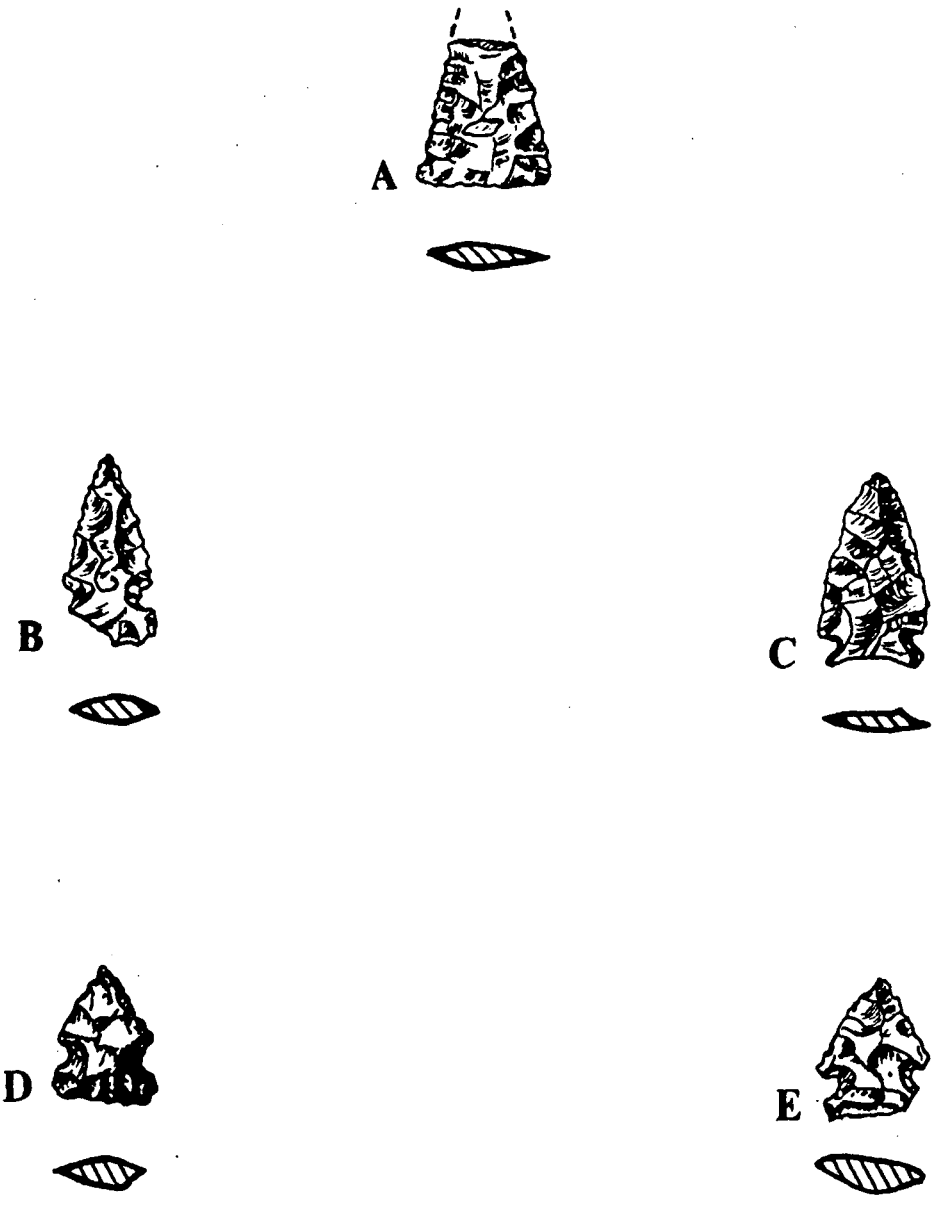


Figure 18. Selected projectile points from Categories 1-3, 13PK251 (Facial views and cross-sectional views are shown. A: projectile point 1060, Category 1; B, C: projectile points 1047 and 1266, Category 2; D, E: projectile points 396A and 943, Category 3. Actual size)

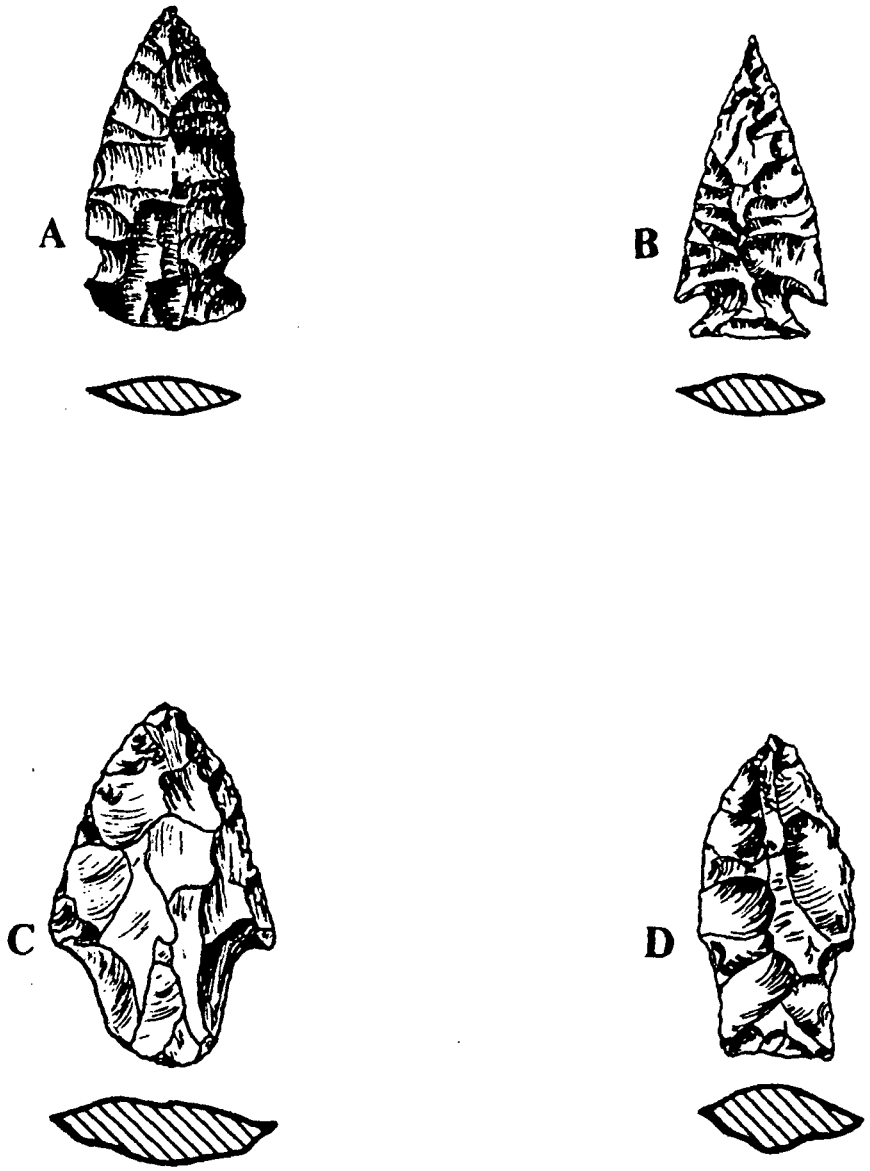


Figure 19. Selected projectile points from Categories 4 and 5, 13PK251 (Facial views and cross-sectional views are shown. A and B: projectile points 294B and 1011, Category 4; C and D: projectile points 511 and 963, Category 5. Actual size)

category	level	catalog number	total length	blade length	stem length	shoulder width	stem width	base width	maximum thickness	blade shape	notch type	stem type	base shape
1	5	1003	24.5*	na	na	na	na	16.0	3.5	triangular	unnotched	na	straight
1	3	1060	27.0*	na	na	na	na	16.0	3.5	triangular	unnotched	na	straight
2	1	1047	24.5	17.0	na	11.5	9.5	--	4.5	triangular	side	na	straight
2	2	1266	24.0	20.5	na	13.5	10.5	12.0	3.0	triangular	side	na	subconcave
3	3	396A	17.0	10.5	na	11.5	8.5	12.0	4.0	triangular	side	na	straight
3	5	447	19.5	12.5	na	13.5	11.0	--	5.5	triangular	oblique-side	na	straight
3	6	773	18.0	13.0	na	14.0	8.5	--	4.0	triangular	corner	na	subconcave
3	6	943	18.0	12.0	na	13.5	10.5	--	4.0	triangular	oblique-side	na	subconcave
3	5	1004	--	--	na	--	9.0	13.5	4.0	-----	--	na	straight
3	9	1069	--	--	na	--	10.0	16.0	3.5	-----	--	na	straight
4	3	294B	40.5	30.0	na	20.0	14.5	19.5	4.5	ovate	side	na	subconvex
4	4	304	--	--	na	--	--	--	6.5	-----	side	na	-----
4	4	422	--	40.5	na	29.0	16.0	--	6.0	ovate	--	na	-----
4	7	671	--	--	na	--	12.5	16.5	5.5	ovate	corner	na	straight
4	6	1011	48.5	34.0	na	20.0	10.0	14.5	6.0	triangular	corner	na	straight
4	7	1021	--	--	na	--	--	--	6.5	-----	side	na	subconvex
5	6	120	--	--	19.0	--	19.0	14.5	7.5	-----	na	contracting	straight
5	3	163	60.0	41.0	15.0	27.0	18.0	17.5	9.5	ovate	na	straight	straight
5	2	359	--	--	15.5	--	18.0	17.0	7.5	-----	na	straight	straight
5	3	511	46.0	31.0	15.0	29.0	20.5	na	8.5	ovate	na	contracting	convex
5	3	827	--	--	14.0	--	18.0	15.0	6.5	-----	na	contracting	subconvex
5	7	957	--	--	16.0	22.0	15.0	20.0	8.0	-----	na	expanding	subconvex
5	9	963	41.0	27.0	14.0	21.0	16.0	14.5	9.5	ovate	na	straight	subconcave
5	8	1344	--	--	16.0	--	20.0	18.0	8.0	-----	na	contracting	straight

na: not applicable
*: estimated length

Figure 20. Tabular summary of projectile point attributes, 13PK251 (All measurements are in millimeters)

have been reported in association with Oneota and Great Oasis manifestations (Gradwohl 1974: 95-97), and were found as well at the Late Woodland, Saylorvillage site, 13PK165 (Osborn, Gradwohl, and Thies 1978: 44-49, Figure 17).

Category 2. Small, side-notched, triangular projectile points (2). Points in this category are similar to Strong's (1935: 88-89) NBa1 and NBb1 categories. They are somewhat elongate, with straight and subconcave bases which measure 12 mm. wide on the unbroken specimen. They have an average total length of 24.3 mm., with average blade lengths of 18.8 mm. Stem widths average 10 mm., with shoulder widths averaging 12.5 mm. The points averaged 3.8 mm. in thickness. Both were produced by pressure flaking. One was made from grey chalcedony, the other from chert. The points are not entirely similar; one (Figure 18, B) has the notching located fairly high on the blade, while the other (Figure 18, C) has very low notching.

Both kinds of points commonly occur in post-Woodland and Late Woodland contexts throughout the Prairie-Plains. One of the points (Figure 18, B) bears a strong resemblence to the Reed projectile point type of the southern Plains, which is estimated to span a time range of A.D. 500 to 1500 (Bell 1958: 78, Plate 38). Projectile points of this form have been found within the central Des Moines River Valley region at Oneota and Great Oasis sites (Gradwohl 1974: 95-97) and at the Saylorvillage site, 13PK165 (Osborn, Gradwohl, and Thies

1978: 44-49, Figure 17). The other of the Category 2 points from Brassica Bench is quite similar morphologically to the Avonlea projectile point type of the northern Plains (Perino 1968: 6, Plate 3). Within that region, Avonlea points are regarded as a horizon marker for the Late Prehistoric period, making their appearance by A.D. 460 or somewhat earlier (Conner 1968: 19; Kehoe 1966: 828-830, Figure 1). Similar projectile points have been reported in Iowa in Late Woodland context at the Walters Site in eastern central Iowa (Anderson 1971: Figure 2.10, g).

Category 3. Short, thick, notched projectile points (6). These projectile points also fit Strong's (1935: 88-89) NBa1 and NBb1 categories, but they nevertheless differ from the Category 2 points in several ways, both morphologically and typologically.

Morphologically, they are shorter, and much less elongated, with an average total length of 18.1 mm. and an average blade length of 12 mm. They are thicker, with an average thickness of 4.2 mm., one point measuring 5.5 mm. thick. They are also wider, with an average shoulder width of 13.1 mm. and an average base width of 13.8 mm. At the same time, they are more constricted at the stem, with an average stem width of 9.6 mm. They further differ in terms of non-metrical attributes, being slightly assymmetrical in shape, and notched in a somewhat amorphous and variable manner; the latter condition making description of their notching a somewhat arbitrary exercise.

Three of the six points were made from fossiliferous chert, and the other three from heterogeneous cherts. Two of the six appear to be heat treated. All are pressure flaked.

Typologically, these projectile points are reminiscent of the Late Woodland "micro-Steuben" projectile point type reported from the Illinois River Valley, with dates beginning at A.D. 500-600 (White 1968: 78-79, Figures 33 and 65). Similar points have also been found in Middle Woodland context at the Ashland Bottoms site and other Kansas City Hopewell sites in central and eastern Kansas (O'Brien et al. 1979: 4-5, Figure 4). A time span of A.D. 300-500 has been suggested as the date of their occurrence at the Ashland Bottoms Site (O'Brien et al. 1979: 18). Moving further afield, the Category 3 points bear a strong resemblence to the Prairie Side-notched projectile point type defined for the northern Plains (Kehoe 1966: 830-832). Temporally, the Prairie Side-notched type centers around A.D. 735 (Kehoe 1966: Figure 1).

Category 4. Medium-sized, notched projectile points (6). The form of these projectile points would fit, loosely, into Strong's (1935: 88-89) expanding stem categories, primarily SCa1 and SCb2. It would seem to be more accurate, however, and more in line with current practice, to describe them as side-notched and corner-notched rather than stemmed. These

projectile points display well-defined notching, whether located at the side or the corner. Three examples of side-notching, combined with subconvex bases, and two examples of corner-notching, combined with straight bases, are present. One point was broken just below the shoulder, and the nature of the notch was not determinable.

These points differ from those of the previous categories in several ways. First, they are thicker, averaging 5.8 mm. thick. Second, they are longer, with an average total length of 44.5 mm., and an average blade length of 34.8 mm. Third, they are wider, with an average shoulder width of 23 mm., stem width of 13.1 mm., and basal width of 16.8 mm. Fourth, their blades tend to be more ovate. Generally, these projectile points are larger and more ovate than those of the last three categories. In addition, one of the corner-notched points exhibits basal grinding. Within this category, one point was made of grey chalcedony, the remainder from chert.

The corner-notched specimens of this category are somewhat similar to the Norton corner-notched type reported from Middle Woodland sites in the Illinois River Valley (White 1968: 71, Figure 28), or the Early Woodland-aged Pelican Lake type reported from central Saskatchewan (Perino 1971: 72, Plate 36). One of the Brassica Bench points (not illustrated) is reminiscent of the Middle Woodland Manker

Stemmed type reported from the Illinois River Valley (White 1968: 72). The side-notched specimens resemble the Gibson and Matanzas projectile point types reported as occurring in Illinois, Missouri, and Iowa (Perino 1968: 24, Plate 12; 54, Plate 27). The Gibson is a Hopewell point type, dating from 50 B.C. to A.D. 250, while the Matanzas is presumed to be late Archaic (Perino 1968: 24).

Category 5. Stemmed projectile points (8).

Points of this category are describable in terms of Strong's (1935: 88-89) SAa, SBa, and SCa2 categories. These points differ morphologically from the others found at Brassica Bench in that they are stemmed. When stems are considered in connection with their bases, these points can be differentiated into five groups: expanding-stemmed with subconvex base (1), contracting-stemmed with subconvex base (1), contracting-stemmed with convex base (1), contracting-stemmed with straight base (2), straight-stemmed with straight base (2), and straight-stemmed with concave base (1). Excluding the convex-base point and the expanding-stemmed point from consideration, bases average 16.1 mm. wide. The expanding-stemmed point measures 20 mm. wide at the base.

Of the four stemmed points with straight bases, two have unfinished bases, and one is only crudely finished. The one with a finished base has a decidedly asymmetrical blade. Very little pressure flaking is found on any of these four specimens,

or on the one point with expanding stem, making it uncertain whether these five constitute finished products. By contrast, the straight-stemmed concave-base, the contracting-stemmed convex base, and the contracting-stemmed subconvex base projectile points are more finely flaked. The former was manufactured from grey chalcedony. Of the others, one is of fossiliferous chert, the others being of heterogeneous cherts. Two of the total appear heat treated.

In terms of size, these points are slightly larger than those of Category 4. Average total length (sample of three measurable specimens) is 49 mm., with an average blade length of 33 mm. Stems average 15.6 mm. long. Average maximum thickness of these points is 8.1 mm., and average shoulder width (sample of four) is 24.8 mm., with an average stem width of 18.1 mm.

The majority of these points conform to the basic descriptions given for Gary points (Bell 1958: 28, Plate 14) and Langtry points (Bell 1958: 38, Plate 19) of the southern Plains, Dickson Contracting Stem points of Illinois (White 1968: 64-65, Figure 26), Burkett points of Missouri (White 1968: 65-67, Figure 25), and Waubesa Contracting Stem points of Wisconsin (Baerreis 1953: 155). These projectile point forms are widespread throughout the Prairie-Plains and eastern Woodlands, occurring over a long time period stretching from late

Archaic to Middle Woodland times and perhaps later. The somewhat amorphous expanding-stemmed projectile point recovered from Brassica Bench resembles, in a general way, the Ansell projectile point type reported from Middle Woodland context in the Illinois River Valley (White 1968: 75, Figure 32).

Projectile point spatial distribution Figure 21 illustrates the distribution of the projectile points, by category. It will be observed that the projectile points of Categories 1 and 2 overlie those of other categories both generally and in nearly all cases where points of different categories were found in the same excavation unit, the only exception being in one square, where a Category 3 point occurred in the same level as a Category 1 point. Category 3 points display a variable vertical distribution, but within individual squares they are overlain by Category 4 and 5 points only twice, and that situation occurs only in one excavation unit (N990/W1020).

Horizontally, Category 1 and 2 points were confined to the northwestern and north central portions of the site, while projectile points of other categories were scattered throughout the site in widely disparate locations. As is evident, however, most of the points of all categories were found in four adjacent, centrally-located squares.

The differences in spatial distribution are of even more interest when considered in connection with the distribution of

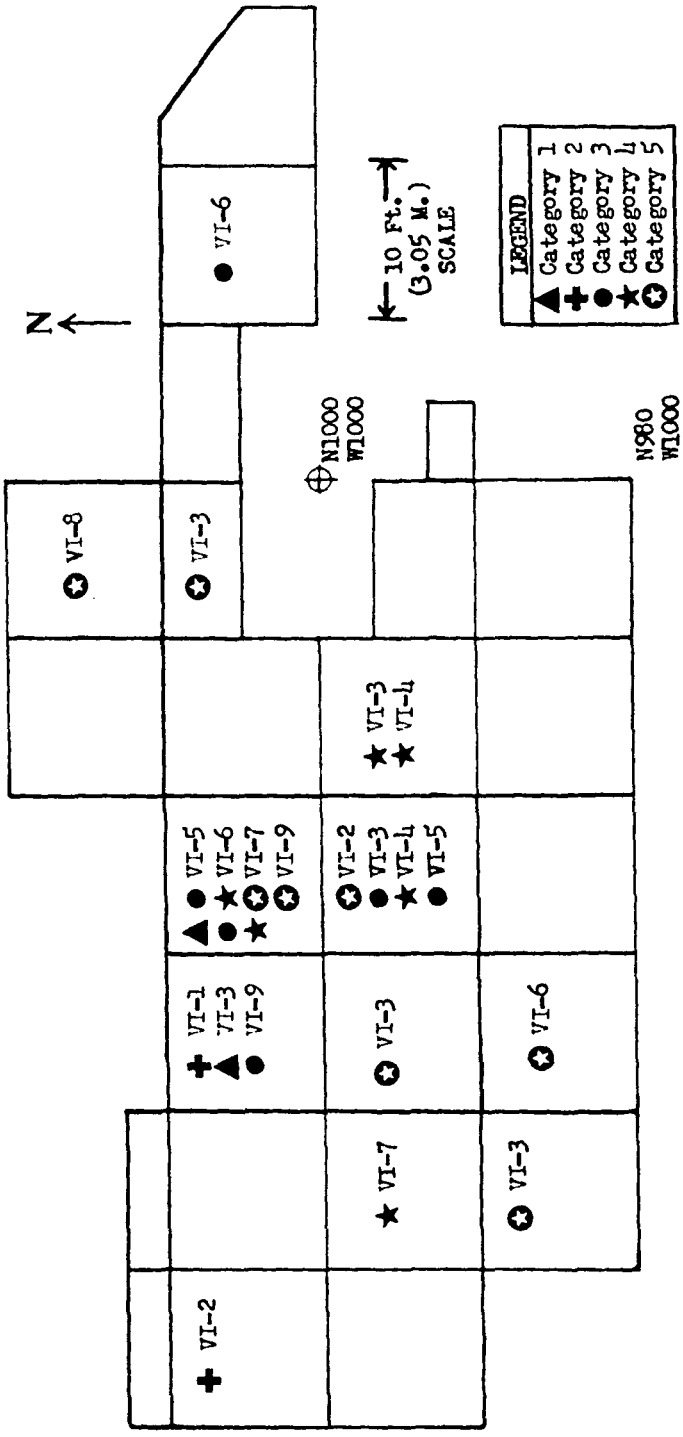


Figure 21. Map showing distribution of projectile points at 13PK251

pottery at the site (compare Figures 14 and 21). The four Oneota sherds were found in the north portion of the site at relatively high elevations, as were the projectile points of Categories 1 and 2. The lowermost of the two Oneota body sherds was found at the same level as the uppermost Category 4 point in that square (N1000/W1020), and the other shell-tempered body sherd was found in the next higher level with two points from Categories 1 and 3. The Oneota rim sherd and handle, found in the adjacent square to the east, were at two successively higher levels. The cord-impressed pottery, on the other hand, like the Category 3 points, is scattered widely throughout the site. In four squares, this pottery overlies Category 4 and 5 points, but the relationship is reversed in square N990/W1010. The tool-impressed pottery, at least in square N990/W1020, was in association with points of Categories 3, 4 and 5.

End scrapers Chipped stone tools which exhibited steep, essentially unifacial retouching, combined with a snub-nosed, plano-convex shape, were identified as end scrapers. The working edges of these tools exhibit use patterns which may be indicative of various scraping functions (Semenov 1964: 85-93). End scrapers are common to prehistoric sites on the Prairie-Plains and elsewhere in North America, and are known on the basis of ethnographic and historical evidence to have been used for the scraping and softening of hides. Inferential evidence

(Wilmsen 1968) also suggests their use in woodworking and bone working, but none of the end scrapers found at 13PK251 exhibit the heavy, steep bits described by Wilmsen for those types of scrapers.

No hafts were found, but it is assumed, following Wilmsen (1968) and others, that these scrapers were hafted or socketed into the severed ends of long bones or ribs. As Wilmsen points out, hafting of this type "increases the mechanical force which may be applied to the distal end of the bit," and since end scrapers are comparatively small tools, "their functional effectiveness probably depended on hafting" (1968: 157). Ethnographic accounts also point to hafting as the predominant mode of use (Mason 1891: 581-587). Bailey's (1978) comparison of edge wear patterns on 175 end scrapers from Kansas and Montana, however, found numerous specimens exhibiting the same degree of wear on lateral and distal edges, with no apparent break in the wear pattern. Bailey further observed that "... Many, though not all, of these are large enough that they could have been hand-held for some time and turned to take advantage of a sharper edge" (1978:3), suggesting that while scrapers may have been designed for hafting, they were also occasionally employed unhafted in a more ad hoc manner, or during appropriate stages of hide-working.

It is assumed, following Frison (1968), that most of the end scrapers found at Brassica Bench are in intermediate stages

of use, and that some are even in a nonfunctional condition, having been repeatedly resharpened and worn until no further use could be made of them. Frison's assumption of rapid attrition, resulting in tremendous variation in size and shape, seems confirmed by Osgood's studies among the Eskimo, which revealed that end scrapers were sharpened up to five times during the scraping of one caribou hide (Osgood 1940: 80).

At Brassica Bench, 37 end scrapers were found. Twenty-six of these are complete, and one nearly complete, while ten consist only of small portions of the original artifact. Almost all (86.4%) were produced on blank percussion flakes or have had the cortex removed; cortex being confined to the dorsal sides of the others. Nineteen were produced from grey chalcedony, eight from fossiliferous chert, nine from heterogeneous cherts, and one from quartz. Twelve of the scrapers appear to have been heat treated, including several of the chalcedony ones. End scrapers displayed a wide distribution at the site, with no pronounced clustering being evident. Figure 22 illustrates their spatial distribution in terms of the categories described below. Four formal categories of end scrapers were discernible: small, circular, flat "thumbnail" scrapers (3 specimens); tear-shaped ovate scrapers (22); stemmed scrapers (6); and scrapers secondarily manufactured from stemmed projectile points (6). Selected specimens from these categories are illustrated in Figure 23.

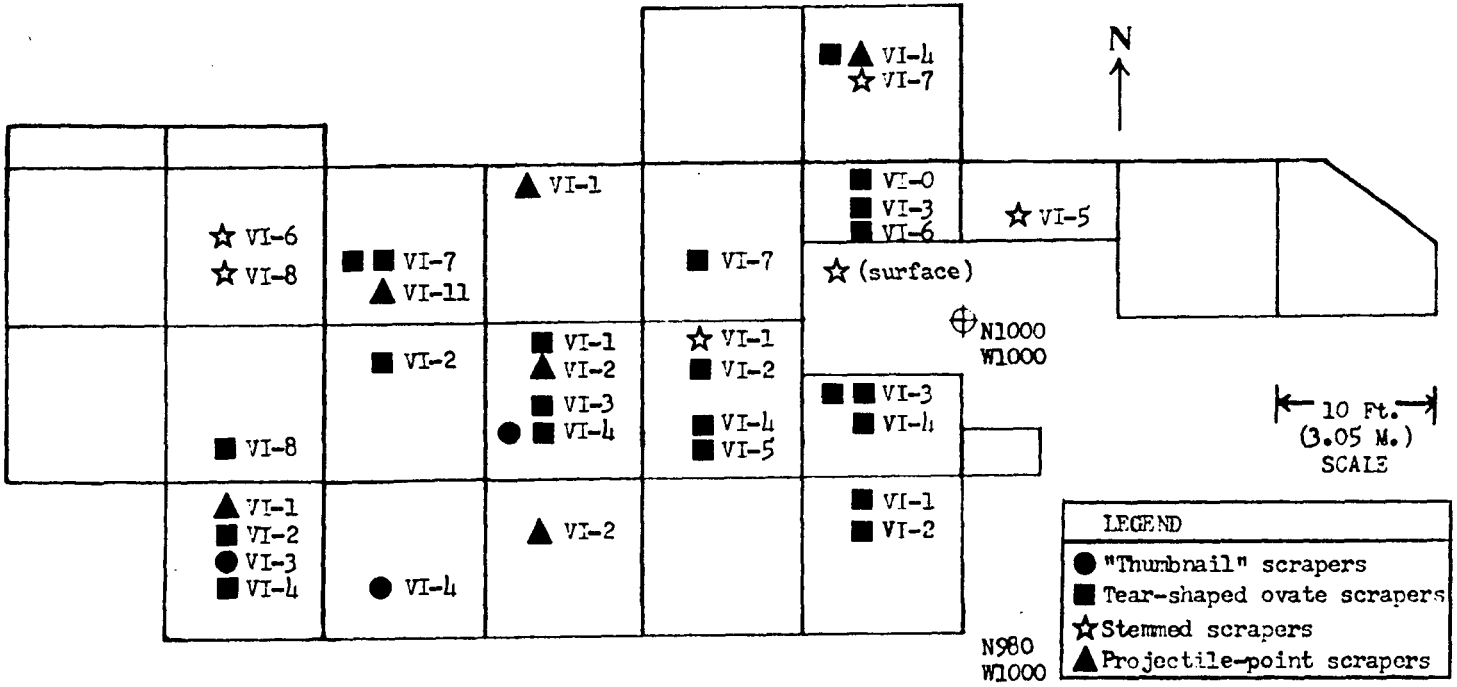


Figure 22. Map showing distribution of end scrapers at 13PK251

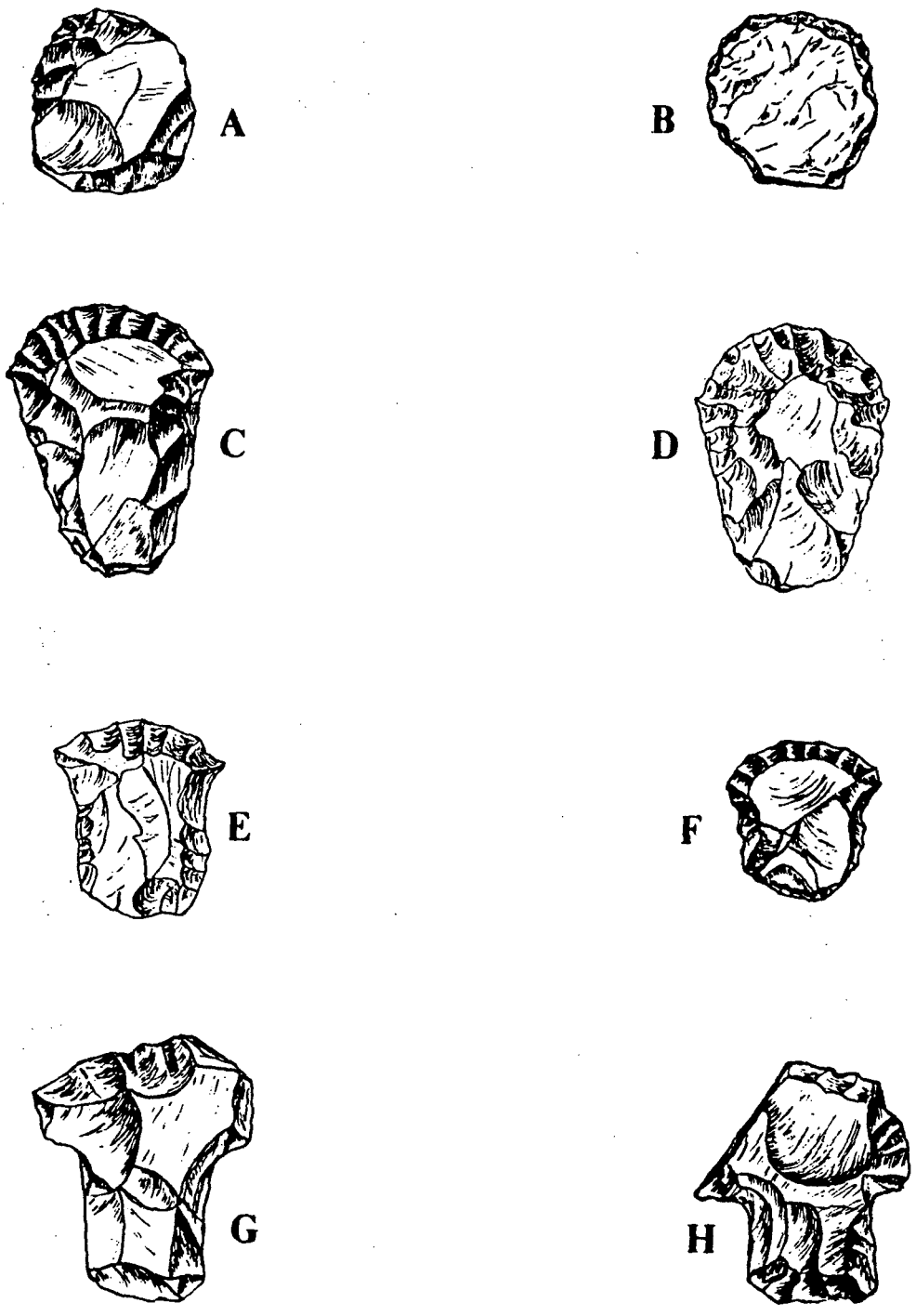


Figure 23. Selected end scrapers from 13PK251 (A and B: "thumbnail: scrapers 425 and 101--the latter is made of quartz; C and D: tear-shaped ovate scrapers 687 and 284; E and F: stemmed scrapers 260 and 1219; G and H: projectile-point-scrapers 890 and 1147. Actual size)

"Thumbnail" scrapers measured an average of 23.7 x 21.7 mm. in their planar dimensions, with an average maximum thickness, usually at the bit, of 5.5 mm. Bits (distal, "working" ends) were not prominent in relation to the bodies of the artifacts. The distribution of these scrapers was confined to the south central and southwestern portions of the site.

Scrapers of the second category, when measureable, averaged 34.1 mm. long, with a range of 25 to 39.5 mm. Bit widths averaged 24.4 mm. wide. All of these scrapers are snubnosed, and distinctly plano-convex in cross-section, although nine were ventrally worked (i.e. bifacially) along lateral and basal edges. Thirteen are keeled, most only slightly, while the nine others are nearly flat on their dorsal faces. Taken together they have an average bit thickness of 7.4 mm. Several are more angular than ovate, and two are asymmetrical, exhibiting one concave lateral edge. Four display sharp, diminutive "points" or protuberances on at least one of their lateral edges at the wide part of the bit. These protuberances could have resulted inadvertently from resharpening of the tool, but they appear purposely placed, and may have functioned as gravers. Measurements taken at the midsection of the scrapers reveal an average width of 21.3 mm., with a range of 16 - 30.5 mm., and it is assumed that these dimensions approximate the interior diameter of the hafts, while bit widths would exceed it.

While the scrapers just discussed represent standard fare throughout the Prairie-Plains, the stemmed scrapers are more unusual, although essentially differing from those of the last category in only one way: their mid-sections have been laterally and often bifacially trimmed until the form of the scraper approximates a "T" shape, with a wide, short bit and a constricted, narrower midsection and proximal end. The stemming effect is most prominent on the two specimens illustrated in Figure 23, somewhat less so on the other four. Five of the six scrapers possess sharp protuberances, which could in some cases be termed "spurs," on at least one lateral edge at the point of juncture of the bit and the stem. It is assumed, following Brennan (1975: 80), that these most likely functioned as cutting tools.

Scrapers of this category average 25.8 mm. long, with average bit widths of 23.6 mm. and bit thicknesses of 6.5 mm., making them somewhat smaller than the tear-shaped ovate scrapers. Above the bit at the "neck" of the stem, they average 20.9 mm. wide with a range of 17 to 26.5 mm. These measurements would seem to indicate the use of a slightly smaller haft than was used for tear-shaped ovate scrapers, although the difference seems somewhat negligible given the range.

This category of scrapers exhibited a wide distribution throughout the site, although occurring in relatively low

levels in the northern portion and at somewhat higher elevations in the southern. In passing, it should be noted that the stemmed category might in actuality be larger than analysis revealed, since several of the scrapers assigned to the tear-shaped ovate category consisted of fragments on which the stemming effect was impossible to determine. It is also worth noting that this kind of scraper comprised one of the ten types listed by White, Binford and Papworth (1963: 44) as representative of Hopewell end scrapers. Within the central Des Moines River Valley region, a "plano-convex, side-notched end scraper" of somewhat similar shape has been reported from the DeArmond/ Barrier Dam site (13PK154), a site assumed to be Late Archaic to Late Woodland in age (Gradwohl and Osborn 1977: 41, Figure 9). This site is located in the uplands on the left bank of Big Creek, within the local site catchment area of the Brassica Bench site.

The fourth category of scrapers resulted from the recycling or modification of medium to large sized stemmed projectile points, and represents Collin's (1975: 25) last step in the manufacture and use of artifacts, which is to maintain, modify, or discard. Three of the six scrapers were produced from grey chalcedony. Stems are quite similar to those of the stemmed projectile points found at the site, measuring an average of 17.4 mm. in length, 18.5 mm. in width, and 16.3 mm. in width at the base. Morphologically, two are contracting-

stemmed with subconvex bases, two are straight-stemmed with subconvex bases, and two are straight-stemmed with straight bases. One of the straight-stemmed scrapers has an unfinished base and exhibits cruder flaking than the others, indicating an early stage of manufacture. Three of the others have finished bases, one of which is ground, but are sparsely retouched, suggesting that they were only a little further along in the manufacturing process. Only two of the six scrapers seem to have been produced from fully finished artifacts. All are bifacially worked to some extent; one completely so, including the bit. Four are lenticular in transverse cross-section, while two are relatively plano-convex, although all are longitudinally snub-nosed. Four have had third-category retouch flakes (cf. Frison 1968: 150) removed from the ventral face at the bit, presumably to enhance the scraping effectiveness of the artifact. Bits range from 18 - 30 mm. wide (average of 24.5 mm.), with an average thickness of 6.7 mm. The scrapers range in length from 20 - 36 mm., a variability which probably derives from the different points of breakage on the original tools rather than from choice of the manufacturer or attrition from resharpening.

These scrapers displayed a variable distribution throughout the site, seemingly unconnected with diagnostic pottery and projectile point types. It is quite possible that

at least some of them were modified and used at a later date than that of their original manufacturing as projectile points.

Drills Following Gradwohl and Osborn's (1972: 31) usage of the term, chipped stone objects which are bifacially worked, elongated, pointed, and have relatively thick or diamond-shaped cross-sections have been categorized as drills. At the Brassica Bench site, 23 drills were recovered. Like the scrapers, many could be in non-functional condition. It is assumed that these tools were used for drilling holes or cavities, through or into wood, bone, or the softer grades of stone. It is further assumed that they were unhafted, since a haft would only add to the circumference which must be turned, causing a decrease in economy of motion.

Of the 23 drills found at the site, only five are complete specimens; three are illustrated in Figure 24. Eleven consist mainly of distal, "working" ends, and seven of primarily basal portions. Nine are heat treated. Eleven (47.8%) are made of grey chalcedony, and six of fossiliferous chert, the remainder of heterogeneous cherts.

Morphologically, these artifacts can be differentiated according to the shape of the base and the shape of the shank, although the functional importance of these differences is uncertain. Of the 11 bases, nine are "expanding-base" or "T" based (see Figure 24, A and C), while two exhibit fairly

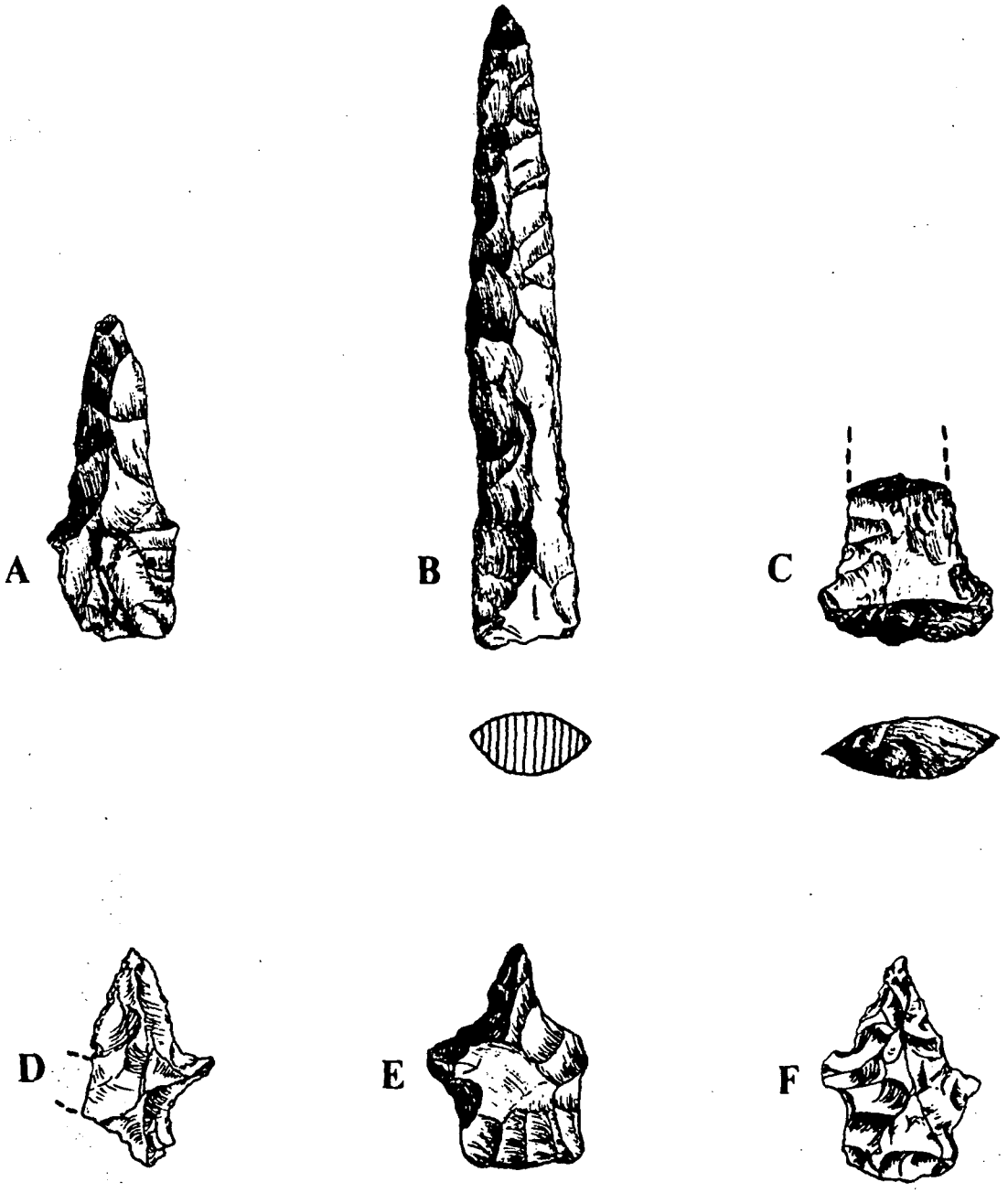


Figure 24. Selected drills and graver/perforators from 13PK251 (A: expanding-base drill 873B; B: straight-sided drill 99, with view of cross-section; C: expanding-base drill 873A, with view of basal "bit"; D, E, and F: graver/perforators 188, 645A, and 1336. Actual size)

straight sides, with only minor and gradual broadening towards the base (see Figure 24, B). Most bases are relatively thin, similar to projectile point stems, rather than bulbous in cross-section. One expanding-base drill (see Figure 24, C) is much wider (24 mm.) and more bulbous at the base than the others, and its base has been unifacially worked into a convex, snub-nosed shape which may have served for gouging or scraping. Excluding this possible composite tool from consideration, the drills average 16.1 mm. wide at the base, with a range of 8.5 to 19.5 mm.

It was possible to classify all the drills according to the cross-sectional shape of their shanks. The majority (14) displayed triangularly ovate cross-sections, while six were trapezoidal, and three diamond-shaped. Shanks averaged 10.3 mm. wide and 6.2 mm. thick; measurements being taken a short distance below the tip of the drill whenever possible, and at the uppermost portion of the drills which lacked distal ends.

Lengths could be determined only on the five complete specimens. One (Figure 24, B) was exceptionally long (89 mm.); the other four averaging 47.6 mm. in length, with a range of 41.5 - 55 mm.

In terms of spatial distribution, the drills were found in a southwest to northeast arc across the site, at upper and lower levels. They were in association with pottery and projectile points of all categories.

Graver/perforators This tool category has been somewhat arbitrarily defined. These tools are characterized by the presence of sharp, bifacially-worked graver "spurs", or projections, and a short, relatively narrow, nearly rounded "blade". It is assumed that the gravers were used for slitting, scoring, slicing, or cutting of hide and/or wood, with the blade being used for perforating hides. Three graver/perforators were found at Brassica Bench; all three are illustrated in Figure 24.

Two of the three have tips which are sufficiently wide and angular to have performed drilling functions, and on one (Figure 24, D) the "base" is similarly shaped. All are somewhat short, averaging 31.3 mm. long, with blade lengths of 11, 14, and 14 mm. One appears heat treated. One was produced from fossiliferous chert, the others from heterogeneous cherts; none are made of grey chalcedony. All were produced on blank flakes, or have had the cortex completely removed.

Two of the three were apparently recycled from broken or worn stemmed projectile points. Stem shape and size approximates those described in the projectile point inventory, with stem lengths averaging 13.5 mm., stem widths of 17.5 mm., and base widths of 17 mm. Morphologically, both are straight-stemmed with subconvex bases.

These tools were distributed in the southwest and northeast areas of the site, in squares N980/W1040, N990/W1040, and N1010/W1000, at intermediate to low levels (VI-5 and VI-6).

To this category, one additional artifact has been added: a rather thick and somewhat crudely flaked biface with one very sharp and pointed end (not illustrated). While it might just as easily have been included in the biface category, its sharp tip would seem to suggest a graving or perforating function. It was produced from grey chalcedony and was found in square N990/W1030 at the VI-4 level.

Knives This tool category includes bifacially-worked artifacts which are elongated, relatively large, and regularly shaped. They differ from the biface category primarily in their elongation, and the regularity and symmetry of their shape. It is assumed that they were used as cutting tools, and were probably hafted. Only three knives were found at 13PK251, although the longest of the stemmed projectile points might actually be a knife, along with several of the artifacts classified simply as bifaces.

One of the three knives is made of grey chalcedony, but consists only of a long, rather narrow (19 mm.) tip section, and may only be a preform. The two others are illustrated in Figure 25. One (Figure 25, A) is a decidedly large, ovate, stemmed variety, unfortunately broken, with an estimated width of 6.5 mm. and an estimated length of 138 mm. It is 15 mm. thick, and made of grey chalcedony. The third knife (see Figure 25, B) is smaller, lanceolate in shape, and relatively thick through its middle (11 mm.) in proportion to its size,

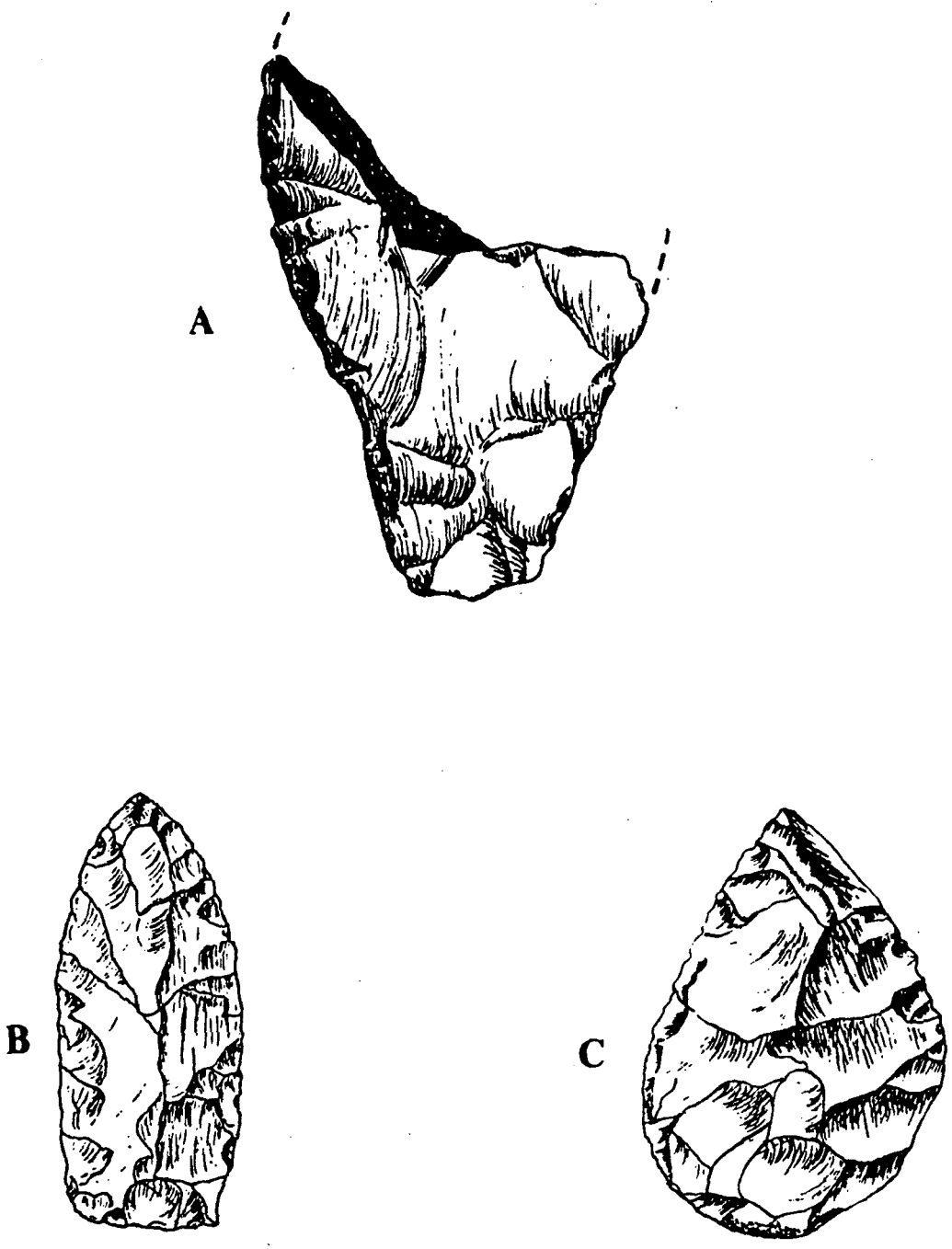


Figure 25. Selected knives and biface from 13PK251 (A: knife 1045; B: knife 1033; C: biface 587. Actual size)

possibly indicating a preform stage of manufacture. It is made of heat treated chert. Both of the latter two knives were found in square N1000/W1020 at levels VI-13 and VI-8, respectively. The other knife was found in square N990/W1010 at level VI-3.

Bifaces This category is more descriptive than functional, since all bifacially-worked chipped stone artifacts other than "recognizable" tools and cores are included. Some bifaces may be fragments of former tools, but are so small or lacking in diagnostic features to be recognizable as such. Many may be tool preforms representing various early stages of manufacture, while others may have been quickly flaked and used once in an ad hoc manner and then discarded. It is assumed that all the bifaces were used or intended for cutting purposes.

At the Brassica Bench site 106 bifaces were recovered. Of these, 23 (21.7%) are grey chalcedony, 38 (35.8%) are fossiliferous chert, two are quartz, one is quartzite, one (very crudely flaked) is argillite, and the remainder heterogeneous cherts. Only 28.3% displayed the presence of lithic cortex, and only 34.9% appeared to be heat treated.

Morphologically, the bifaces can be differentiated in a number of ways. To begin with, 69.8% are classifiable as thin rather than thick in proportion to their size, suggesting a more finished stage of artifact manufacture. Most of the

thin bifaces exhibited retouching along their edges, and half appeared to be tips, midsections, or bases of finished products, although this conclusion is impossible to confirm. Five appeared to be the stems of broken, stemmed projectile points or knives, while three others are probably the barbs of notched or stemmed points. In terms of configuration, almost all of the bifaces were generally ovate, except for the few tips and bases which displayed more specific and angular shapes. One of the more finished and uniform of the ovate bifaces, a "D" shaped tool with both a straight and convex cutting edge, made from heat treated chert, is illustrated in Figure 25. It was recovered from level VI-7 in square N990/W1030.

In all, 44.3% of the bifaces appeared to be preforms. Judging from their size and shape, at least two were destined to be small triangular projectile points of the Category 3 variety, and ten to be stemmed or notched points. The other "preform" bifaces do no indicate their final or intended form, and some of these may be simply "test" pieces, or preforms inadvertently broken during very early stages of manufacture. Of the bifaces which are fragments or preforms of notched or stemmed points, only three are made of grey chalcedony, the remainder of heterogeneous cherts.

In terms of distribution, several facts deserve consideration. To begin with, three chert bifaces were recovered from Feature 12 in square N990/W1020. These are the

only tools other than utilized flakes to come from any of the features. Throughout the rest of the site, bifaces displayed a wide distribution, a fact consistent with their generalized nature and large numbers. They were concentrated, however, in the central squares of N990/W1020-W1030 and N1000/W1020-W1030, and the squares to the immediate south and west. They were found at all levels and at the surface of the site, but in the four squares just mentioned they were especially predominant from level VI-4 to VI-9. The same distribution was observed to be true of the bifaces which appear to be stemmed or notched point fragments or preforms, as well as the chalcedony bifaces. Both of the latter two groups are common in all levels of square N990/W1030, but also occur more generally throughout the site, usually at low levels in northern excavation units and at higher levels in southern units. Both of the small-triangular-point preforms, on the other hand, were found in square N990/W1020 at high levels (VI-1 and VI-4). In passing, it is of interest to note that the argillite biface was found in square N980/W1030 at level VI-6.

Retouched and utilized flakes This category is also more descriptive than functional, encompassing a relatively high number of irregularly-shaped flakes which exhibit marginal modification by retouch and/or use. Retouched flakes were identified by the presence of unifacial retouching along at

least one edge of the flake, while utilized flakes displayed steep, non-uniform "flaking" or patterned breakage along at least one edge, probably deriving from utilization as "momentary" cutting or scraping tools. The retouched flakes might have derived from "testing" of a flake for flaking quality, or they might as easily be various kinds of scrapers (e.g., side-scrapers). Some retouched flakes have been more regularly modified than the others, and have a somewhat snub-nosed shape, enabling their classification as retouched flake scrapers. It should be pointed out that retouched edges are not necessarily working edges, since Wilmsen has noted that retouching may have been employed to create dulled edges on the backs of cutting and scraping tools so that greater pressure could be applied to the working edges of the tools (1968: 156). Taking this into account, and since analysis revealed that many of the retouched flakes at 13PK251 display wear along edges opposite their retouched edge, both retouched and utilized flakes have been treated here as one general category.

At the Brassica Bench site, 222 retouched or utilized flakes were found. Almost all were produced on blank flakes (78.4%). At least 29.3% appear to have been heat treated. A large proportion of the total (40.5%) was produced from grey chalcedony, and only 17.6% from fossiliferous chert. Most of the remainder were made from heterogeneous cherts, but two retouched flakes were made from "Knife River Flint", or

brown chalcedony, one retouched flake scraper from heat-treated Tongue River Silica, and one utilized flake from red quartzite.

Slightly over half (55%) of these flakes displayed retouch or utilization along only one edge. Most of the rest displayed modification along two edges, usually on opposite edges, but seven (3.1%) were modified along all edges. At least 69.4% seem to have been used randomly, in an ad hoc manner, while the rest are more regularly and extensively modified, suggesting a more purposeful design or goal.

In slightly more functional terms, 57.2% were classifiable as utilized flakes, 22.5% as retouched flakes, and 20.3% as retouched flake scrapers. Seventeen (37.7%) of the latter appear to be of the "thumbnail" variety. At least four of the retouched flakes appear to be scraper preforms, while 11 are probably fragments of broken end scrapers. Twenty-seven of the retouched or utilized flakes displayed concavities suggesting their use as spokeshaves. While these are generally assumed to have been used for the scraping of wooden shafts, they may have been used for cutting, since "experiments have found that the 'spokeshave' performs indifferently as a shaft smoother but works very well as a rotating knife; that is, a shaft can be cut by rotating the 'spokeshave' about its circumference, the 'graver tip' acting as the cutter" (Brennan 1975: 80). The majority of the utilized flakes,

however, displayed wear indicating their use in scraping tasks of a more generalized and planar nature.

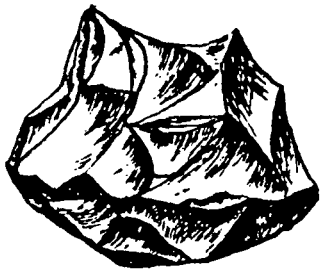
Retouched and utilized flakes displayed a wide pattern of distribution at the site, being found in nearly every excavation unit, at varying depths and at the surface of the site. They were concentrated, however, in the central and southwestern excavation units, in a pattern somewhat approximating that of the bifaces. One utilized flake, made of grey chalcedony, was found in Feature 12, and one utilized chert flake was recoverd from Feature 8.

Cores and core fragments This category consists of thick chipped stone objects which are characterized by the presence of large percussion flake scars. Flake scars are occasionally placed so as to result in a sinuous, bifacial edge, but more commonly occur in a more random fashion on the surface of a stone nodule. Following Gradwohl and Osborn (1972: 33), cores are assumed to represent nuclei from which flakes have been detached in the apparent initial investigation of the nodule or in later stages of the preparation of the source material. It is further assumed that flakes struck from these cores were then used as needed for the production of "finished" artifacts.

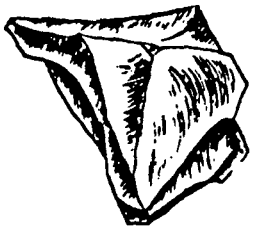
At Brassica Bench, 38 cores and core fragments were found. Less than half were "complete" cores. the remainder being core fragments or very lightly worked cores. Only eight of the

total were completely blank, the rest retaining some amount of lithic cortex. A variety of stone was present, including grey chalcedony (one core, two core fragments), fossiliferous chert (four cores, eight core fragments), red quartzite (one core, one core fragment), quartz (one core), red agate (one small pebble core), and pale brown chalcedony (one small pebble core). The remainder was made up of heterogeneous cherts. The grey chalcedony core and one core fragment of this material both appear to be heat treated, and overall, 50% of the cores and core fragments displayed the characteristics of heat treatment. Only two cores were "regular" in form, in Gradwohl and Osborn's (1972: 33) sense of the term, displaying the characteristics of "systematic" removal of cortical material and subsequent flakes; the remainder are classifiable simply as "irregular" in form. One core could well have served as a "chopper" cutting tool, but the majority of the cores and core fragments are rather amorphously and irregularly shaped. The two regular cores are illustrated in Figure 26. One (Figure 26, A) was produced from grey chalcedony, the other from heat-treated chert.

Cores and core fragments displayed a variable distribution throughout the site, concentrating only slightly in the central and extreme southern excavation units, at various levels.



A



B

Figure 26. Selected cores from 13PK251 (A: grey chalcedony core 1342; B: chert core 5. Actual size)

The "regular" grey chalcedony core was found at level VI-7 in square N1010/W1000, the "regular" chert core at level VI-1 in square N980/W1000.

Waste flakes and shatter This category consists of unused flakes and shatter, or "debitage", assumedly produced as a by-product of the manufacturing and repair of chipped stone tools. Waste flakes characteristically exhibit positive bulbs of percussion, ripple marks, and radial fissures, although the expression of these classic features varies with the degree of homogeneity of the source material (Gradwohl and Osborn 1972: 34). Shatter has been differentiated primarily on the basis of its thick, irregular, "chunky" shape and lack of sharp, "leading" edges. To quote Binford and Quimby (1963: 278), shatter consists of "cubical and irregularly shaped chunks that frequently lack any well-defined bulbs of percussion or systematic alignment of cleavage scars on the various faces," and results from "both heavy percussion techniques and the cleavage of raw material along old fracture planes such as frost cracks and the like".

A total of 4,593 waste flakes and shatter was recovered at the Brassica Bench site, of which only 4.8% was shatter. In terms of decortication, 86.9% of the total were blank, 10.2% were secondary, and only 2.9% were primary decortication flakes or shatter. Only 14.7% appeared to have been heat treated. Grey chalcedony was the most predominant single type

of stone, comprising 31.5% of the total, with flakes of this material appearing identical with the chalcedony tools and cores already discussed. Relatively homogeneous fossiliferous chert was also a common occurrence (13.9%), with the remainder of the total consisting mainly of heterogeneous cherts. Present but in very small quantities were flakes and shatter of quartz (19 specimens), red quartzite (18), jasper (8), argillite (6), tan quartzite (5), hematite (4), and "Knife River Flint", or brown chalcedony (1). The six argillite flakes appear to have been struck from the biface of the same material. It might be noted that although the four hematite flakes have been placed in this category, technically they probably derive from ground stone industry, having occurred during the initial shaping of hematite artifacts.

Debitage size deserves added attention here, since a large proportion of the debitage category was obtained through the water flotation technique, which resulted in the recovery of numerous small flakes which would other wise have been lost. Debitage was graded into four groups during the analysis: very small (ca. 3 mm. or less), small (ca. 3 - 8 mm.), medium (ca. 8 - 22 mm.), and large (over 22 mm.). It is assumed that the very small specimens derive from pressure flaking, and the larger from percussion flaking. Shatter, it might be added, was predominantly medium to large in size.

When the debitage recovered through water flotation are excluded from the total, 5.9% of the remainder were classifiable as very small, 42% as small, 42.8% as medium, and 9.2% as large in size. When the flotation material is included, 29% of the total are very small, 34.7% are small, 30.1% are medium, and 6.3% are large in size.

In terms of distribution, it is important to note that 418 very small and small waste flakes and one shatter were found in Feature 12, and that 47.7% of these were grey chalcedony, the remainder heterogeneous cherts. Only 83 waste flakes were found in all the other features combined, with the majority of these divided between Features 4, 8, and 10. In general, however, waste flakes and shatter were a common and widespread occurrence at the site. As with other chipped stone artifacts, they were somewhat concentrated in the central squares, particularly squares N990/W1020 and N990/W1030, at intermediate and low levels. The same observation is true of the grey chalcedony debitage.

Ground stone One other class of lithic artifacts was recovered from Brassica Bench, consisting of stone which has been pecked and/or ground. Tools, ornaments, and pigment sources are included within this category. It is assumed that the tools and artifacts were pecked into a rough shape with the aid of a hammerstone, and then ground and/or polished

into a finished state with the use of sandstone and other abrasive materials. Pigment sources were probably simply scratched on or with sandstone.

Ornaments The most common form of ornament found at the site consisted of hematite beads. Four were found, all complete (see Figure 27). All four have been ground into shape, but none have been polished. Biconical holes, measuring an average of 2 mm. at point of greatest constriction and expanding to 4.5 mm. at the point of entry, were drilled into the center of each of the beads. The beads have an average planar thickness of 6 mm., with a range of 4 - 8 mm., and an average overall diameter of 16.1 mm., with a range of 14.5 - 18 mm. Three of the four beads were found at relatively deep levels (VI-4 and VI-7) in square N1000/W1020, and the other at level VI-1 in square N980/W1010.

One other object (see Figure 27, E) has been classified as an ornament, although its identification is somewhat problematical in comparison to the beads. It appears to be a pendant, made from an irregularly-shaped piece of hematite, or extremely ferruginous sandstone, through which a biconical hole has been drilled. The natural shape and contours of the stone are suggestive, at least to the author, of the head of a bird. The hole in this artifact is about 9.5 mm. in diameter at the point of greatest constriction, and

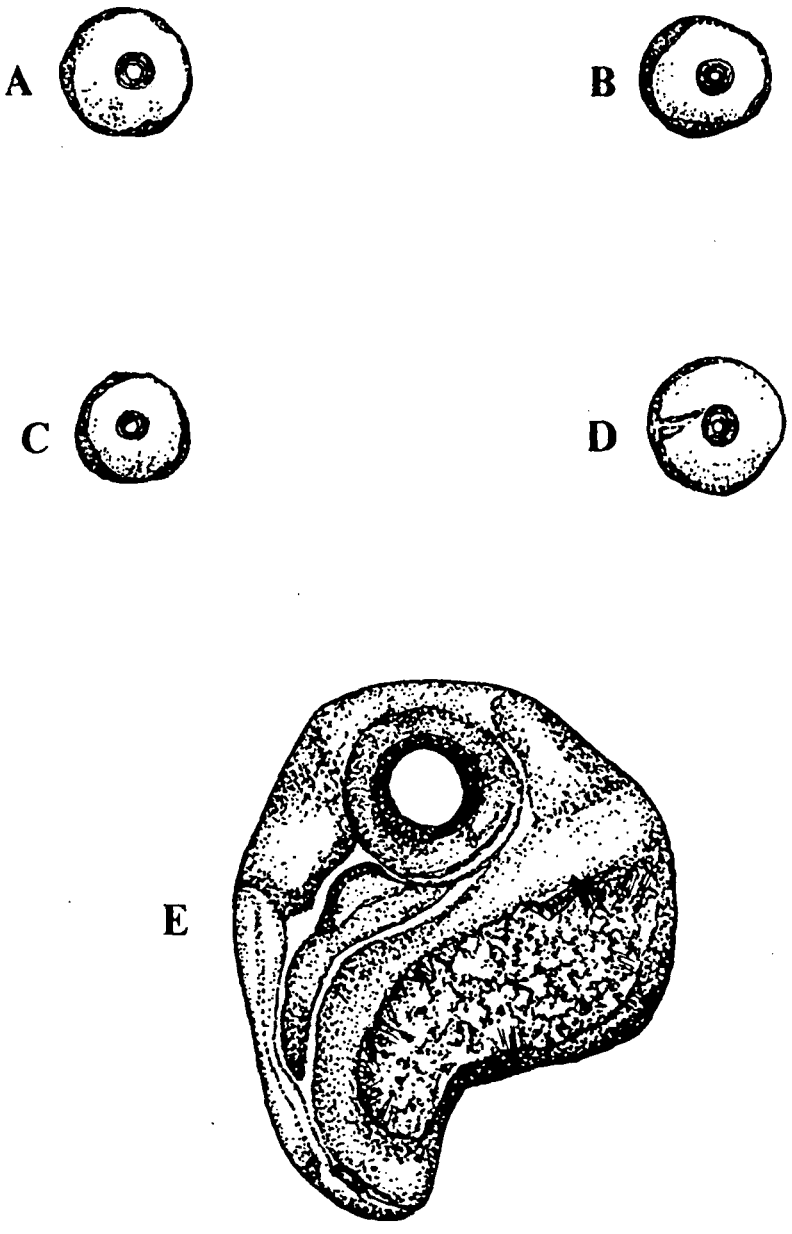


Figure 27. Hematite geads and pendant from 13PK251 (A, B, C, and D: beads 22, 934, 935, and 1026; E: pendant 807. Actual size)

expands to 13 mm. at the point of entry. Except for the hole, the stone has not been extensively modified, with grinding and light polishing serving only to smooth and accentuate the natural contours. The pendant was found in square N1000/W990 at level VI-6.

Celts Celts were identified on the basis of their flat, elongated shape, combined with at least one sharp edge or bit. Following the usual usage of the term, celts were defined as being ungrooved.

At Brassica Bench, two celts and one probable celt blank, all made of hematite, were found. The two celts, both highly polished bit fragments, are illustrated in Figure 28. They have maximum thicknesses of 12 and 14.5 mm., and widths of 36 mm. and 53 mm., respectively. Both were found in square N980/W1030 at levels VI-1 and VI-3. The celt blank, which is assumed to represent an early stage of manufacture, was found in the excavation unit to the immediate east (N980/W1020) at level VI-5. It measures 90 mm. long, 60 mm. wide, and 12 mm. thick, and displays a few negative flake scars along its edges.

It should be noted that small hematite celts comprise one of the "characteristic" artifacts found at Woodland sites in the central Des Moines River Valley region (Gradwohl 1974: 94). Several hematite celts, quite similar to the ones

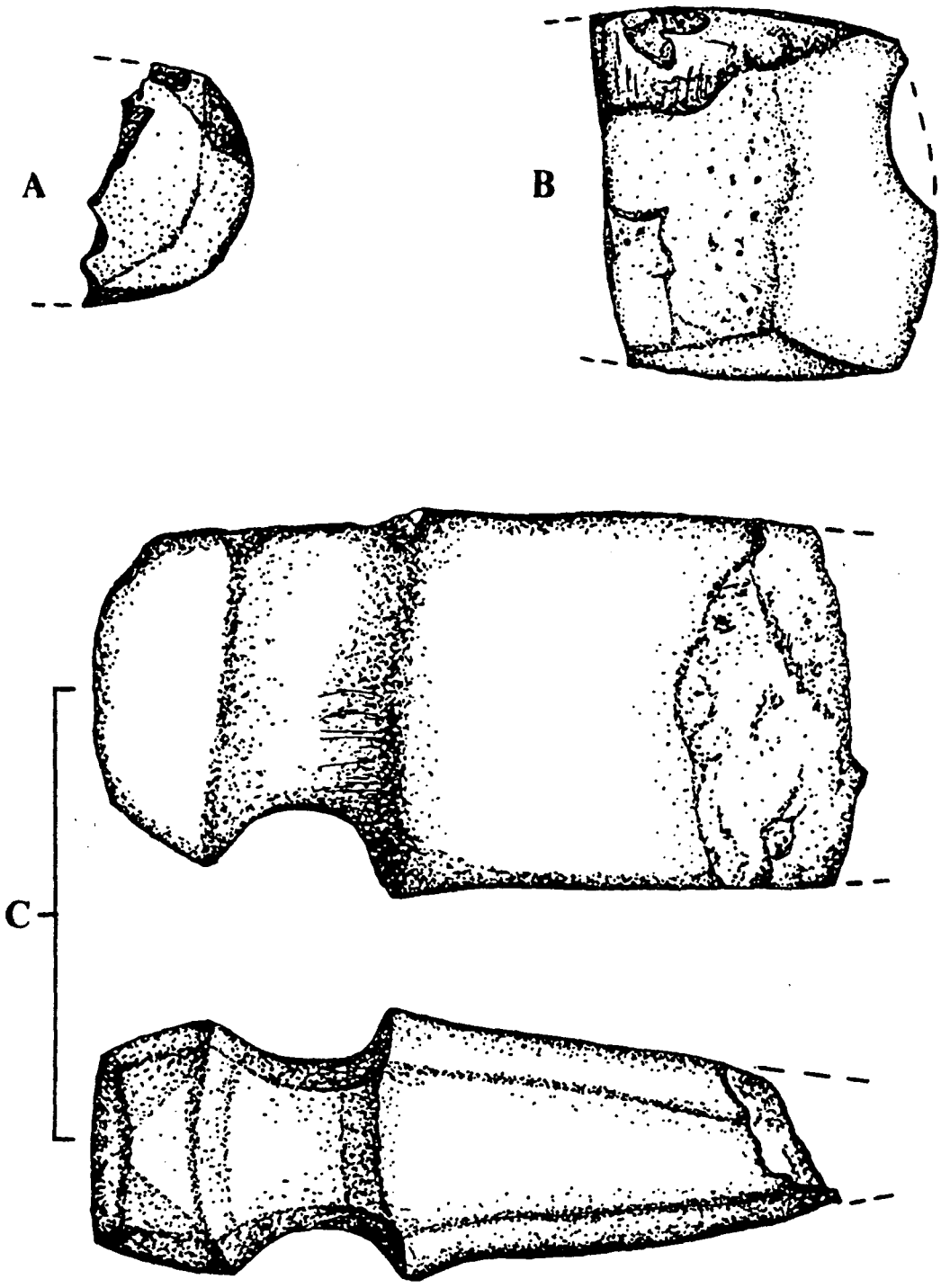


Figure 28. Selected celts and axe from 13PK251 (A: celt 76; B: celt 514; C: axe 514, showing side and bottom views. Actual size)

found at Brassica Bench, have been reported from the Saylorvillage site, 13PK165 (Osborn, Gradwohl, and Thies 1978: 62-65, Figure 23).

Axes Ground stone objects generally similar to celts, but grooved, were classed as axes. One unfinished and one finished axe were found at Brassica Bench. The latter, illustrated in Figure 28, is a nearly complete, three-quarter-grooved specimen. It is made of diorite, and is highly polished. Length could not be determined, but width measured 56 mm. The maximum thickness is 44 mm., narrowing down to 29 mm. at the groove. The unfinished axe (not illustrated) is not truly grooved, but rather is simply constricted on its lateral edges. It is double-bitted, and somewhat ovate or hour-glass in overall shape. The artifact is 90 mm. long, 24 mm. thick, and has a maximum width of 75 mm. and a "groove" width of 29 mm. It was found at a deep level (VI-11) in square N990/W1040.

Like the small hematite celts, three-quarter-grooved axes are a "characteristic" artifact at Woodland sites in the central Des Moines River Valley region (Gradwohl 1974: 94). Two axes of this kind were reported from the Saylorvillage site, 13PK165 (Osborn, Gradwohl, and Thies 1978: 62, Figure 22).

Abraders These artifacts were identified primarily by the presence of shaped grooves on their surfaces, which likely resulted from their use in smoothing wooden shafts or in creating new striking platforms on the edges of chipped stone tools (Flenniken ca. 1976). Excavations at the Brassica Bench site produced ten abraders, of which selected examples are illustrated in Figure 29. Eight of the ten abraders were made from a relatively dense, light-brown sandstone. The other two (not illustrated) were made from a ferruginous sandstone of somewhat coarser texture; both are small, lightly-worked fragments.

All the Brassica Bench abraders displayed "V" shaped grooves indicating their use as flint-knapping abraders. The largest specimen (see Figure 29, A) also has "boat" or "U" shaped grooves likely derived from shaft smoothing. The distribution of the abraders is shown in Figure 30; most were found in the center of the site at intermediate levels.

Hammerstones These artifacts were identified primarily on the basis of their extremely battered surfaces, and their small "hand" size. The battered surfaces of these tools are assumed to derive from their use as "hammers" in both chipped stone and ground stone industry. Nine hammerstones were found at Brassica Bench, one of which is illustrated in Figure 31. All were small, usually-fist-sized chert nodules. Two appear to have been heat treated, and thus may have been

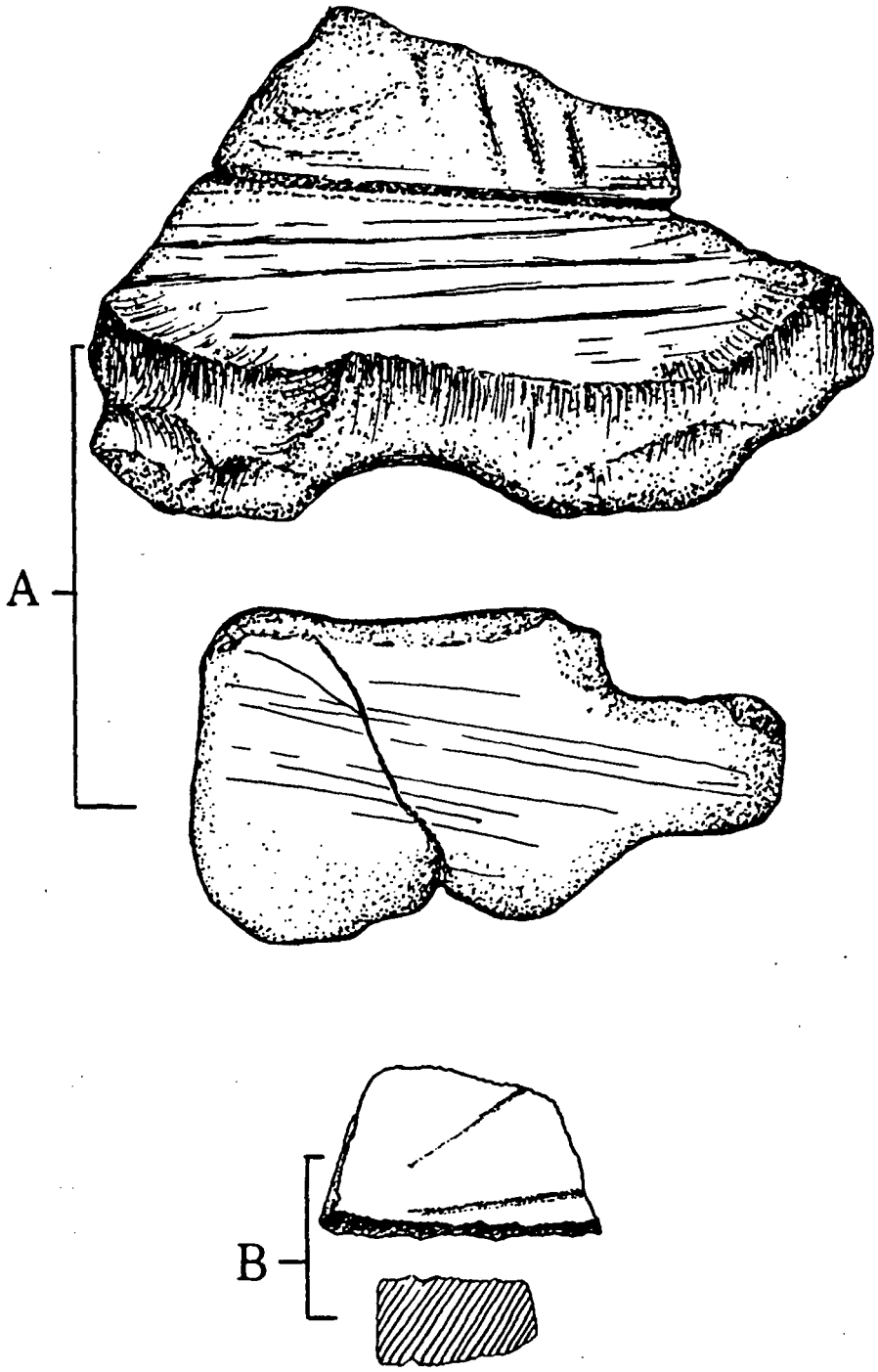


Figure 29. Selected abraders from 13PK251 (A: three-quarters' view and end view of abrader 1502; B: three-quarters' view and cross-sectional end view of abrader 362. Actual size)

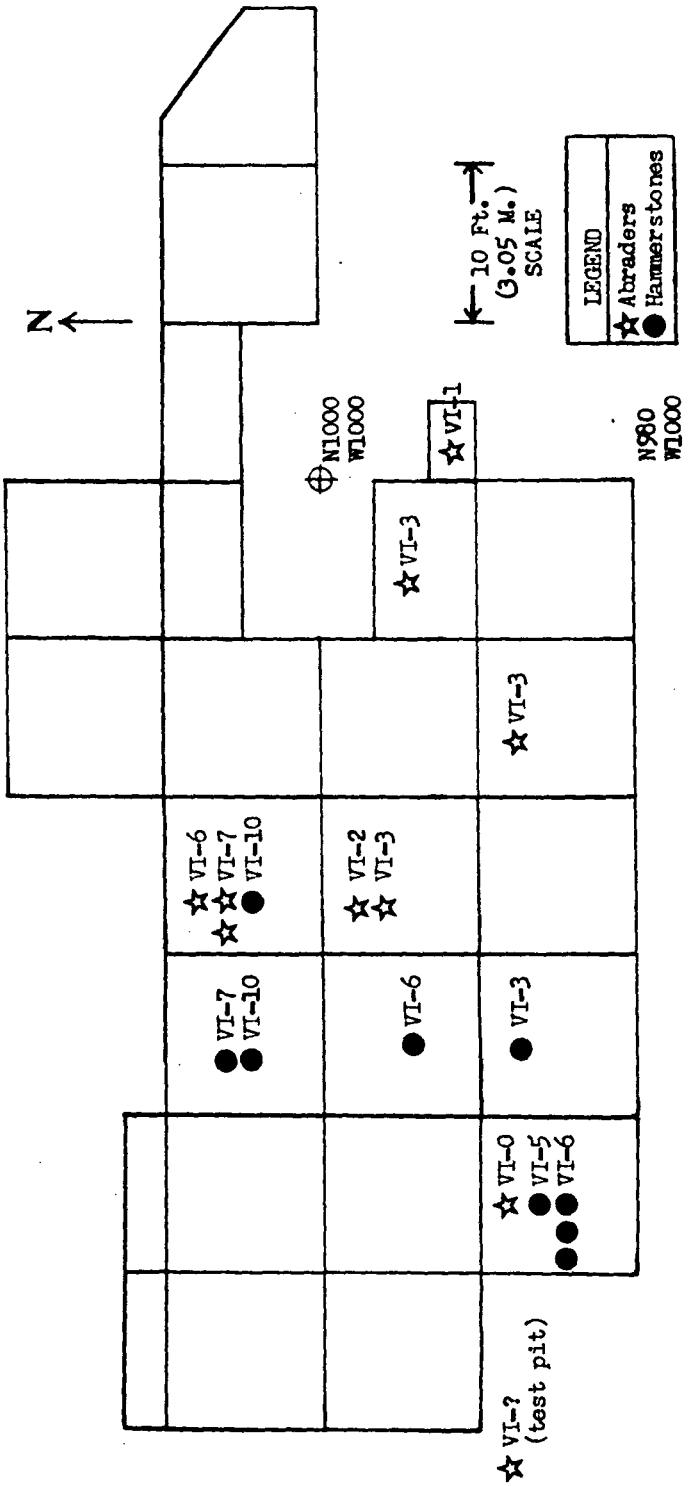


Figure 30. Map showing distribution of abraders and hammerstones at 13PK251

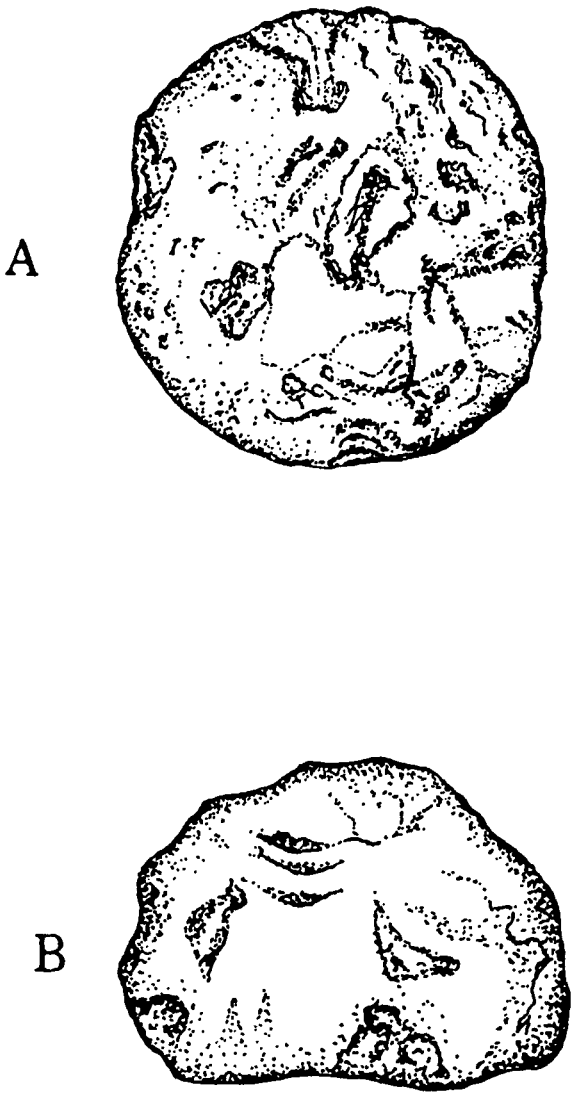


Figure 31. Selected hammerstone from 13PK251 (A: "top" view, and B: "end" view of hammerstone 1113. Actual size)

intended to be used as cores. Spatial distribution of the hammerstones is shown in Figure 30; most were found at relatively low levels in the western portion of the site.

Ground stone Three items were recovered at the site which exhibit slightly striated or smoothed surfaces, suggesting their use in grinding, although little else can be inferred concerning their use. All are basalt, and judging from their size and shape they can be tentatively identified as manos, or hand grinding stone. Two fragments of apparently smoothed or ground granite were also found, but no metates, or grinding slabs, were identifiable. All five ground stone objects were found in central excavation units at intermediate to low levels.

Pigment sources Forty-three fragments of stone were found which exhibit little more in the way of modification than scratched or polished areas. Judging from their small, fragmentary nature, as well as from the types of stone -- hematite, limonite, limestone, and siltstone -- it is assumed that they were used as sources for pigment. Since red pigments were perhaps the most frequent of the colors used by Indians of the Plains (Lowie 1954: 55), it is not surprising that most of the Brassica Bench specimens are hematite (88.4%).

Most of the fragments were only lightly worked, usually on only one side or portion of the fragment, although two

were more extensively modified into somewhat faceted shapes. Almost all were found in the central and southern portions of the site, usually at fairly low levels.

A total of 158 unworked fragments, which could also be included in this category, were present at the site and displayed a similar distribution. Almost all were hematite; a few limonite fragments and one chalk fragment also being present, the latter in Feature 1. While these could all be non-cultural, since these types of stone occur naturally in the glacial till, they just as likely could have been gathered for later use as pigment sources.

Miscellaneous items

Daub or burned earth Eight pieces of daub or burned earth were found in excavations at Brassica Bench. Three of these exhibit finger-size twig or pole impressions. All are coarsely textured and have coarse grit tempering. While these items may represent the remains of a wattle and daub house, it is just as likely that they are simply burned earth. It is possible that they are lumps of potter's clay which were discarded and then fired inadvertently. All were found in or immediately above Feature 2, which is interpreted as a small trash pit (see section on Features).

Features

The term "feature" is used to denote "those material and visible items in or about archaeological sites that are either atypical of the general run of the deposit or not frequently encountered on the surface or in the vicinity of an aboriginal habitation. Generally speaking, features are "things that are not brought back to the laboratory or museum" (Hester, Heizer, and Graham 1975: 131).

At the Brassica Bench site, 12 features were designated. Generally, these features were discrete areas of soil discoloration and/or concentrations of burned earth, charcoal, and rock. The Brassica Bench features have been interpreted as belonging to four categories: large roasting pits (3), small hearths (1), small trash pits and/or hearths (6), post-holes (1), and non-cultural humic concentrations (1). The features are described individually, below; general comments follow the descriptions. A map showing the spatial distribution of the features is contained in Figure 32.

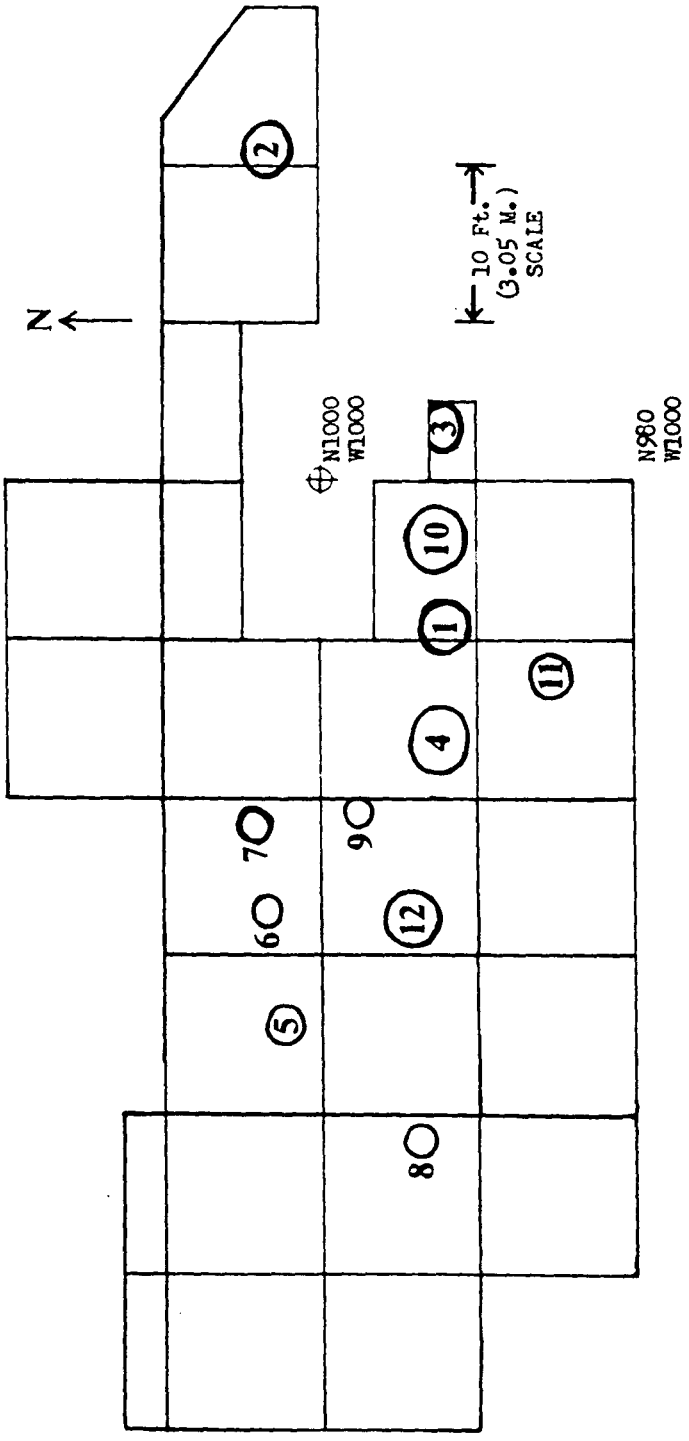


Figure 32. Map showing location of features at 13PK251 (Shape and scale of features has been approximated)

Feature 1

Location: N991.4/W1009 (center of orifice).
Horizontal shape: circular.
Horizontal dimensions at defined orifice: 3.6 feet (1.08 meters).
Vertical shape: relatively deep, basin-shaped pit.
Vertical depth of feature: 0.7 feet (9 cm.) below orifice.
Depth at which orifice was defined: level VI-7.

Contents:

One waste flake (chert)
One shatter (chert)
One piece of fossiliferous chalk
Charcoal fragments (many)
Burned earth fragments (many)
Angular granite rocks (many)

Comments:

The feature was lined and nearly filled with apparently fire-cracked rocks, which in combination with the charcoal fragments and burned earth fragments and burned earth fragments suggests interpretation as a hearth.

Feature 2

Location: N1002.25/W978.75 (center of orifice).
Horizontal shape: oblong.
Horizontal dimensions at defined orifice: 3.0 x 1.5 ft. (90 x 45 cm.).
Vertical shape: shallow, basin-shaped pit.
Vertical depth: 0.6 ft. (18 cm.) below orifice.
Depth at which orifice was defined: 0.7 - 1.3 ft. (21 - 39 cm.) below modern ground surface.

Contents:

Five pieces of daub or burned earth
Burned earth fragments (few)
Charcoal flecks (few)
Ash (small amount)
Small angular granite rocks (few)

Comments:

Vertical location is somewhat uncertain due to excavation of this feature during testing of the site, before depositional units had been clearly defined. Judging from the shallow depth of the feature, and the fact that the periphery appears unaffected by firing, these remains are interpreted as a trash pit.

Feature 3

Location: N991/W994 (center of orifice).
Horizontal shape: oblong.
Horizontal dimensions at defined orifice: 3.9 feet (1.17 meters) in diameter.
Vertical shape: shallow, basin-shaped pit.
Vertical depth: 0.3 feet (9 cm.) below orifice.
Depth at which orifice was defined: level VI-7.

Contents:

One waste flake (chert)
Angular granite rocks (few)

Comments:

Rocks in this feature were underlain by faint stain. Shallow nature of this feature and the lack of material suggests interpretation as a trash pit or short-term hearth.

Feature 4

Location: N992.6/W1017.2 (center of orifice)
Horizontal shape: circular.
Horizontal dimensions at defined orifice: 4.0 feet (1.2 meters) in diameter.
Vertical shape: deep, hemispherical pit (see Figure 33).
Vertical depth: 1.75 feet (50 cm.) below orifice.
Depth at which orifice was defined: level VI-7.

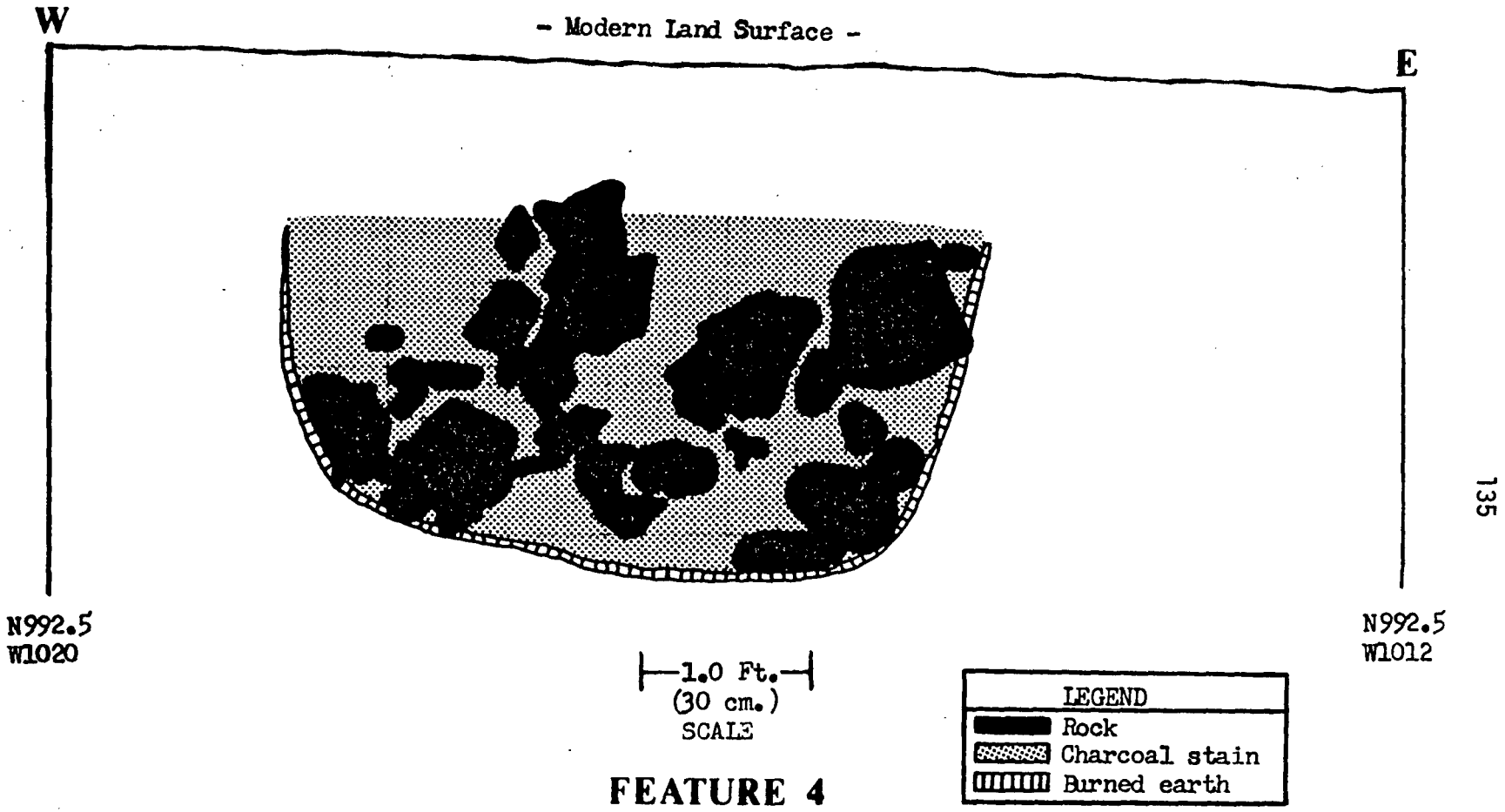


Figure 33. Cross-sectional view of Feature 4, 13PK251 (Looking north)

Contents:

17 waste flakes (four grey chalcedony, 13 chert).
Charcoal fragments (many).
Burned earth fragments (many).
Large, angular granite and basalt rocks (many).

Note: feature was contained within a distinct and continuous "ring" of burned earth (except at the orifice).

Comments:

This feature was densely packed with apparently fire-cracked rock, which, combined with the distinct, continuous ring of burned earth, indicates intense firing. Charcoal fragments are somewhat fibrous, indicating incomplete burning. These remains have been interpreted as a roasting pit.

Feature 5

Location: N1002.8/W1034.5 (center of orifice).
Horizontal shape: circular.
Horizontal dimensions at defined orifice: 2.5 feet (75 cm.) in diameter.
Vertical shape: shallow, basin-shaped pit
Vertical depth: 0.65 feet (19.5 cm.) below orifice.
Depth at which orifice was defined: level VI-13.

Contents:

11 waste flakes (two grey chalcedony, nine chert)
Burned earth fragments (few)
Charcoal flecks (numerous)
Angular, granite rocks (few)

Comments:

Boundaries of this feature are ill-defined. This, combined with shallow nature of pit, suggests interpretation of feature as a trash pit or short-term hearth.

Feature 6

Location: N1003.3/W1026.3 (center of orifice).
Horizontal shape: circular.
Horizontal dimensions of defined orifice: ca. 2.1 feet (63 cm.) in diameter.
Vertical shape: shallow, basin-shaped pit.
Vertical depth: 0.7 - 0.8 feet (21 - 24 cm.) below orifice.
Depth at which orifice was defined: level VI-9.

Contents:

Charcoal flecks (several)
Angular, granite rocks (several)

Note: chert knife #1033 (see Figure 25, B) was found immediately above this feature at level VI-8.

Comments:

The shallow nature of this feature and the lack of clear definition of its dimensions, combined with absence of alteration of the perimeter by firing, suggests interpretation of feature as trash pit or short-term hearth.

Feature 7

Location: N1004.3/W1020.75 (center of orifice).
Horizontal shape: squarish-circular.
Horizontal dimensions of defined orifice: ca. 0.9 - 1.0 foot (27 - 30 cm.) in diameter.
Vertical shape: elongated, pointed downward.
Vertical depth: 2.4 feet (72 cm.) below orifice.
Depth at which orifice was defined: level VI-7.

Contents:

Seven waste flakes (two grey chalcedony, five chert)
Burned earth fragments (few)
Charcoal flecks (few)

Comments:

Distinctive shape of feature indicates original use as posthole. Presence of waste flakes suggests that the post may have been removed or burned and the hole subsequently filled or infiltrated with trash.

Feature 8

Location: N993.35/W1041.1 (center of orifice).
Horizontal shape: circular.
Horizontal dimensions at defined orifice: ca. 1.7 feet (51 cm.) in diameter.
Vertical shape: shallow, basin-shaped pit.
Vertical depth: 0.5 foot (15 cm.) below orifice.
Depth at which orifice was defined: level VI-7.

Contents:

One utilized flake (chert)
18 waste flakes (two grey chalcedony, 16 chert)
Charcoal flecks (many)

Comments:

This feature is interpreted as a trash pit due to the shallow nature of the pit and the absence of rock or alteration by firing.

Feature 9

Location: N997.3/W1021 (center of orifice).
Horizontal shape: oblong.
Horizontal dimensions: ca. 1.2 x 1.6 feet (36 - 48 cm.).
Vertical shape: basin-shaped pit.
Vertical depth: 0.85 foot (25.5 cm.) below orifice.
Depth at which orifice was defined: level VI-7.

Contents:

Six waste flakes (one grey chalcedony, five chert)
Burned earth fragments (few)
Charcoal flecks (few)

Comments:

This feature is interpreted as a trash pit due to the shallow nature of the pit and the absence of rock or alteration by firing.

Feature 10

Location: N992.75/W1004.05 (center of orifice).
Horizontal shape: circular.
Horizontal dimensions at orifice: 4.0 foot (1.2 meters) in diameter.
Vertical shape: deep, hemispherical pit.
Vertical depth: 2.2 - 2.4 feet (66 - 72 cm.) below orifice.
Depth at which orifice was defined: level VI-7.

Contents:

22 waste flakes (13 grey chalcedony, nine chert)
Charcoal fragments (many)
Burned earth fragments (many)
Large, angular granite, basalt, and sandstone rocks (many)

Note: feature was contained within a distinct and continuous "ring" of burned earth (except at the orifice).

Comments:

This feature was densely packed with apparently fire-cracked rock, which, combined with the distinct, continuous ring of burned earth, indicates intense firing. Charcoal fragments are somewhat fibrous, indicating incomplete burning. These remains have been interpreted as a roasting pit.

Feature 11

Location: N982.5/W1015.7 (center).
Horizontal shape: amorphously oblong.
Horizontal dimensions: ca. 3.2 x 2.8 feet (96 x 84 cm.).
Vertical shape: amorphous, diffuse.
Vertical depth: ca. 1.5 - 2.0 feet (45 - 60 cm.) below point of encounter.
Depth at which feature was defined: level VI-6.

Contents:

Large amounts of peat-like humic material.

Comments:

Boundaries of this feature are amorphous and diffuse. These remains are interpreted as those of a decomposed or burned tree stump and associated roots (i.e., non-cultural).

Feature 12

Location: N994.2/W1027 (center of orifice).
Horizontal shape: circular.
Horizontal dimensions at orifice: 4.35 feet (1.3 meters) in diameter.
Vertical shape: deep, straight-sided, hemispherical pit.
Vertical depth: 1.47 feet (44 cm.) below orifice.
Depth at which orifice was defined: level VI-7.

Contents:

419 waste flakes (228 grey chalcedony, 191 chert)
Three bifaces (chert)
One utilized flake (grey chalcedony)
Charcoal fragments (many)
Burned earth fragments (many)

Note: feature was contained within a distinct and continuous "ring" of burned earth (except at the orifice).

Comments:

This feature was densely packed with apparently fire-cracked rock, which, combined with the distinct, continuous ring of burned earth, indicates intense firing. Charcoal fragments are somewhat fibrous, indicating incomplete burning. These remains have been interpreted as a roasting pit.

Discussion of the features

The majority of the Brassica Bench features are relatively undistinguished, and minimally informative. The roasting pits are somewhat more remarkable, and will receive more attention here.

The Brassica Bench roasting pits were essentially large, deep pits, four feet (1.2 meters) in diameter and 1.5 - 2.5 feet (45 - 75 cm.) thick, filled with charcoal, burned earth, and apparently fire-cracked rock, contained within "rings" of burned earth. These characteristics are nearly identical with those reported for roasting pits excavated at the Gore Pit site (34CM131), an Archaic site in Oklahoma (Hammatt 1976: 250-255). Roasting pits at the Gore Pit site differ mainly in being larger (6 - 8 feet, or 1.8 - 2.4 meters, in diameter), and shallow in proportion to their size (see Hammatt 1976: Figures 7 and 8).

The Brassica Bench features, like the Oklahoma examples, could be identified not only by the characteristics already mentioned, but also by the patterned distribution of rock outside the features. It is presumed, following Hammatt (1976: 253), that this distribution resulted from rocks being thrown up and to the side when the pit was opened and the cooked food removed. A patterned distribution is most apparent for Feature 12 (see Figure 34). It seems apparent

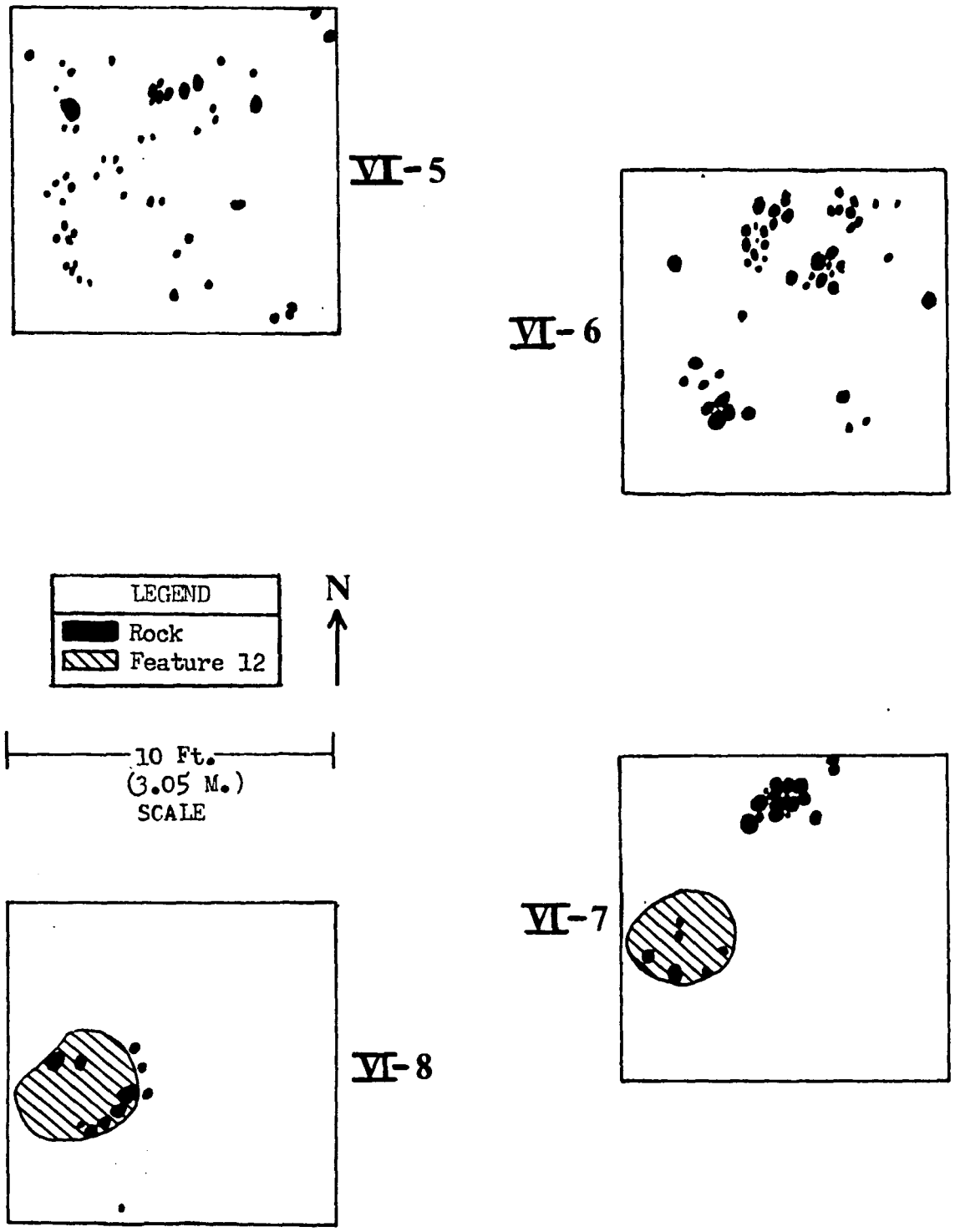


Figure 34. Maps showing distribution of rock from Feature 12, 13PK251 (Four successive levels of Depositional Unit VI in square N990/W1020 are shown)

that rock was taken from the pit and stacked rather neatly in a pile to the northeast, the land surface at that time lying at what is now level VI-7. Again drawing on Hammatt (1976: 253), this would seem to indicate that the wind was out of the south or southeast at the time the rocks were removed.

Similarly, rock apparently derived from Feature 4 lay to the north of that feature. Rock from Feature 10, however, lay to the south and southeast. In both of these cases, the distributional pattern was less clustered than that observed in association with Feature 12, although the pattern was still discernible. Rock from Feature 4 was mainly confined to levels VI-8 and VI-9, while most of the rock from Feature 10 lay within level VI-3. In all three cases, the rock lying outside of the feature consisted of angular granite, basalt and sandstone identical to the rock found within the feature. Charcoal fragments were also found with the rock, although loosely scattered, further strengthening the inference that the rock had been removed from the roasting pits.

It should be noted that the cultural material recovered from the Brassica Bench features consisted in the main of very small waste flakes recovered by means of water flotation. Feature 12 was by far the richest in terms of amount; flakes from this feature were almost entirely "very small" in size.

Organic Remains

Excavation of the site produced very few organic remains. This section discusses them in terms of three categories: faunal remains, floral remains, and carbon samples.

Faunal remains Faunal remains can be summarily dealt with, since they are minimally informative and appear to be generally unconnected with the prehistoric occupations of the site. The following discussion includes for consideration the few faunal remains recovered by means of the water flotation technique, since almost all were recovered from high elevations in disturbed squares.

Five categories of faunal remains were found: bovid long bone fragments (59 specimens), a canid tooth (1), a rabbit maxilla (1) with seven teeth, various rodentia skeletal parts (6), and small identifiable bone fragments (9). All but seven of the identifiable bone fragments were found either on the surface of Deposition Unit VI or at very high elevations in disturbed squares. The seven bone fragments which were associated with prehistoric occupation of the site were found in square N1000/W1010 in levels VI-5 to VI-9. Unfortunately, they are too small and fragmentary to yield any information concerning subsistence resources.

Floral remains Excavation of the site did not produce any plant remains other than carbon samples, discussed in the

following section. A number of floral remains were recovered by means of the water flotation technique, and are discussed in Chapter 5.

Carbon samples Numerous carbon samples were collected at the Brassica Bench site. These were mainly from features, although many small charcoal fragments were collected from generalized locations throughout the site. Charcoal was most abundant in and around the features identified as roasting pits. All the samples are uncontaminated, and could be used for radiocarbon dating if funding was available. At present, three carbon samples, from Features 4, 5, and 10, have been sent to the University of Wisconsin Radiocarbon Laboratory for dating.

Attention was also given to the possibility of identifying the kinds of wood used in firing the features. Representative specimens of the carbon samples were examined by James Funk, a graduate student in the Department of Botany, Iowa State University. Unfortunately, even the "good" specimens were unidentifiable, although it is possible that some could be identified by means of thin-section analysis if funding were available.

Historic Artifacts

A variety of historic material was found at the site, none in demonstrable association with the prehistoric components. Almost all the historic material was found at the base of Deposition Unit V, or in the two uppermost levels of Deposition Unit VI. In the latter case, material was generally not located within Deposition Unit VI, but rather at equivalent elevations in squares disturbed by erosion and/or roadwork. In only one instance was a historic item found at a deeper level; this consisted of an Ironstone whiteware cup handle fragment found at level VI-6 in a relatively heavily disturbed square (N1000/W980). Due to the small size of the fragment and the highly disturbed nature of the excavation unit, the find cannot be regarded as anything but intrusive, and in fact, all the historic material can safely be regarded as such.

In addition to the cup handle fragment, the material consisted of eleven .30-.30 rifle cartridge cases, two .32 caliber hand gun cartridge casings, one .38 caliber hand gun cartridge casing, one #10 gauge shotgun shell casing, one #12 gauge shotgun shell casing, one #16 gauge shotgun shell casing, one round head wire nail, one foot-long section of unbarbed fencing wire, several small metal fragments, and one

clear glass bottle. The bottle bears marks indicating that it was produced by a semi-automatic bottling machine, probably between A.D. 1880-1903 (Newman 1970: 72). Most of the rifle and shotgun casings were found in areas of the site disturbed by roadwork, and probably derive from modern hunting or target shooting activities. The nail, wire, metal fragments and bottle were found in western excavation units under the bulk of the overburden. It is assumed that they derive from the initial construction of the road, suggesting that the site was initially affected by such activity around the turn of this century, or some time thereafter.

CHAPTER 5.

ANALYSIS OF THE FLOTATION DATA

As previously mentioned, 753 soil samples were put through the water flotation process. Analysis revealed that both heavy fraction and light fraction units of these samples generally contained sparse amounts of charcoal fragments, snails and snail fragments. The latter two items were collected for possible future analysis. Charcoal was sparse both proportionately and absolutely within samples, and was too fragmentary for analysis of genus or species. Being unnecessary for carbon dating, as well as comparatively contaminated from the flotation process, the fragments were usually discarded after their relative presence was recorded. Some of the largest charcoal fragments were collected, but have not been further dealt with.

Heavy Fraction Units

These units were almost entirely composed of gravel and smaller-sized pebbles and small rocks, quite in keeping with the glacial origin of the soil. Artifacts, by contrast,

formed a very small proportion of these units, and were present in only 50% of the samples, which usually produced from three to nine waste flakes a sample. The bulk of the artifacts consisted of chipped stone, including 1,496 small to very small waste flakes, two bifaces, and two utilized flakes, with 13 grit-tempered body sherds and 50 bone fragments also being recovered. The bulk of the bone fragments (39) was confined to a single sample from a disturbed surface level.

Light Fraction Units

These units contained charcoal fragments, snails, roots, and other vegetal debris, as well as insect bodies and parts, small fruiting bodies (plant fungi), and seeds. Most of the latter were identified by Dr. Leroy Everson of the Iowa State University Seed Laboratory. Almost all appear to be modern and none can be ascribed with any certainty to the prehistoric occupations of the site.

Brassica seeds

The overwhelming bulk of the seeds found at the site were identifiable as Brassica sp. (Cruciferae family), an identification which was independently corroborated by Laurie Lucking, an experienced ethnobotanist in the Department of

Anthropology, University of Minnesota. Identification as to the exact species is uncertain, but B. kaber (B. arvensis) is the most likely suspect. These seeds were truly ubiquitous at the site, being found by the hundreds, if not thousands, in all samples inspected, from all levels and excavation units. Their ubiquity, which prompted the name for the site, is all the more impressive when one realizes that they are without doubt intrusive into the area of prehistoric occupation, and almost certainly derive from natural "seed rain" during excavation. Brassica sp. has long been recognized by botanical authorities as being of Eurasian origin, having arrived in the New World as part of the post-conquest European invasion (U.S. Department of Agriculture 1895: 211, 594, Greene 1907: 171, Pammel and King 1913: 701, Cratty 1929: 257, Shimek 1948: 68, Fernald 1950: 707, and Hedrick 1972: 374).

Anthropological data further confirm the Old World origin of the plant. Ethnographically, no mention of Brassica sp. was encountered by Yarnell (1964) in his definitive examination of ethnohistorical and historical accounts relating to aboriginal plant use in the upper midwest. The plant was exploited historically as a food resource by the Cherokee in the Southeast, but even there it was recognized by them as having been brought by "African or European settlers" (Hamel and Chiloskey 1975: 18, 46). Yarnell's examination

(1964) of archaeological data likewise found no documented evidence of Brassica sp. in any prehistoric context. It is assumed, therefore, that the plant was simply not present in Iowa in prehistoric times, and must be intrusive into the prehistoric occupation levels at 13PK251.

This assumption is further affirmed by the distribution of the Brassica sp. seeds at the site, for they are found in all excavation units, irrespective of the location of features or possible activity areas, and in all levels, although their abundance diminished with the depth of the excavation units. The seeds are morphologically uniform and range in size from very small to microscopic. Their small size would have facilitated wind dispersal of the seeds, a common fate for weed seed (Mead 1974: 30). Since seed rain is, comparatively speaking, a reflection of the local vegetation (Watts and Winters 1966: 1354), these seeds indicate nothing more than the quite unsurprising presence of modern Brassica sp. plants growing somewhere near 13PK251, most probably on the weed-infested Des Moines River bottomland. Much of the bottomland in the lower reservoir was being cleared and burned off in 1976 (and several years prior), another factor which would aid in wind dispersal and account for the profusion of these seeds, as well as their slightly carbonized condition.

The abundance of the Brassica sp. seeds is also notable in that it attests to the effectiveness of the water flotation technique and the particular water flotation device used in processing the samples (see Chapter 3). Due to their small size, none of these seeds were visually observed at the site, either on the ground or as "rain"; their discovery was due entirely to the use of the water flotation technique. The seeds are small in a relative as well as absolute sense, and their recovery suggests that if other seeds were present at the site, they would surely have been recovered. Unfortunately, as will be discussed in the following section, very few plant remains other than Brassica sp. seeds were found.

Other plant and tree remains

A variety of other seeds and tree fruits were found at Brassica Bench, none in features. The most notable in terms of possible prehistoric exploitation are those identified as lambsquarter, or Chenopodium sp., probably C. album (25 seeds). All were found in two squares, N1000/W1020 and N1000/W1030, in levels VI-1, 2, and 3. Their clustered distribution seems somewhat fortuitous, and there is no reason to suspect that they are not modern. Moreover, C. album is generally considered to be a European immigrant (U.S. Department of Agriculture 1895: 600). Yarnell, however,

notes that uncertainty has arisen concerning both its nativity and its exact botanical identification, and reports that it was used historically by Indians of the upper Great Lakes (1964: 41-42). It is therefore possible, but not probable, that these seeds derive from prehistoric occupation of the site.

Other seeds which were recovered include Acalypha virginica, or copperleaf (39 seeds), Carex sp. (20 seeds), Cyperus sp. (16 seeds), Eleocharis sp. (13 seeds), Bromus sp. (2 seeds), and one Cucurbitaceae seed, as well as seven unidentifiable and immature "buds" or floral heads. The first four of this list are derived from grass-like or rush-like herbs and shrubs common in the area today. None were reported by Yarnell (1964) as being of aboriginal importance. The Bromus sp. seeds are derived from modern, domesticated brome grass. The one Cucurbitaceae seed appears to be unquestionably modern, judging from its uncharred, "fresh" appearance. None of these seeds, in fact, appear to be charred. All were found in scattered, isolated instances throughout the site, almost always in upper or surface levels. Judging from their proveniences and physical condition, it is assumed that all are modern and unconnected with the prehistoric occupation of Brassica Bench.

Two types of tree remains were found at the site. Twenty nutshell parts and fragments were present, and were identified by Dr. D. Farrar of the Iowa State University Botany Department as red oak, or Quercus rubra, a species common to the area today. The nutshells were almost entirely located in the uppermost levels of disturbed excavation units and are thus assumed to be modern. Thirty-seven fruit seeds of Ostrya virginiana, or eastern hop-hornbeam, a member of the Hazel family, were found, and were identified by Dr. Charles R. Gunn of the U.S. Department of Agriculture Beltsville Agricultural Research Center, Beltsville, Maryland. These fruits were found loosely scattered throughout upper levels of the site and are likewise assumed to be modern. Dr. Gunn suggests (personal communication) that they are much less than 100 years old.

In sum, a number of plant and faunal remains were found by means of the water flotation technique, but few can be attributed with any certainty to the prehistoric occupation; in fact, all the plant remains are probably modern. The evidence for the subsistence base of the prehistoric occupants of the site is discussed more thoroughly in Chapter 6.

CHAPTER 6.

SUMMARY AND CONCLUSIONS

The present study has concentrated thus far on four main topics, primarily in descriptive terms. First, background information was given, describing the general location of the Brassica Bench site and the basis for its excavation, and the theoretical basis for the present study. Second, the ecological setting was examined, focusing primarily on the diversified nature of the archaeological region, the exploitive potential of the site catchment, and the culture-historical sequence of the region. Third, the history, rationale, and methodology of the site investigation were presented. Fourth, the archaeological remains were described; these were found to consist almost entirely of ceramic and lithic artifacts, with very little direct evidence relating to the subsistence base of the occupants being present.

While the preceding portion of the study is largely descriptive, this section presents conclusions of an interpretive nature. First, the evidence is considered in terms of the cultural affiliation of the occupants of the site. Second, the socio-cultural activities of the

occupants are interpreted from the data. Third, the significance of the site is discussed, and final reflections on the investigation of the site are presented.

Culture-Historical Interpretations

The diagnostic artifacts recovered from the Brassica Bench site provide convincing evidence that the occupants of the site were part of a cultural continuity represented throughout the Prairie-Plains and eastern United States and referred to as the Woodland tradition. The three-quarter-grooved axe and the hematite celts, for example, are quite similar to those reported from Woodland sites in these area. Similarly, the majority of the projectile points at the site are of stemmed and notched styles which are generally in accord with established Early to Late Woodland point types. Certain stemmed point forms at Brassica Bench are also known from late Archaic associations while the small plain triangular points are typical of manifestations generally regarded as post-Woodland. Probably the best evidence for Woodland occupation of the site consists of the grit-temperd ceramics, which are quite similar in terms of tempering, surface treatment, decoration, and vessel morphology with ceramics found at sites affiliated with the Woodland tradition.

Within the Woodland tradition as expressed in the Prairie-Plains and eastern United States, certain types of ceramics have been distinguished typologically as Middle Woodland and Late Woodland. Diagnostic generally of Middle Woodland ceramics are decorative techniques including incising, embossing and punctation. Cord-impressed decoration, on the other hand, has been regarded as Late Woodland. For the most part, radiocarbon dates have substantiated this sequential model but they also indicate some temporal overlap in the decorative techniques.

The temporal and cultural separation between Middle Woodland and Late Woodland pottery in central Iowa is somewhat uncertain at the present time. Radiocarbon dates ranging between approximately A.D. 250 and A.D. 600 have been obtained from Woodland tradition sites in the central Des Moines River Valley region. The ceramics from these sites are presently regarded typologically as Middle Woodland. No radiocarbon dates are available in the region at sites yielding single cord-impressed ceramics. On typological and comparative bases the occupation of the Saylorvillage site -- which produced single cord-impressed ceramics and small triangular projectile points -- has been regarded as Late Woodland probably dating between A.D. 700-900.

On these bases, the ceramics recovered from Brassica Bench suggest both Middle Woodland and Late Woodland affiliations ranging in time between A.D. 250 and A.D. 900. It is uncertain whether the site underwent one long-term occupation or several shorter-term occupations. Horizontally within the site some clustering of diagnostic artifacts is apparent. Cord-impressed ceramics are concentrated in the extreme northern portion of the site, while tool-impressed ceramics are restricted to the central portions of the site. This distribution would seem to indicate two separate occupations. It is possible, however, that tool-impressed and cord-impressed pottery may have been made concurrently.

While the evidence clearly indicates the presence of at least one Woodland component at the site, the same cannot be said concerning the possibility of an Oneota component. The only evidence at the site which can be firmly linked with the Oneota tradition consists of four shell-tempered sherds representing one vessel. The vessel is obviously Oneota; its characteristics are quite in accord with those reported from Moingona phase sites, and there is nothing to indicate it to be a Woodland plagiarism. The presence of four small sherds, however, does not provide clear-cut evidence of Oneota occupation, and for this reason no claim will be made here for an Oneota component at Brassica Bench. Nevertheless,

the sherds were present at the site, and must be accounted for in some manner. While the matter cannot be resolved with certainty, several explanations, some more likely than the others, can be advanced.

First, it is possible that an Oneota occupation did occur. In this interpretation, the two small triangular projectile points take on greater significance, since they constitute one of the most common of the Oneota projectile point styles. Moreover, their spatial distribution at the site was much the same, though not identical, as that of the four sherds. A co-association between these points and the sherds might be inferred, strengthening the possibility of an Oneota occupation. Nevertheless, the projectile points cannot be considered definite supporting evidence, since the small triangular point style is also found at Great Oasis sites in the region (Gradwohl 1974: 97) and in Late Woodland context, as evidenced by its occurrence at the Saylorvillage site, 13PK165 (Osborn, Gradwohl, and Thies 1978: 45-48). And while the points and sherds occur at high elevations within the Brassica Bench site, they are certainly not isolated from the Woodland material, stratigraphically or otherwise; indeed, they occur in the midst of it, and sometimes in close association with it. In sum, the data base does not provide conclusive evidence of an Oneota occupation. Moreover,

although a few isolated shell-tempered sherds are known within Saylorville Reservoir, an Oneota occupation of the Brassica Bench site is unlikely since the site is located outside of the presently-known spatial boundaries of the nearest Oneota manifestation, the Moingona phase.

A second possibility is that members of the Great Oasis tradition, the only other post-Woodland archaeological manifestation presently known in central Iowa, brought the vessel to the site. This explanation is extremely unlikely, judging from the total lack of evidence for Great Oasis at the site.

A third possibility is that the vessel represents a trade item obtained from a Moingona phase group and brought to the site by the Woodland -- presumably Late Woodland -- occupants. A fourth possibility, in the same vein, is that the vessel was brought to the site or made there by a captive or traded Oneota potter. Both explanations, however, carry with them a concomitant assumption of Oneota-Late Woodland contemporaneity, an assumption somewhat at variance with present views concerning the matter, at least in terms of the central Des Moines River Valley region.

Despite the problem of contemporaneity, the author considers the most likely explanation of the four to be that the vessel is a trade item. If one accepts this assumption, then one

must consider the possibility that the site was occupied into or beyond the 10th and 11th centuries A.D. While this temporal assumption might be justified on the basis of distributions of cord-impressed ceramics and small triangular projectile points in the upper Mississippi Valley, the same assumption cannot be made for the incised, punctated and embossed ceramics along with the stemmed and notched projectile points. On this basis the present writer infers that the Brassica Bench site was occupied at least twice by people of the Woodland tradition.

Socio-Cultural Activities at the Site

Having established the cultural affiliation of the Brassica Bench inhabitants, it remains to interpret their archaeological residue in terms of their interaction with the physical environment. The following section deals with several categories of socio-cultural activities, beginning with subsistence activities, lithic technology, ceramic technology, woodworking, and cord manufacture, and ending with more speculative comments concerning the settlement type and seasonality. The section concludes with observations on the significance of the site and reflections on its excavation.

Subsistence activities

Unfortunately, very little direct evidence relating to the subsistence base of the Brassica Bench inhabitants was recovered from the site, despite the heavy use of the water flotation technique. It can be inferred, however, on the basis of certain artifact categories and features, that the inhabitants subsisted by hunting animals and collecting vegetal remains.

Although most of the faunal material found at the site appears to be unrelated to the prehistoric occupation, the seven bone fragments recovered from within Depositional Unit VI can be regarded as direct evidence of animals being brought to the site and eaten. Unfortunately, the remains are so small and fragmentary that nothing can be said concerning the types of animals hunted and their dietary importance. Faunal exploitation may be confidently inferred, however, from the abundance of projectile points at the site. The variety of cutting and scraping tools -- knives, bifaces, end scrapers, graver/perforators, retouched flakes, and utilized flakes -- indicates that the butchering of animals and the processing of hides were also principal activities. Processed skins may have been used for clothing or for shelter.

Evidence for exploitation of vegetal resources is almost entirely inferential, since none of the plant remains

recovered at the site can be ascribed with certainty to the prehistoric occupation. The possible hand grinding stones may be indicative of the processing of vegetal resources, but the absence of grinding slabs militates against this inference.

The possibility should not be overlooked that the three roasting pits reflect the exploitation of floral resources, although there is no direct evidence to support this conclusion. It has been suggested that the appearance of such features in southern Plains Archaic sites, along with grinding stones, signals a shift to the use and preservation of vegetable resources (Hammatt 1976: 270). While the Brassica Bench pits may have been used for roasting meat, or mussels, it is interesting to consider them in light of the following account, recorded in 1867 by F.M. Buckelow, who, as a captive, watched the Lipan Apache cook agave and sotol:

> Another choice food of the indians (sic), and one in almost constant use, was bread made from the bulb of the sotol plant, which grew in abundance along these western rivers. In preparing the plant for food, large quantities of bulbs were cooked in a kiln. In this kiln they would place wood and rocks in a way they would be thoroughly heated by the time the wood was burned. The rocks and fire were removed and the rocks replaced. The sotol was placed on these and brush and leaves were placed next to the sotol, and the entire heat covered over with dirt so as to make it airtight. This was allowed to remain several days and during this time the heated rocks would thoroughly cook the bulbs. When satisfied that the contents were thoroughly cooked they would remove the dirt and leaves, and take the hoe and rake the sotol out (Dennis and Dennis 1925: 97-98, quoted by Hammatt 1976: 255).

Lithic technology

Judging from the artifact inventory, the manufacturing and repair of chipped stone tools were major activities at the Brassica Bench site. The presence of complete and broken chipped stone artifacts, along with cores and debitage, clearly attests to this fact. Refurbishing and modification of broken or worn artifacts is evidenced by the presence of scrapers recycled from stemmed projectile points. It is also evident that thermal pretreatment was employed to enhance the flaking qualities of the source materials. The heterogeneity of the source materials suggests that local glacial cobbles and stream gravels were gathered, an inference consistent with Gradwohl's observation that glacial cherts were the most frequent source of raw materials for Woodland populations in the area (1974: 94). Judging from the abundance of grey chalcedony tools and debitage, a certain amount of selection was involved in the utilization of these source materials. The presence of worked and unworked cores, primary and secondary decortication flakes, and shatter indicates that the initial stages of manufacture took place at the site. The hammerstones and "V" grooved abraders found at the site were undoubtedly used in the process.

Evidence for ground stone industry is also present, although the presence of four hematite flakes, and the flake

scars on the celt blank, suggests that the hematite artifacts were initially shaped by percussion flaking. Sandstone and other abrasives were undoubtedly used for finishing and polishing of the ground stone artifacts. The unfinished axe and the celt blank, as well as the hematite flakes, can be regarded as evidence that ground stone artifacts were made at the site, rather than being brought in. Axes and celts may have been pecked into shape with the use of the hammerstones, and the holes in the four hematite beads and the hematite pendant may derive from the use of the chipped-stone drills found at the site.

Ceramic technology

The abundance of grit-tempered pottery sherds at Brassica Bench indicates that ceramic industry was common to the Woodland occupants. The seven burned earth fragments, tentatively identified as potter's clay, suggest that ceramic vessel manufacturing may have taken place at the site. If so, clay for the vessels was undoubtedly gathered nearby. The grit tempering in the vessels is made up of crushed or decomposed granite, which could have been obtained from the friable, fire-cracked granite rocks found in the roasting pits and small hearths at the site. Cord-roughening found on the surfaces of the vessels indicates that the paddle-and-anvil technique was employed in the manufacturing of the vessels. Cord-rolling was also employed, although this

treatment may have been meant as decorative. Even admitting the latter possibility, it is evident that decoration of the vessels was primarily accomplished in two ways: in one, cord was impressed into the clay; in the other, tools were used to punctate, emboss, and incise the clay. Firing of the vessels apparently took place in an oxidizing atmosphere -- probably an open fire -- judging from the variability in surface colors and the predominance of yellows, reds, and browns. Black-colored sherds are too few to indicate reduction, or smothering of the fire. The few black sherds that are present probably represent "firing clouds," which commonly result from open firing.

Woodworking

No wood artifacts were recovered from the site. Nevertheless, the artifact inventory is indicative of woodworking activities. The axes and celts provide perhaps the most obvious examples, since this type of artifact is believed to have been used mainly for the felling and shaping of timber. The utility of the small, relatively soft, hematite celts is somewhat questionable in that regard, but the two axes found at the site, particularly the large, finished axe, look as if they would have been quite useful for a variety of woodworking tasks. While the actual purposes to which these tools were used cannot be discerned from the

evidence at hand, one can speculate that they were used to cut firewood, poles or beams for shelters, and smaller lengths of wood for arrow shafts and hafts for cutting and scraping tools.

Woodworking on a smaller scale, but of no less importance, can be inferred from the presence of the large number of retouched and utilized flakes with "spokeshave"-like concave edges. Presumably, these tools were used in cutting, shaping, and smoothing arrow and spear shafts, axe handles, and other such items. Other chipped stone tools may also have been used in these tasks, but this assumption cannot be verified from the data base.

Cordage manufacture

While no specimens of cordage were found at Brassica Bench, the cord-impressions exhibited on the surfaces of the ceramics indicate that cordage manufacture was practiced by the occupants of the site. At least three different kinds, or twists, of cords were made, including both single-ply and double-ply. The fibers used in the cordage could not be determined, but they likely consisted of bast fibers, such as nettles and the inner bark of cedar and basswood, which were recorded for the historic Sauk (Skinner 1925: 136). No fabric impressions were observed, but judging from fabric impressions on Late Woodland ceramics in northeast Iowa

(Benn 1978: 224-225) and Wisconsin (Hurley 1975: 96-100), it might be assumed that the Brassica Bench cordage manufacturers also produced twined fabrics, or at least had the knowledge and ability to do so.

Settlement type and seasonality

The intensity of the occupational debris at 13PK251 clearly indicates that something more than an overnight, nomadic camp is represented. Judging from the variety of the evidence, the site was undoubtedly occupied rather intensely on several occasions, although it is possible, though not likely, that only one, longer-term occupation occurred. Brassica Bench has a very limited amount of living space available, however, making it likely that a small, band-sized group of people was involved.

When one takes the environmental positioning of the site into account, along with the intensity of cultural material, a striking resemblance can be seen to the "Base Settlement" settlement type reported for Middle Woodland populations in the Illinois River Valley (Struever 1968a: 307). Like the Illinois sites, the Brassica Bench site is situated at the base of the bluffs on the western side of the valley, at the junction of a secondary stream valley.

The evidence for structural remains contributes very little information in terms of settlement type, since little

can be said concerning the construction of house structures at the Brassica Bench site. Feature 7, interpreted as a posthole, is singularly interesting in this regard but hardly constitutes certain evidence of a structure, in the absence of other such features. The burned earth fragments in Feature 2 may constitute the remains of a wattle-and-daub house, but the minimal quantity of these fragments and their very localized distribution casts doubt on this interpretation. The artifact density in the central portion of the site is also interesting in this regard, but cannot be regarded as definite evidence of a house structure. Similarly, seasonality is not inferrable from the data at hand. Judging from the location of the site, a winter occupation might be implied, but there is no reason that the site could not have been occupied at any time of the year.

Statement of Significance and Final Reflections

The results of the Brassica Bench excavations are archaeologically significant in that they demonstrate once again the pronounced Woodland presence in the central Des Moines River Valley region. Woodland utilization of bench locations, for example, was not known in the region prior to the investigation of the site. Documentation of the presence of cord-impressed, presumably Late Woodland, pottery at the site is particularly valuable in view of

the general lack of knowledge about Late Woodland in the region and the growing interest in this cultural manifestation as a result of excavations at the Saylorvillage site.

The presence of Oneota pottery at Brassica Bench is especially significant, since it suggests that Oneota and Late Woodland were contemporaneous, and that a trading relationship existed between the two. If Oneota-Late Woodland contemporaneity is inferred, then our understanding of the temporal limits of one or both of these manifestations is incorrect -- likely the Late Woodland, since no reliable dates are available concerning the terminal temporal limits of that cultural manifestation, at least within the central Des Moines River Valley region. This inference also has obvious relevance to the whole matter of Late Woodland-Great Oasis relationships as well, since it would seem to indicate contemporaneity of these two cultural traditions, and a coterminous occupation -- at least in this one instance -- of the northern subregion. And if all three groups -- Oneota, Great Oasis, and Late Woodland-- were contemporaneous, even for a short time, the nature of their relationships poses an interesting archaeological problem.

If, on the other hand, the evidence is interpreted as representing an Oneota occupation altogether separate from the Woodland component at the site, then our present understanding of the limited spatial distribution of Great

Oasis and Oneota manifestations in the region must be questioned. Then too, it is possible that Oneota occupation at Brassica Bench -- if it occurred -- simply marked an exception to the rule, rather than being representative of a Moingona phase settlement pattern more widespread or diversified than previously recognized. At any rate, the results of the excavations at Brassica Bench tend to bring regional archaeological problems into sharper focus, rather than solving them, indicating the need for further research.

In terms of final reflections, it is apparent that the water flotation technique was of little use at the site. The lack of information which resulted from the use of the technique is hardly surprising given the acidic and unstratified nature of the soil matrix. In retrospect it is unfortunate that the low potential for preservation was not given more consideration, since the extensive, random sampling of the site proved to be counterproductive in terms of the vast amount of time required for collection, processing, and analysis of the samples. It might be noted however, that the water flotation device had not been used before on Saylorville sites, and the opportunity was simply taken to see what might turn up. Judging from the successful recovery of small modern seeds, it is safe to assume that if prehistoric microfloral and microfaunal remains had been present at

Brassica Bench, they would have been recovered. The decision to "flot" all feature fill appears to have been well taken, since the features had a much higher potential for preservation of plant and animal remains, and the amount of fill was comparatively small. And even though no subsistence information was gained from processing the feature fill, the amount of lithic debitage recovered, particularly from Feature 12, was quite gratifying. The lesson to be learned is apparent; in future excavations all features should be "floted" whenever possible, while random sampling should be reserved for sites or portions of sites where good potential exists for the preservation of plant and animal remains.

And finally, it is important to note that the site would have been totally destroyed and the information lost, if excavation had not taken place. Fortunately, this was not the case, and it will be possible to use the information from Brassica Bench in further regional and area studies.

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ACKNOWLEDGEMENTS

Funding for the excavations at Brassica Bench was provided as part of a cooperative agreement between the U.S. Army Corps of Engineers (Rock Island District) and Iowa State University for archaeological survey and mitigation in Saylorville Reservoir. Permission to use the resulting data as the basis for a master's thesis was granted by David M. Gradwohl and Nancy M. Osborn, co-principal investigators on the Saylorville Reservoir archaeological project.

I would like to take this opportunity to extend my gratitude to the individuals who contributed to the completion of this report. It would not have been possible without them.

Technical advice and analyses were provided by E. Arthur Bettis, of the Iowa State University Department of Agronomy, who helped in the soil analysis; Dr. Leroy E. Everson of the Iowa State University Seed Laboratory, Dr. Donald R. Farrar of the Iowa State University Department of Botany, Dr. Charles R. Gunn of the U.S. Department of Agriculture, and Laurie Lucking of the University of Minnesota Department of Anthropology, who identified the plant remains from the site; Dr. Donald L. Biggs of the Iowa State University Department of Earth Science, who made several lithic identifications; Dr. Turgut Demirel of the Iowa State University Department of

Civil Engineering, and Dr. David R. Wilder of the Iowa State University Department of Ceramic Engineering, who aided in the ceramic analysis.

The success of any site report is in a large measure due to the expertise of the excavators. I am indebted in this respect to E. Arthur Bettis, James Farwell, Nancy Griffith, David Halterman, Don Hirt, Mark Metzler, Leah Minc, and Duane E. Peter of the 1976 ISUAL staff, and Sieglinde Bauer, Harley Cochran, James Gifford, Karen Gillum, Mary Goose, James Plambeck, Dennis Porter, James Rehard, and Karen Turnmire of the 1976 Iowa State University archaeological field school.

The present study benefits greatly from the artifact illustrations done by Marc M. Mills and Martha E. Williams. Mills' credits include Figures 14, A, B; 16, A, B; 17, D; 18, A; 22, A, B, C, E; 23, A; and 29, B. Williams' illustrations include Figures 17, A, B, C, E; 18, B, C, D; 21, A, B, C, D, E, F, G, H; 22, D, F; 23, B, C; 24, A, B; 26, A, B, C; 29, A; and 30, A, B. My compliments to both illustrators.

I wish to thank the members of the ISUAL "winter crew" of 1978-79, James Gifford, Don Hirt, Dennis Porter, and Kathy Gourley, who did most of the tedious work of "picking" the heavy fraction flotation units, and who put up with my analytical antics in the lab over the winter.

Typing of the present manuscript was done by Sandi Wright, and I would like to express my gratitude to her.

I have received encouragement, advice, and support from several archaeological comrades who deserve mention here: E. Arthur Bettis, John Broihahn, Don Hirt, Dale Maul, Robert Timberlake, Nancy Osborn, and Martha Williams. I wish to thank them all.

Members of my thesis committee included Dr. John R.F. Bower and Dr. David M. Gradwohl of the Iowa State University Department of Sociology and Anthropology, and Dr. Achilles Avraamides of the Iowa State University Department of History; I thank them for their advice and efforts on my behalf.

It was a great pleasure to have been introduced to archaeology by Thomas A. Witty, Jr. and John D. Reynolds, of the Archaeology Division of the Kansas State Historical Society. They showed me a whole new world, and I thank them for that.

Most of all, I would like to express my indebtedness to Dr. David Gradwohl, friend, mentor, and major professor. His fellowship and high standards, both in the classroom and the field, provided a challenging and stimulating atmosphere in which to work.

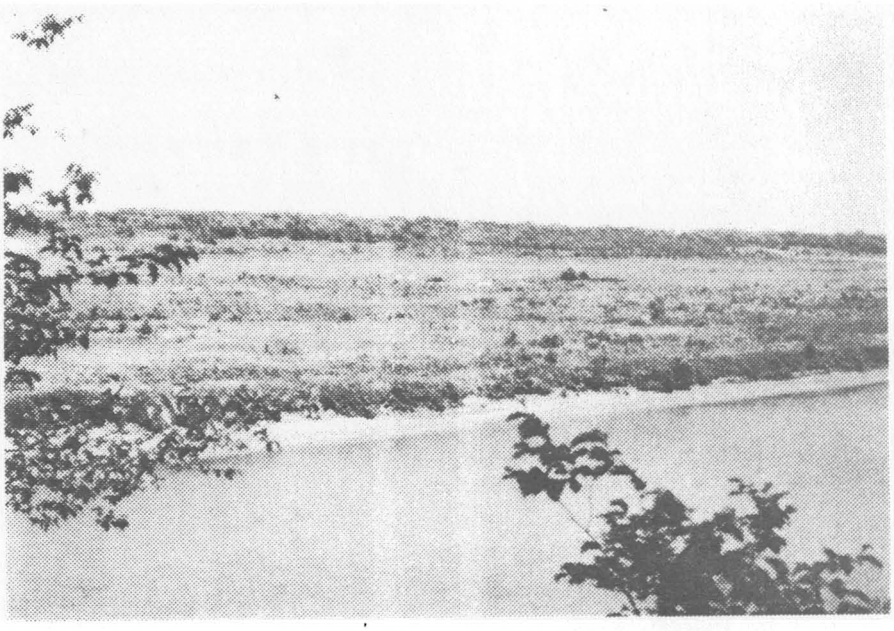

Plate 1. View of the Des Moines River Valley from the Brassica Bench site (Looking to the east-southeast, at archaeological site 13PK149. Photograph was taken in early Summer, 1976, following the clearing of trees from the bottomland)

Plate 2. View of the Brassica Bench site at the beginning of the excavation, during the digging of the trenches (Looking to the southeast, with the Des Moines River in the background)

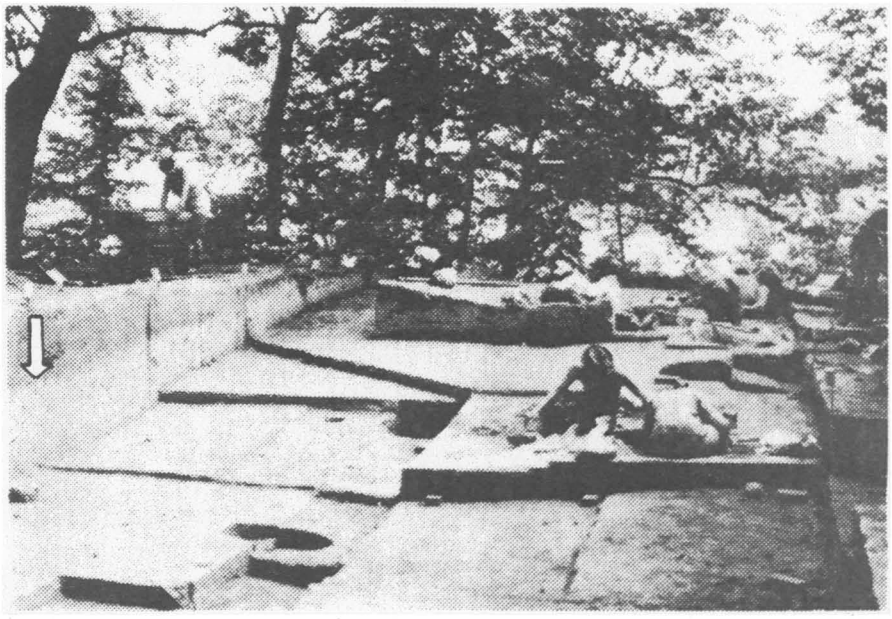

Plate 3. View of the Brassica Bench site during excavation (Looking east. The white arrow points to the top of Depositional Unit VI)

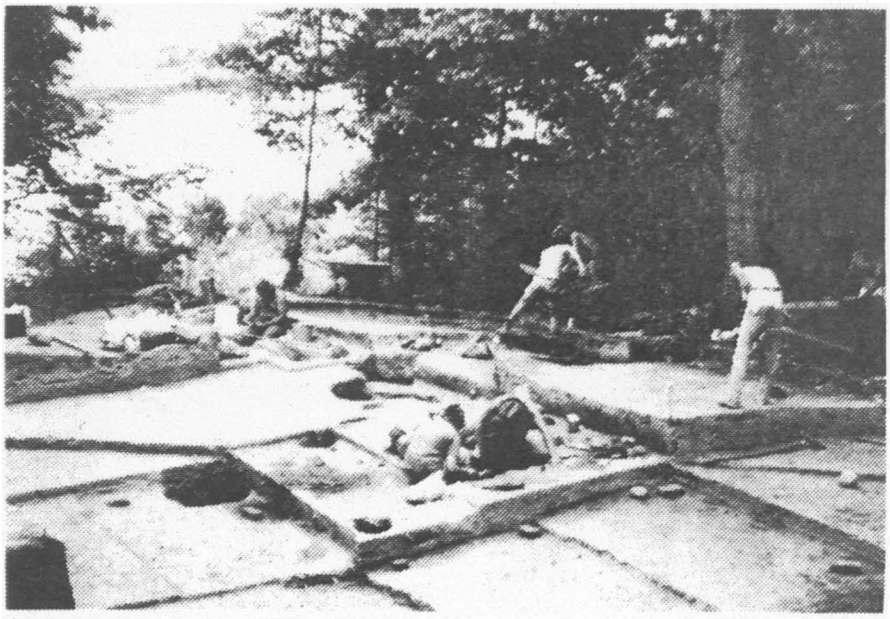

Plate 4. View of the Brassica Bench site towards the end of the excavation (Looking to the east-southeast, with the Des Moines River in the background)