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The Kansas Anthropologist

Journal of the Kansas Anthropological Association

KANSAS ANTHROPOLOGICAL ASSOCIATION

The Kansas Anthropological Association is the oldest amateur archeological organization in the state. Its membership is made up of individuals and institutions interested in the prehistoric and historic peoples of the area. The objectives and goals of the Association are the preservation and interpretation of archeological and ethnographic remains within the state; the scientific study, investigation, and interpretation of archeological remains and ethnographical materials; the publication and distribution of information concerning Kansas archeology and ethnology; and the development and promotion of a greater public interest and appreciation for the heritage of the state.

Types of memberships and dues:

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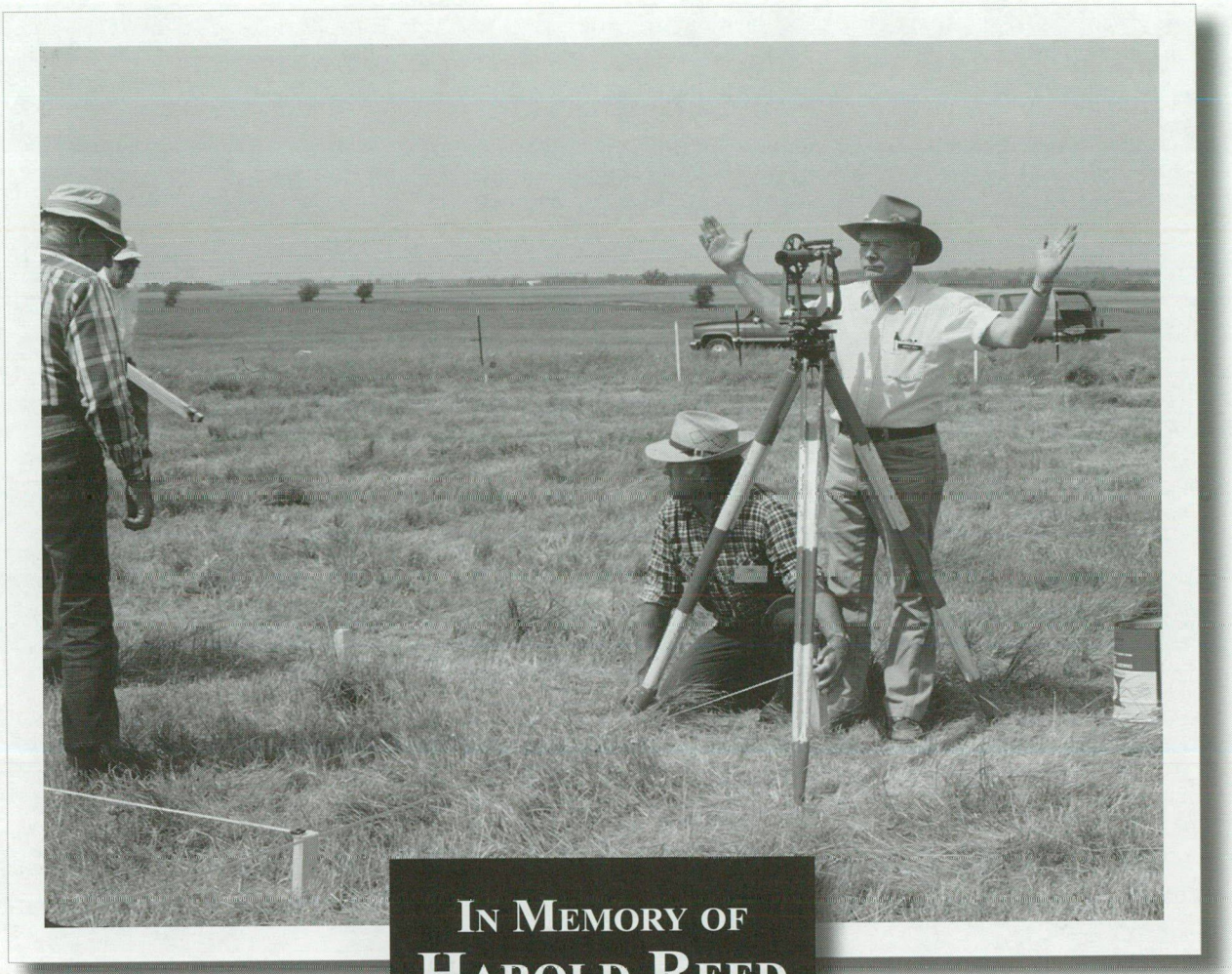
PUBLICATIONS

Each year members receive four issues of the *Kansas Anthropological Association Newsletter* (ISSN 1069-0360) and one journal, *The Kansas Anthropologist* (ISSN 1069-0379). They also receive six issues of *Kansas Preservation*, the newsletter of the Cultural Resources Division of the Kansas State Historical Society. All members and interested individuals, professional or amateur, are invited to submit material to the editors for use in these publications. Back issues of the journal or newsletter, if available, may be ordered from the Historian-Recorder at the address listed above. Prices will be furnished upon request. Abstracts of *The Kansas Anthropologist* are posted on the KSHS web site at www.kshs.org/publicat/anthropologist.

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Notes



In Memory of
Harold Reed
1935 - 2005

Harold Reed
and the Kansas Anthropological Association

I had the benefit and enjoyment of having known and worked with Harold and Margie Reed through 34 years at the Kansas State Historical Society. I first met them in 1967 at a meeting of the Apache Chapter of the Kansas Anthropological Association. They were new members and very enthusiastic and wanted to be involved.

How and where Harold and Margie became involved has been well reviewed in previous articles. However, from my viewpoint, two actions have and will continue to have significant benefits for archeology in Kansas: the creation of the Kansas Archeology Training Program and the Harold and Margie Reed Publication Fund.

In 1974 Harold became president of the KAA. It was at this time that Arkansas University was beginning an archeological training program with amateurs. Harold wanted a program like that for the KAA. We talked and I found myself in the role of "the immovable object being acted upon by an irresistible force": the Reeds.

That June we all went, his family and mine, to Arkansas. Their program was a two-week dig with field lab and training classes. We were impressed and decided that we wanted one of those! Our program would be almost an exact copy. The Kansas Archeology Training Program would be held the first two weeks in June each year. All participants had to be members of the KAA. The first dig was in 1975, and there has been one every year since!

The program has facilitated research into a variety of sites and cultures not possible before. Archeologists and students from the University of Kansas, Kansas State University, and Wichita State University have taken part.

However, Harold's most personal and very significant contribution is the Harold and Margie Reed Publication Fund, which established an annual grant for publication of KAA investigations. Fieldwork may take weeks, but the analysis, writing, and production of graphs and illustrations take months and too often fail to result in published documentation. The fund assures that good research still in specimen boxes and file cabinets will someday be analyzed and reported.

Many good people have been involved with the Kansas archeological program, and Harold was one of the best.

By Thomas R. Witty, Jr.
Kansas State Archeologist 1960-1994

Nomination Of Harold Reed for the Kaa Lifetime Achievement Award

By Rose Marie Wallen

A version of this nomination was published previously in the 2005 *KAA Newsletter* 17(4):10-12.

In January 2005 the members of the Mud Creek Chapter nominated Harold Reed to receive the KAA Lifetime Achievement Award. Harold had been an integral part of the chapter since its beginning in 1974 and was a continuous presence at state KAA events since he joined in 1967. Certainly Kansas archeology would not be what it is today without Harold Reed's interest and work.

Harold Reed was born in Salina in 1935 and attended Salina schools. He spent four years in the Air Force, 1956 through 1959, and was trained in drafting. He married his wife Margie in 1957, and they have 4 children and 11 grandchildren. Harold had a career as a millwork contractor. He sold his business in 1999.

Besides his 38 years in the KAA, Harold was involved in Boy Scouting for more than 50 years. He was an Eagle Scout and an example to his son and grandson, who also became Eagle Scouts. For 10 years he was fire chief for Saline County Rural Fire District #5. He was a lifetime member of the Kansas State Historical Society and a member of the Santa Fe Trail Association. In addition, Harold served on the Kansas Unmarked Burial Sites Board since its inception in 1990.

Harold became interested in archeology through his acquaintance with collector Jim Stauffer, whom he met at work. When Harold and Margie were collecting at the Sharps Creek site in August 1967, landowner Paul Dahlsten recommended that he look into joining the Kansas Anthropological Association. The Reeds joined and became acquainted with archeologists Tom Witty and Tom Barr, who guided them onto the path of true archeological investigation.

The Kansas Archeology Training Program (KATP) began in 1975. Harold and Margie participated in 26 KATP events held since then. They worked on all types of sites and cultural areas of Kansas prehistory, as well as historic sites. (The Cuesta phase of southeast Kansas is the only cultural area on which Harold spent little time working.) Harold served as crew chief for several seasons, including at the Wollenberg site (14WH319) in 1991, the Sharps Creek site (14MP408) in 1992 and 1993, and the Albert Bell site (14SD305) in 2002. He served as instructor of the Orientation and Principles of Archeology classes in 1994, 1995, and 1996 and as official project photographer in 1996, 1998, 2000, and 2001. Another important contribution Harold made to the KATP was the construction of several tripod screens, which are used consistently at field school.

Harold served on the small committee that designed the KAA Certification Program, following the model of the Arkansas Amateur Training Program. The initial version was adopted in 1974. Harold also was part of the review committee that made major revisions in 1993. The program is a comprehensive measure of achievement in archeological activities, and Harold and Margie Reed were among the few who successfully completed all categories, receiving their awards in 1994.

In addition to attendance and leadership at the KATP, Harold contributed to the KAA state organization by serving as Second Vice President 1970-1972, First Vice President 1972-1974, and President 1974-1976. After that time he was Area 2 Representative until 1996. He was a charter member of the Mud Creek Chapter, founded in December 1974. He served several terms each as president and vice president, provided numerous programs, and organized many events for the chapter. Harold designed the majority of the annual commemorative pins. Although Mud Creek members work out the details together, he was responsible for all but two of the designs. (The exceptions were 1997 and 2003.)

Harold did extensive survey work, especially in Saline County where he recorded more than 50 sites

on the Saline, Smoky, and Soloman River drainages. Most of these sites are attributable to the Smoky Hill culture, his favorite area of investigation. Harold also recorded 20 to 25 sites outside his county, pertaining to the Great Bend, Smoky Hill, and Archaic, as well as historic, periods. Together with other Mud Creek Chapter members, Harold and Margie conducted a systematic survey of the Turkey Creek drainage. They described their investigations in the 1996 volume of *The Kansas Anthropologist*.

Harold also wrote an article about ground stone celts printed in the *Journal of the Kansas Anthropological Association* in 1980, and one about sandstone celts published in the 2003 volume of *The Kansas Anthropologist*. In the area of experimental archeology, Harold worked closely with State Archeologist John Reynolds on a study of chert firing. Results were published in *The Kansas Anthropologist* in 2001. Besides working with the KAA, Harold worked as a crewmember for the Kansas State Historical Society on many of occasions.

The Reeds made independent excavations of two sites in the years before the KATP was established. One was 14MP408 in 1967. The other was 14SA415 near their home, which they investigated in 1970 with Earl and Iris Monger of Larned. Of his many achievements, Harold was most proud of his extensive well-catalogued private collection. He learned cataloguing from Tom Witty early on, so his entire collection is well documented. It will serve as a valuable research tool for future archeological investigators.

Harold was a positive influence on behalf of archeology through public outreach. Besides presentations given within the association, he made presentations at several Salina Chamber of Commerce "noon coolers." These talks were videotaped by Salina Public Access Television and were shown many times. For many years Harold set up a traveling display about archeology in towns around Kansas, usually taking it to areas where he went for his cabinetmaking business and setting it up in store windows or libraries. No doubt this brought archeology home to many who otherwise might never have taken the time to visit a museum. In 2002 Harold mentored two Salina Central High School students interested in becoming archeologists. They met frequently and took field trips, receiving class credit for the experience. Because of his long experience with artifact identification, Harold was a valuable presence at artifact identification events at the Pawnee Indian Village Museum and those held by Mud Creek Chapter (2000-2004). His promotion of archeology and the KAA no doubt garnered many recruits for the organization.

In January and February of 2002, Harold and Margie served as volunteers for the National Park Service at the Hubbell Trading Post near Ganado, Arizona. During that time they made some good friends, provided valuable assistance, and also indulged their interest in Native American art. They shared some of what they learned at Hubbell in a living history presentation at the 2002 KAA Annual Meeting in Kanopolis.

In the fall of 2003, the Reeds conceived of and proposed the Harold and Margie Reed Publication Fund to spur an increased number of archeological reports. They arranged for a percentage of the earnings from an annuity account to be transferred to a separate, accessible account earmarked for the writing and publication of reports of KAA investigations. The KAA Executive Committee accepted the Reeds' generous offer and invited others to increase the fund with their own donations.

The members of the Mud Creek Chapter felt that Harold Reed was a deserving recipient of the KAA Lifetime Achievement Award. He dedicated much of his life to the avocational pursuit of archeology and to the advancement of the KAA organization.

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Smoky Hill Phase Settlement Patterns in the Salina Area

Donna C. Roper
Kansas State University

The Kansas Anthropologist 26:5-24

Harold Reed recorded 85 archeological sites in Kansas during a period of approximately 40 years. Of these 85 sites, 28 were recorded within an intensively surveyed 12-mi² area encompassing the Smoky Hill and lower Saline river valleys in Saline County. Seventeen of these sites are identifiable to the Smoky Hill phase. The central concern of this paper is Smoky Hill phase settlement patterns. To this end, the settlement pattern concept is briefly reviewed and a detailed discussion of the environmental setting of the study area is presented. The settlement pattern analysis then proceeds. First, the types of Smoky Hill phase sites known within the study area are described. Recognized site types include lodge sites, mortuary sites, and campsites. Then, the relations of each site to others of the same type are analyzed, and some consideration is given to the relations of sites to sites of other types. The distributions of the lodge sites and the campsites to resource zones of the Smoky Hill and lower Saline river valleys are analyzed. The study shows that the Smoky Hill phase settlement pattern is more complex than we usually envision and that social considerations probably played a role in Middle Ceramic period settlement in this area.

During his nearly 40-year career as an amateur archeologist, Harold Reed recorded 85 new archeological sites spread through an area within Kansas from as far east as Chase County to as far west as Sheridan and Gove counties (Figure 1). He also collected artifacts and site data from several sites recorded by others. However, Reed lived in or, later, just outside Salina, so his primary study area was in Saline County. Here, he recorded 45 new sites and knew several previously recorded sites.

Saline County is cut by two of the major rivers of northern Kansas, the Smoky Hill and the Saline. These two rivers join northeast of the city of Salina, in the northeastern part of the county. Reed lived between the two rivers, about 2 miles upstream from the point where they converge. In part because of the need to concentrate his activities within a short distance of his home, he paid particular attention to parts of an approximately 3 x 4-mile (12 mi²) area, almost exactly centered on it. This area neatly encompassed the rivers' confluence area, the lowermost few miles of the Saline River, and a several-mile-long segment of the Smoky Hill River above where it receives the Saline River (Figure 2). Twenty-eight of the 45 Saline County sites that Reed recorded lie within this area; several more lie just beyond it. Most of these sites have yielded temporally or culturally diagnostic artifacts and a majority are identifiable to the Smoky Hill phase.

A detailed study of the collections and records from 54 of the sites that Reed recorded or knew in Saline and Ottawa counties, and a few sites beyond, is in preparation (Roper 2008). This paper has a more limited scope and seeks to examine prehistoric settlement patterns, primarily Smoky Hill phase settlement patterns, in the Smoky Hill River/Saline River confluence area. Although it draws on information from other sources, as available and as relevant to the central purpose of the paper, it is based mostly on Harold Reed's collections and records from the sites in or very near the portion of the confluence area that Reed so intensely studied. This study area is not representative of the full landscape variety of even northeastern Saline County and certainly not of the county or the Smoky Hill River basin as a whole. It lies entirely within river bottoms in a situation that, as

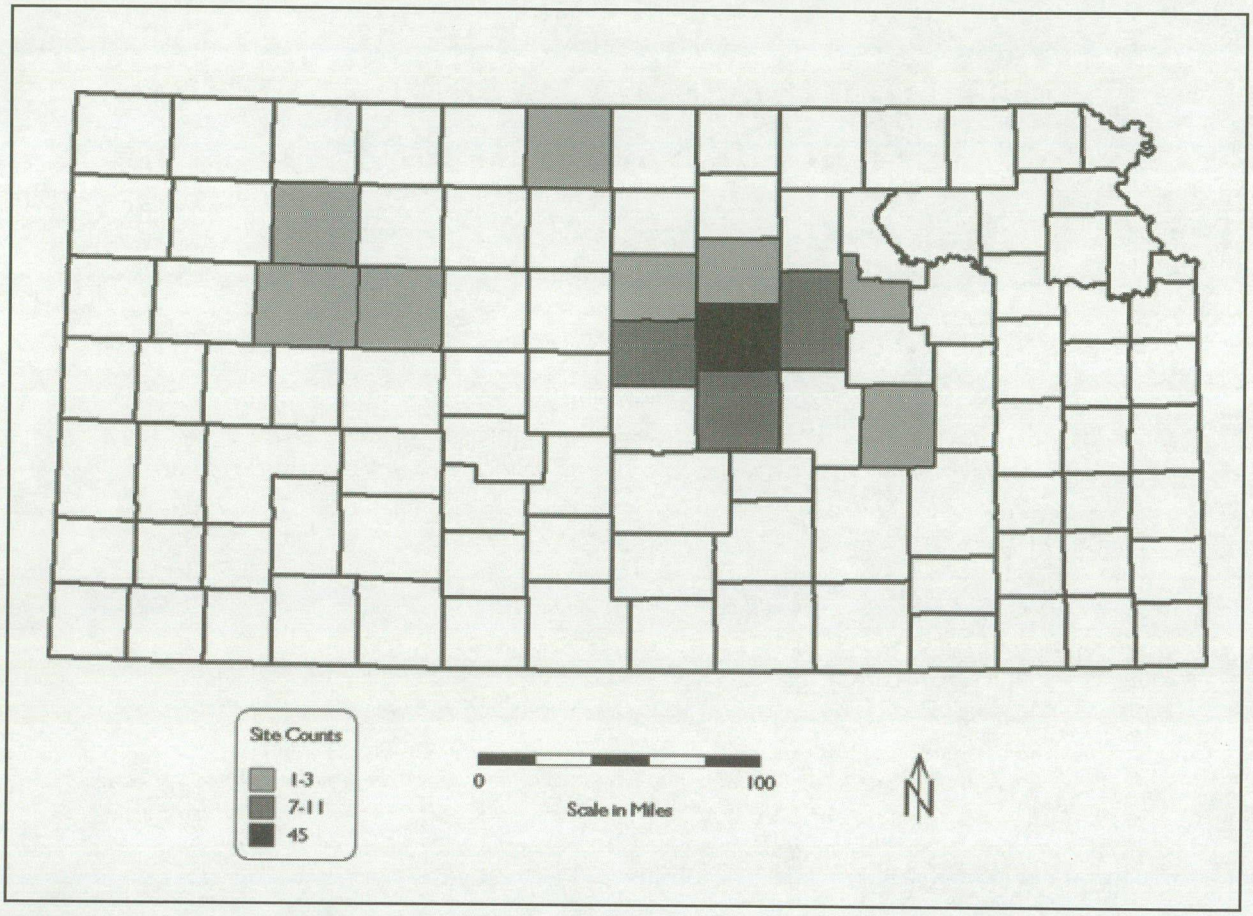


Figure 1. Distribution of sites recorded by Harold Reed by county.

will be described below, is sufficiently unusual to be nearly unique in the upper Kansas River basin. Nor is the study area fully representative of this particular bottomland area, for Reed once stated that he focused on a particular type of setting within that area, and his records bear that out. Nevertheless, the study area does contain a diverse, if subtly intergrading, complex of ecological settings. As this paper will show, it also contains several types of Smoky Hill phase sites.

The Smoky Hill phase was defined in part from one of the sites in this study area (Wedel 1959:563). It is best known from the numerous lodge sites that have been excavated in the past eight decades (a recent review of Smoky Hill phase archeology can be found in Roper [2006a:23–42] and references cited therein). Yet the people of the Smoky Hill phase did use other types of sites and, as it happens, these non-lodge sites, like the lodge sites, are best represented in bottomland settings. Further, the lodge sites (although not necessarily the lodges themselves) vary in significant ways. For all these reasons, therefore, a study of settlement patterns has considerable value, and Reed's collections and data may be one of the best data sets available for such a study. Before conducting the analysis, however, it will be useful to consider what is meant by settlement pattern and how this settlement pattern study will be conducted.

Studying Settlement Patterns

From its origins with Gordon Willey's (1953) analysis of settlement patterns in the Virú valley of Perú, the study of settlement patterns has been important to archeologists throughout the Americas. In fact, concerning Willey's Virú valley project, one commentator went so far as to remark, "arguably no other single project has so fundamentally changed the manner in which archaeology is conducted" (Billman 1999:1). Another recent commentator emphasized the interrelation of comprehensive surveys—such as those

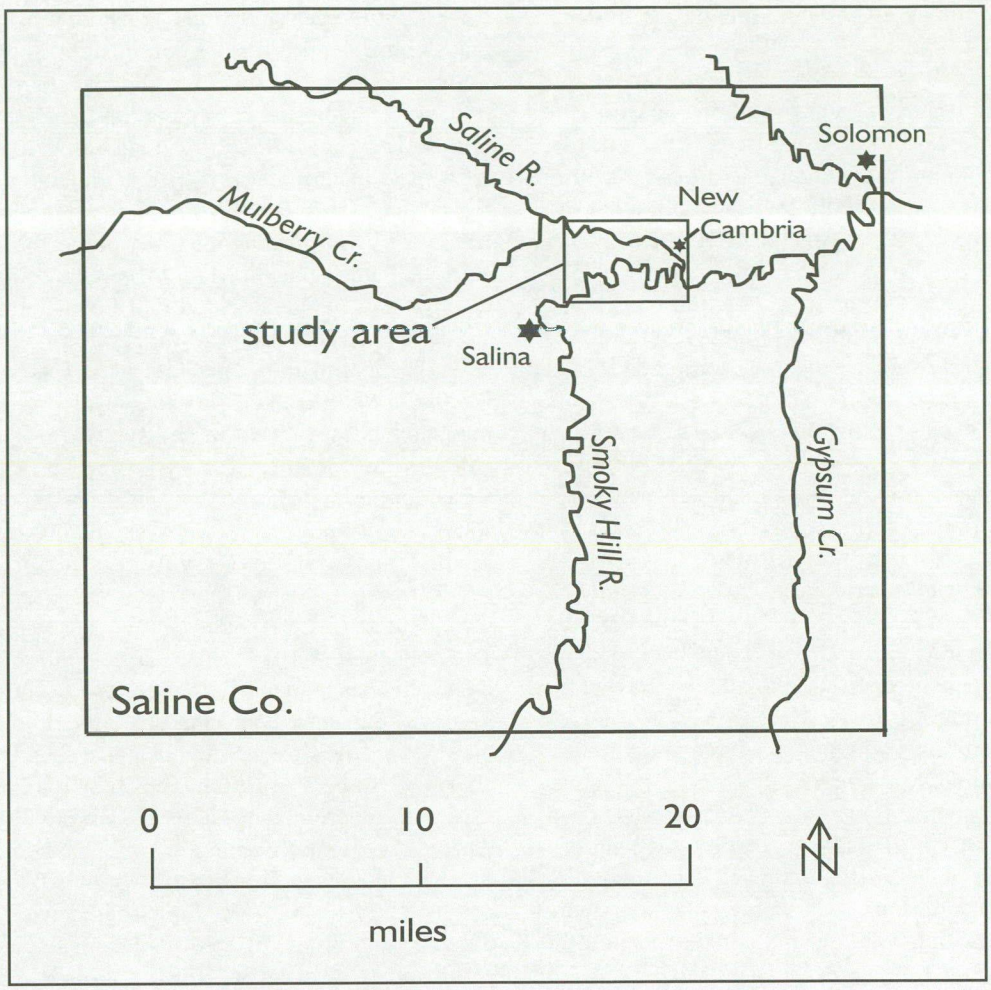


Figure 2. Location of the study area in Saline County.

conducted by Harold Reed in the Salina area—and settlement studies, noting that with Willey's Virú valley study "individual sites ceased to be studied as ends in themselves or to be regarded as representative of a particular culture or region. Instead, they were seen as forming networks within which sites often played very different and complementary roles" (Trigger 2006:377). With those assessments and without further belaboring the point, let it just be said that it would be impossible to overemphasize the importance of settlement pattern studies in the Americas in the slightly more than half a century since the publication of the Virú valley study.

Given the importance of settlement pattern studies, though, it should come as no surprise that the term settlement pattern has come to have multiple meanings and that settlement pattern studies have been conducted in many ways. In the introduction to the Virú valley study, Willey (1953:1) himself defined settlement pattern as "the way in which man [sic] disposed himself over the landscape on which he lived." His lengthy monograph went on to describe sites and their distribution, as well as dwellings and their arrangements, by period, in this one valley of coastal northern Perú. Settlement patterns soon came to be studied at three levels: individual structures, the arrangement of structures within communities, and the distribution of communities across the landscape (Trigger 1968:55).

In common current usage the study of structures is not often considered a settlement pattern study. For example, the editors of a recent book about the Plains earthlodge (Roper and Pauls 2005), although they were studying structures, never thought of themselves

as editing a book about settlement patterns. Indeed, they referred to the lodge as "the largest and most complex *artifact*" on Plains sites (Roper and Pauls 2005:xv; italics added). On the Plains at least, the study of structures is often referred to as the study of architecture. The arrangement of structures within communities is a bit more in line with common conceptions of settlement patterns but often is referred to as community pattern to distinguish it from Trigger's third level of settlement pattern. It is the third level, the distribution of communities (sites is a better term) across the landscape, that is the most common referent of the term settlement pattern in general usage.

Settlement patterns in this sense have come to be studied in two ways. One is the distribution of sites relative to one another—so-called "man-man" relationships. Settlement pattern studies of this kind might evaluate size distributions of sites, spacing of sites, or geometric patterning of sites. They may be particularly relevant for complex societies where the sites were obviously not simply used by the same culture but were contemporaneous, making these comparisons meaningful. Joyce Marcus' (1976) study of the spatial relations, including spacing and geometric patterning, among Maya regional capitals, secondary centers, tertiary centers, and so on is an especially vivid example of this type of analysis. In that study Marcus identified sites to their place in the regional hierarchy by studying inscriptions. She knew what sites were exactly contemporaneous and could make meaningful statements about the geometric patterning of those sites. These kinds of data are rarely available, but that does not mean that credible man-man studies cannot be done in their absence. Jeffrey Parsons (1971), for example, did not have inscriptions when he studied settlement patterns in a portion of the Valley of Mexico. He did, however, have a chronological scheme with narrowly defined periods and, therefore, could evaluate quantities and proportions of types of sites, occupied area, and populations within several regions of the valley. He also could evaluate population trends and settlement shifts. The assumptions, of course, were that individual sites were occupied for a large amount of time and that all sites assigned to a particular period were occupied at once, but both assumptions probably were reasonable for that area.

The second way to look at third-level settlement patterns is to evaluate the relations of sites to their biophysical settings—so-called "man-land" relationships. A study of this nature might evaluate the relations of sites to streams, landforms, soils, or some set of all of these biophysical characteristics and others, too, as appropriate and as feasible in a given situation. To be realistic, such a study must consider the possibility that streams, landforms, the composition and distribution of biotic zones, and so forth have changed in the time since the period of occupation being studied. It is pointless and potentially misleading to measure each site's distance to a river if, as in the Salina area, the rivers are constantly changing their locations. Likewise, it is misleading to evaluate the relationships of Paleoindian sites to vegetation communities when it is well documented that floral communities on the Plains matured and diversified considerably over the several millennia following the end of the Ice Age. It also is necessary to consider what factors may have been relevant to understanding a particular culture. For example, an analysis of Great Bend aspect settlement in the Marion, Kansas, area (Roper 2002) stressed the relationship between each site and the surrounding soils. This is highly relevant for intensive agriculturalists, such as the Wichita people at Marion were, but it hardly would be relevant for studying settlement patterns of Archaic period hunter-gatherers. If the analysis is focused on the entire corpus of sites in a regional survey, and the objective is to evaluate the relations of sites to biophysical settings, then the analysis will be most effective if it can at least place sites within periods or phases. As adaptive strategies change, so location strategies will change. It also is advantageous to be able to sort sites by type and conduct the analysis so that the associations of the various site types with their settings can be detected. This would work toward what Howard Winters (1969:110) conceived of as an analysis of settlement systems, i.e., "the functional relationships among the sites contained within the settlement pattern." Much work with the Smoky Hill phase has focused on the lodge sites but, as a recent study in this journal (Roper 2005a) showed and as will be further discussed in this paper, the Smoky Hill phase settlement system did include other site types. Evaluating the differing positions of site types within a settlement system contributes greatly to recognizing just how those different site types functioned and, therefore, how the society as a whole adapted to its environment.

This study of settlement patterns in the Saline/Smoky Hill rivers confluence area is a bit of a mix of several types of settlement pattern studies just discussed. Although not strictly analyzing community pattern, it nevertheless assesses the configurations and variation among lodge sites within and, to an extent, beyond the study area. It also evaluates the settlement system of the Smoky Hill phase and discusses the relationships of the various elements of the settlement system to their biophysical setting.

Harold Reed's Survey and the Sites He Recorded

Harold Reed recorded data and collected artifacts from many sites in the Smoky Hill River valley in Saline County. These sites extend from a point several miles below the Saline River/Smoky Hill River confluence upstream to near Bridgeport, about 1 mile north of the southern boundary of Saline County. Most of them are Smoky Hill phase sites, and most are known or thought to have lodges. Reed also collected from the Minneapolis site (14OT5) and several other Smoky Hill phase sites near it that he recorded in the Salt Creek/Solomon River confluence area near Minneapolis in Ottawa County. Throughout this extended area, his emphasis was obviously on the Smoky Hill phase lodge sites and his recording was site-specific. That is, he did not record what areas he surveyed without finding sites, only where he did find sites. The exception was in the 12-mi² area containing the confluence of the Smoky Hill and Saline rivers. Within this study area, and sporadically in sections near it, he plotted the areas surveyed, whether or not he found sites, in addition to the sites he recorded. He also recorded all sites that he encountered, regardless of their temporal or cultural affiliation and regardless of their size and apparent site type.

Site and survey information for this study area was compiled on a single master map. Reed had been trained in drafting while in the Air Force in the 1950s, and he brought this skill to preparing the map. The map was carefully and precisely redrafted from the two USGS 7.5-minute topographic maps that cover this area: the southern edge of the New Cambria quadrangle and the northern edge of the Salina quadrangle. According to its title, the map was drafted in March 1976. An original of this map must be somewhere, but the master survey and site map is a blueline copy. Areas surveyed were colored with yellow pencil, and the sites were plotted in red and labeled with the unique number part of their site numbers (in other words, the 14SA is omitted since all sites are in Saline County, Kansas). The map legend indicates that several areas (colored green) were "destroyed by leveling etc."

Reed surveyed approximately 1,940 of the 7,680 acres (12 sections of 640 acres each) or 25.3 percent of the 12-mi² study area. Most of this acreage lies between the two rivers, and another substantial proportion lies in the western two sections of the study area north of the Saline River. The Saline River here has turned from its west-to-east course to flow overall to the southeast. Thus, the eastern two sections north of the river are farther away from the stream than are the two western sections. In an interview about his collecting activities, Reed indicated that he tended to emphasize the vicinity of old stream meander scars (personal communication, November 8, 2005). The two omitted sections contain no portion of the current river channel and no old meander scars. Similarly, Reed surveyed very little land south of the Smoky Hill River, but the southern edge of the 12-mi² study area runs largely along the base of the southern valley wall of the Smoky Hill River, and the river is toward the southern edge of the valley, leaving very little bottomland between the river and the valley wall. In addition to the 1,940 acres surveyed within the 12-mi² study area, Reed also surveyed about 490 acres in adjacent and nearby sections farther upstream along the Saline or Smoky Hill rivers and along the Smoky Hill River downstream from the confluence of the Saline. These usually were small and scattered patches of land or were continuous with land inside the 12-mi² area.

In spite of recording what areas had been surveyed, a good indication of Reed's survey techniques and procedures is lacking. That is, it is unclear if he walked systematic transects and, if so, how widely the transects were spaced. Regardless, it seems likely that the coverage was thorough, for Reed recorded many small sites with light debris scatters. A reading of site forms and field notes suggests that Reed usually did not pick up everything he saw on the surface of a site. He did, of course, collect artifacts such as pottery, projectile points, bifaces, scrapers, and other shaped tools. A few pieces of debitage, bone, and mussel shell, if present, were collected as what he called samples of what was on the site. Collections later were washed and catalogued. Notes and catalogue entries make it clear that some sites, perhaps many sites, were visited repeatedly. Some of these notes reveal how Reed's perception of a site developed. This is more fully discussed in the detailed study of the collections (Roper 2008).

Reed's maps, records, and collections show that he studied and, in many cases, was the original recorder of 28 sites in the 12-mi² area. Most, but not quite all, are within the 1,940 acres marked on the master map as surface surveyed. Only one of the few other sites recorded within the area is considered in this study: the Whiteford site or Indian Burial Pit (14SA1), a site that is critical to a study of Smoky Hill phase settlement patterns.

Diagnostic artifacts, principally pottery and projectile points, in the collections allow temporal or cultural identification of all but 3 of the 28 sites. The components span much of the prehistoric period of the

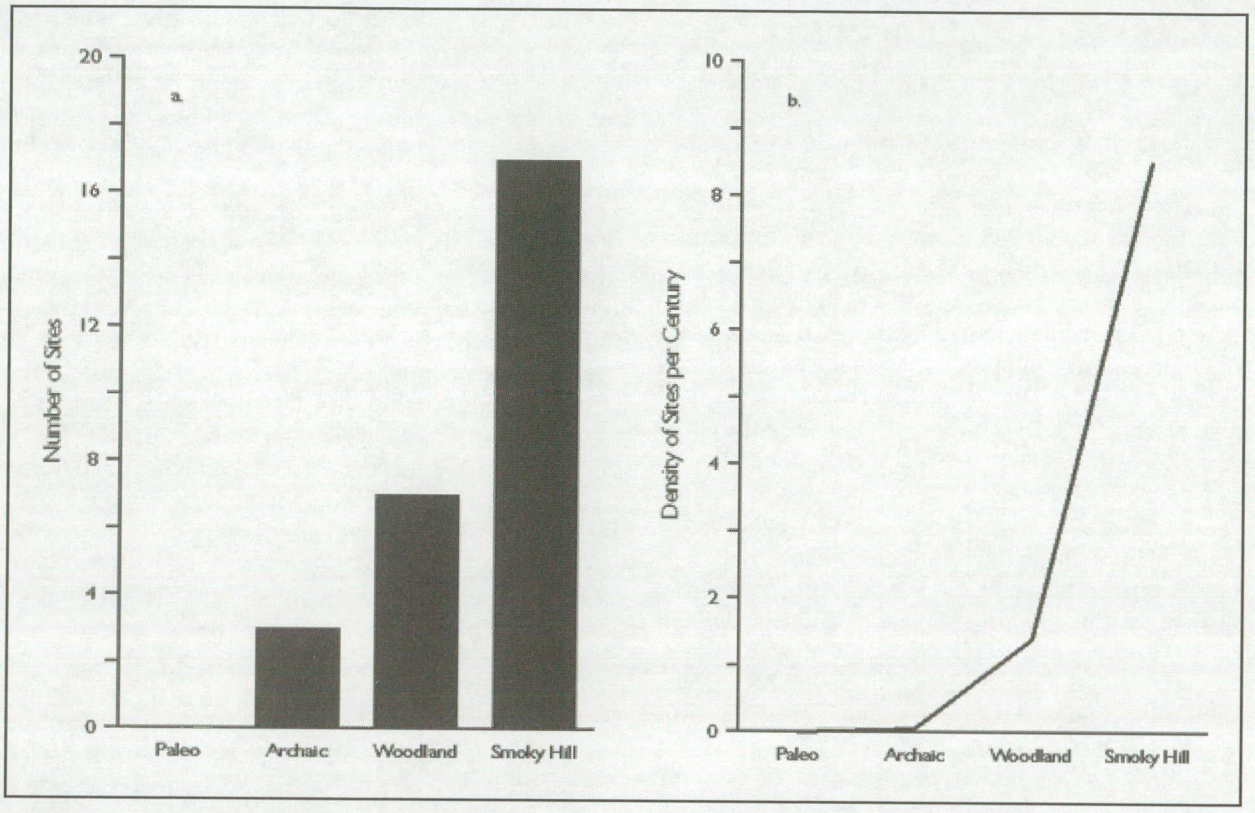


Figure 3. a) Numbers of sites, and b) densities of sites, per century, within the study area.

Central Plains. No Paleoindian remains are identified in the collections, but three sites are identifiable to the Archaic period or at least have Archaic period components. A fourth site with Archaic material lies a few miles downstream from the confluence. These components collectively represent several Archaic complexes of the Central Plains, including Logan Creek and Munker's Creek. One other Archaic site has a projectile point that seems most consistent with a Plains Archaic complex of the High Plains (Frison 1991), as well as lithic raw materials from southeastern Wyoming and a flake of obsidian of the Malad (Idaho) source type (Hughes 2007). At least seven sites were used during the Early Ceramic period and have Woodland tradition components. Some, perhaps all, of these are identifiable to the Keith phase. With a total of 17 identified components, plus the Whiteford site, the Middle Ceramic period Smoky Hill phase sites expectably are the most numerous sites in the study area and are the main focus of this paper.

The simple bar graph of Figure 3a summarizes the site counts by period. The three periods represented by these sites differ considerably in the amounts of time they encompass. The Archaic complexes represented in the Reed collection extended over five or six millennia; the Woodland tradition spanned at least a half millennium and perhaps more; the Smoky Hill phase lasted for about two centuries. Thus, the more recent the period, the shorter the amount of time over which sites assignable to that period accumulated. The raw frequencies of Figure 3a, therefore, may be restated as site densities, expressed as number of sites per century, and graphed as in Figure 3b. Site preservation may have something to do with the broad disparity in site density, but the potential for buried sites in this area is not known. Presumably, site burial would obscure more earlier and fewer later sites. Nevertheless, the site totals likely are heavily influenced by both increasing population through time and a greater permanence of occupation during the Smoky Hill phase.

The Study Area

Before further describing the sites and considering the settlement pattern of the Smoky Hill phase, it is necessary to review the biophysical setting of the study area. Physiographically, the study area lies just

about at the intersection of the Flint Hills to the east and the Dakota Hills or Smoky Hills to the west. That statement, however, is too simplistic to convey the specific and largely unique nature of the study area. Anyone who has traveled I-70 past Salina has passed through the northwestern corner and just north of the northern edge of the study area. Anyone who has traveled old US Highway 40 northeast of Salina has driven obliquely through it.

Surely this traveler would note how broad the river valley and its bottomlands are in this vicinity. This is not common on the Central Plains, and the specific geologic history of this area holds the key to explaining how it came about. A general geologic map of Kansas (available in several sources, including Steeples and Buchanan 1983:5) seems to show the Saline/Smoky Hill River confluence area on the eastern fringe of the Dakota Hills, in the area where lower Cretaceous formations, particularly the Kiowa Formation, form the valley walls. The 1:500,000 Kansas geology map (Ross 1991) and a county geology map (Fent 1998), however, both show that the lowest exposed bedrock formations flanking the valleys are part of the Permian-age Sumner Group. Permian age rocks define the Flint Hills.

An even more detailed map (Latta 1949:Plate I) shows that the specific formation closest to the valley walls is the Wellington Formation of the Sumner Group. The Wellington Formation has three members: the lowest and the uppermost are shale members, and the middle is the Hutchinson Salt Member (Gogel 1980). This is highly significant, for ancient geological processes tilted all Cretaceous and Permian (and older) formations in Kansas so that their surfaces dip to the west, leaving their edges exposed to the east. This is why a trip from east to west across Kansas is a trip through millions of years of geologic time. Not surprisingly, a salt member cannot be exposed to the elements for long without dissolving. As recounted by Ted Gogel (1980:12–14), therefore, ancient dissolution on the exposed edge of the Hutchinson Salt Member led adjacent and overlying bedrock units to collapse into the underground void, leaving deep and broad valleys near the edge of the Wellington Formation. These valleys now are filled with Quaternary alluvium. Borings on a valley cross section that happens to fall in the western part of the present study area showed the alluvium to average 61 feet and be as much as 69 feet deep (Latta 1949:33 and Plate I), while a cross section of the Saline River valley a few miles upstream from the study area showed as much as 90 feet of alluvium (Cline 1974:41).

Through this broad valley flow the two major rivers of the study area, the Saline and the Smoky Hill. The northern of the two, the Saline River, rises well to the west as gathering streams in southern Thomas County. The river flows overall to the east, arcing gradually to the southeast, and then only slightly, as it encounters the low-resistance shale units of the Kiowa Formation and the uppermost member of the Wellington Formation at the east edge of the Dakota Hills in northwestern Saline County. The Smoky Hill River rises in eastern Colorado and flows overall to the east across the western part of Kansas. It begins a long gentle curve to the southeast as it crosses Ellsworth County, then takes a near right-angle turn in northwestern McPherson County to flow north for about 25 miles to a point northeast of Salina. It then takes another right-angle turn to again flow to the east, receiving the Saline River a few miles downstream from this turn. In ancient times a part of the Smoky Hill River flowed to the Arkansas River in a channel that cut diagonally (northwest-southeast) through what is now McPherson County and beyond (Bayne and Fent 1963). The east-west segment of the Smoky Hill River northeast of Salina was then part of the Saline River. The part of the Smoky Hill River that flows to the north through northern McPherson and Saline Counties was a smaller tributary of the ancient Saline River (now Smoky Hill River) that paralleled Gypsum, Holland, Turkey, and other creeks that flow to the Smoky Hill River. This tributary flowed along and eroded the exposure of the Hutchinson Salt Member. Headward erosion caused the stream to eventually reach and pirate the Smoky Hill River in its ancient channel southwest of modern Lindsborg, disconnecting it from that southeast-flowing channel and forming the modern river configuration (Gogel 1980:13).

This geologic activity set the current overall river courses and occurred long before humans arrived in the area. However, at a larger scale the river positions are not constant within the broad valley north and northeast of Salina. Instead, the rivers meander tortuously and change positions frequently. Photorevisions of the USGS 7.5-minute New Cambria and Salina quadrangles reflect shifts in river positions in the 23 years from original publication in 1955 to the 1978 revised edition. Some of these changes are due to artificial alterations of the Smoky Hill River course; some are not. Comparison of the channels with the GLO plat maps, drawn from land surveys done in 1858, shows even more extensive changes. A major change is the position of the confluence of the Saline and Smoky Hill rivers. In 1858 this confluence was about 1 mile downstream from its current location. One stream that flows to the Saline River in the northwestern part of

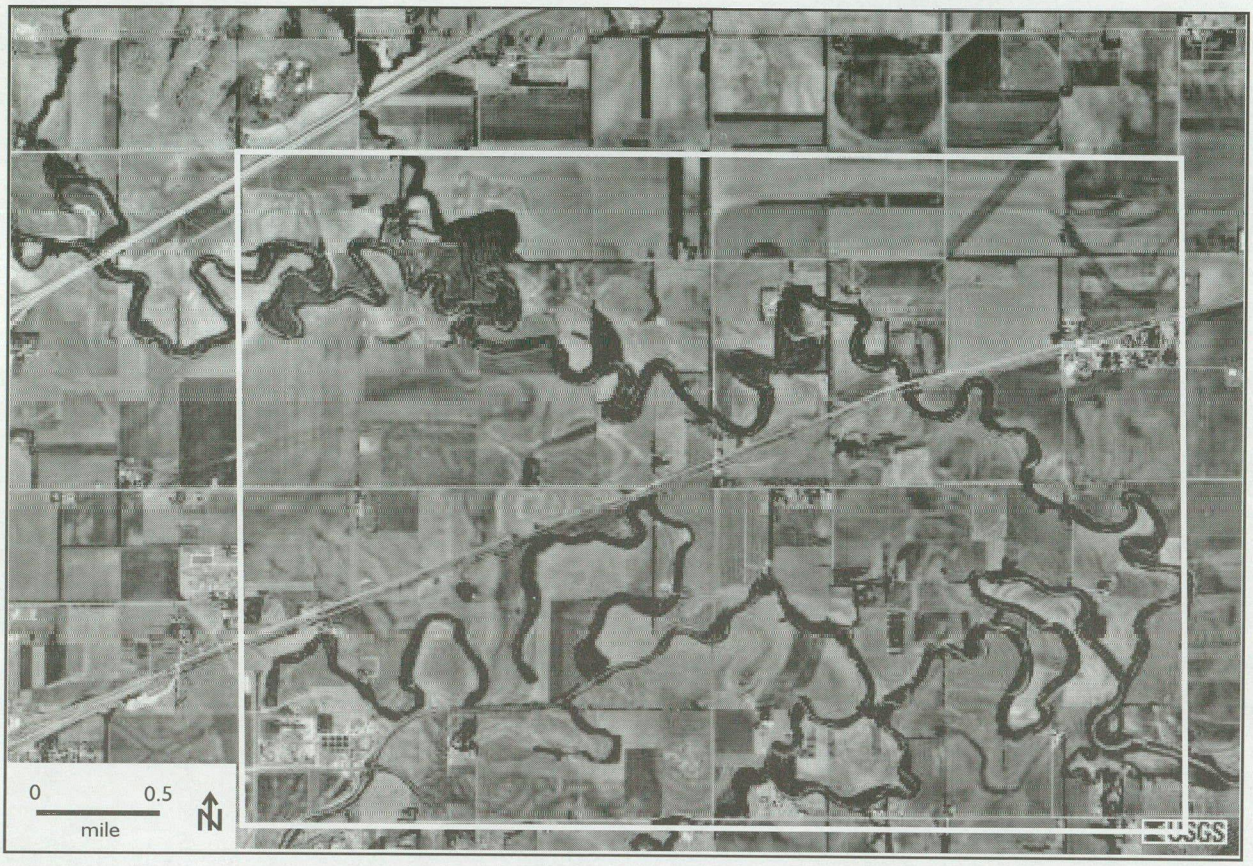


Figure 4. Aerial view of the study area. (1991 image courtesy USGS via TerraServer.)

the study area—unnamed on the quadrangle map but locally known as Crystal Springs Creek—now empties into the Saline River about 3/4 mile downstream from where it did in 1858. Meanders of both rivers may be in different, sometimes very different, locations than they were in the mid-nineteenth century. Other changes are less dramatic but still recognizable. The constant channel changes have left a legacy of abundant channel scars on the river bottoms. These often have topographic expression, and many are easily identified on soils maps and aerial photographs (Figure 4).

Judging from both topographic and soils maps, the meandering rivers have not created a series of stepped terraces within the valley; instead, the stream bottoms are flat terrace surfaces. North-south transects across the valley are at a constant elevation except near the rivers. The surface tilts gently downward to the east, dipping about 15 feet across the 4-mile-wide study area. A meander belt dissects this broad bottomland surface and is incised fairly shallowly into the upper part of the thick alluvium. The meanders and river channel changes have created a series of lateral accretion features that grade into one another within the meander belt. The confluence area for about a mile upstream from the actual river confluence is a part of this meander belt and is a complex of abandoned stream channels and lateral accretion features. All within a broad valley, these three zones—a broad and undifferentiated terrace surface away from the rivers; a meander belt with the river channels, old meander scars, and point bars (younger surfaces) formed within meander loops; and the confluence area that is a broad extension of the meander belt—comprise a complex mosaic that is probably one of the richest riverine areas in Kansas away from the Missouri River valley.

The richness of this setting is in its biotic resources and soils. The vegetation, in particular, is discussed at some length in a study of the Whiteford site or Indian Burial Pit (Roper 2006a:14-19), a site within the study area of this paper. The reader seeking detail is referred to that source and references cited therein or to a shorter version in the background section of a study of several sites that Guy and Mabel Whiteford excavated in this same area (Roper 2001:90-92). Briefly, northeastern Saline County lies near the zone of the transition from a tall-grass to a mixed prairie (Küchler 1964, 1974).

Before the land was opened to modern agriculture, the river bottomlands within this zone would have supported a tall-grass prairie dominated by big bluestem (*Andropogon gerardi*) intermixed with lesser quantities of little bluestem (*A. scoparius*), switchgrass (*Panicum virgatum*), and Indiangrass (*Sorghastrum nutans*). Other grasses and forbs appeared in minor quantities. A stream-lining timber belt is a floodplain forest association. A. W. Küchler (1974) would include hackberry (*Celtis occidentalis*), cottonwood (*Populus deltoides*), several willows (*Salix* sp.), and American elm (*Ulmus americana*) as dominants in these woodlands. Records from the General Land Office (GLO) survey of 1858 in this general area also list oak (*Quercus* sp., species not recorded) and walnut (*Juglans* sp., species not recorded but probably black walnut, *Juglans nigra*). White-tailed deer (*Odocoileus virginiana*), bear (*Ursus americanus*), coyote (*Canis latrans*), fox (*Vulpes vulpes fulva*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), rabbit (*Sylvilagus floridanus*), squirrel (*Sciurus carolinensis*), skunk (*Mephitis mephitis*), muskrat (*Ondatra zibethicus*), beaver (*Castor canadensis*), turkey (*Meleagris gallopavo*), prairie chicken (*Tympanuchus cupido*), quail (*Colinus virginianus*), and other animals inhabited these vegetation zones.

These general descriptions overlook the possibility that the complex of old stream meander scars may have served as wetlands, even though there is little evidence of this in the notes and plat maps of the GLO surveys of 1858. Those notes record only one instance of a slough—that being in the area now occupied by the lower end of Crystal Springs Creek—even though the surveyors must have crossed additional channel scars. On the other hand, these particular lines were set in October and November, which normally are dry months. Of course, the specific weather conditions in earlier centuries are not known. Assuming some wetlands may have been present, they would have held a rich mosaic of plant communities (Smith 2003:45-65) that were attractive habitat for various faunal species, particularly waterfowl.

Overall, then, the study area setting would have been a series of closely spaced, largely linear and parallel resource zones. At the center of these zones would have been the rivers that provided water, fish, and freshwater mussels. The stream banks adjacent to the rivers supported a rich and varied fauna, including a diversity of small and medium mammals. Floodplain soils lined the meander belt of the river and were readily cultivated with a bone- or shell-hoe technology. Floodwaters periodically replenished soil nutrients. The timber belts on parts of the floodplain and terrace edges provided wood, edible foods, and some important mammal and bird resources. The stream bottoms beyond were not particularly diverse in terms of edible foods, the prairie turnip being the major exception. At times, however, they may have held some wetlands, a zone that should have supported a variety of the plant and animal resources. Only a few important resources would not have been available within these combined bottomland resource zones. These would have included large mobile game and certain rock and mineral resources, including chert, the closest source of which would be the Flint Hills to the east.

Essential to a settlement pattern analysis in this area is some sort of map of these resource zones. No such map exists, and one must be constructed using surrogates. For this study it was determined that the best way to do this would be to use the soil series maps (Palmer et al. 1992). Soils correlate with landforms, and biotic resource zones tend to correlate with landforms; thus, by knowing the specifics of the soils/landform correlation in a given area, it is possible to produce a map that will allow an approximation of the resource zonation within a study area. Note, then, that the soils maps are not being used to correlate sites with specific soil series per se—the modern classification is too precise for realistic settlement pattern analysis and soils develop through time anyway—but rather for how they should lead to an understanding of resource availability.

Four major soil series are found in the study area: McCook silt loam, Roxbury silt loam, Hord silt loam, and Detroit silt loam (Palmer et al. 1992:sheets 8 and 13). McCook soils lie adjacent to the streams, on the banks and on the insides of meander loops, suggesting that they are associated with the youngest landforms formed within the meander belt. Roxbury soils are adjacent to the McCook soils. It appears that these are the next youngest soils, probably formed in a manner similar to the McCook soils but longer ago. In other words, both soils are associated with the river meander belts. The Hord and Detroit soils, however, lie back from the meander belt of the rivers and are associated with the undissected terrace surface. In general, the Detroit soils lie farther back from the rivers than do the Hord soils. A few other soils are minor occurrences in this study area: New Cambria silt loam, which is part of the meander belt; Solomon and Sutphen soils, which are associated with closed depressions and old meander scars; and Tobin silt loam, a floodplain soil that seems to be associated with the floodplains of the small intermittent tributaries flowing to the Smoky Hill and Saline Rivers.

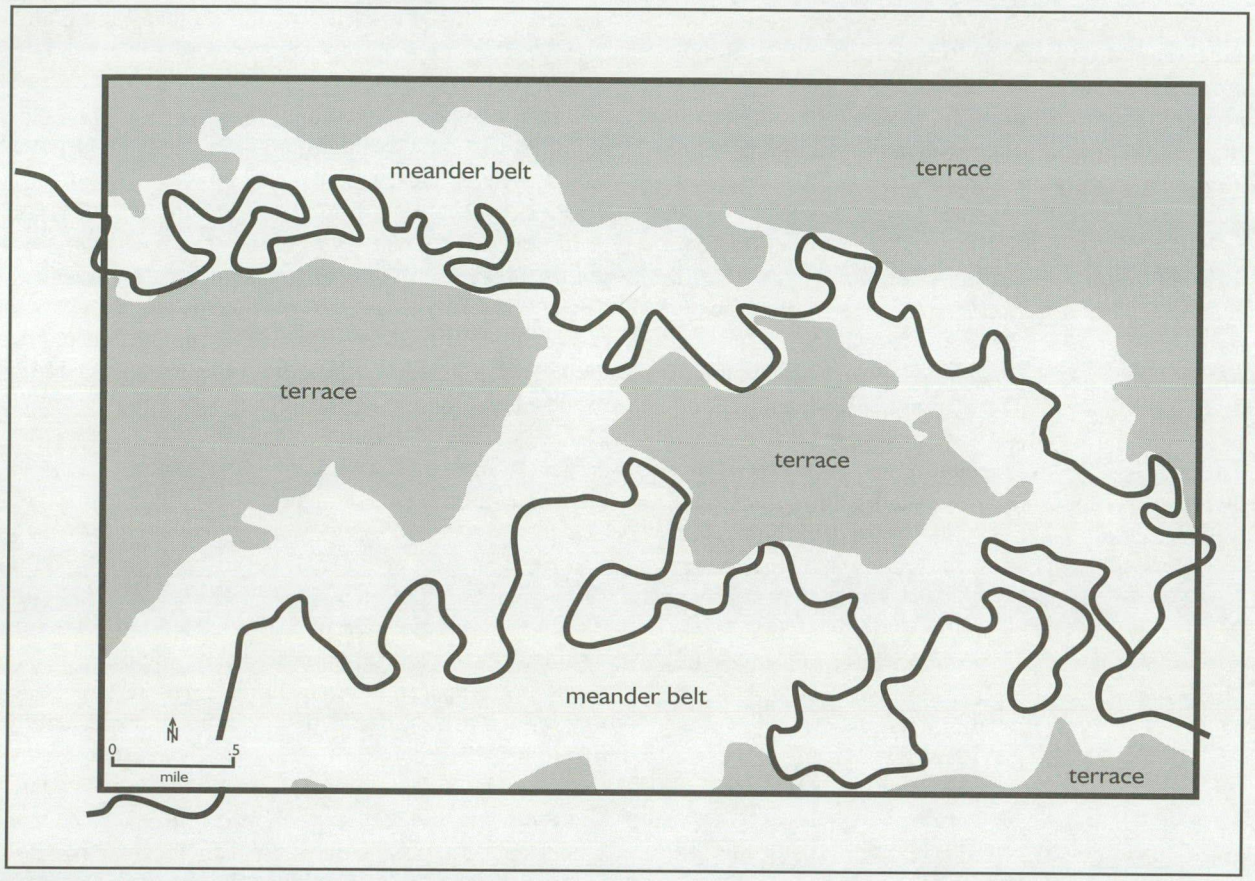


Figure 5. General landforms within the study area, drawn from soil survey maps, as described in the text.

If these soils and landform equations are correct, then, working from the soil maps, a map of landforms and habitat types in the study area can be approximated as in Figure 5. This map was constructed on photocopies of the two sheets from the county soil survey (Palmer et al. 1992:sheets 8 and 13). The major landforms then were delineated by enclosing the McCook and Roxbury soils, along with the minor occurrences of New Cambria soils (mostly at the east end of the study area near New Cambria), within the meander belt, and differentiating these from the Hord and Detroit soils of the undissected terrace. The resultant map indicates a broad expanse of undissected terrace north of the Saline River and between the river and the northern valley wall, which lies beyond the northern edge of the area shown on the map. It also shows a broad expanse of largely undissected terrace lying between the two rivers. The east end of this terrace expanse, however, is separated from the main terrace exposure to the west by an approximately ½-mile-wide, north-south oriented, gap in roughly the middle of the study area. This may represent a long-abandoned location of the Smoky Hill River–Saline River confluence, an inference supported by the presence of several meander scars visible on the aerial photograph (Figure 4). In general, the meander belt is slightly lower in elevation than is the terrace surface and may be not entirely flat. It contains the current river channel and numerous old channel scars. The terrace surface is flatter and nearly level and is largely undissected.

The distinction between these two landforms is important. The undissected terrace in former times would not have been subject to flooding (by definition, terraces do not flood; if they do, they are not terraces). It probably was largely covered with prairie grasses and a tough sod. Woodlands may have narrowly lined the edges near streams. The meander belt, however, would have been a very rich and varied environment. Prairie grasses probably would have been sparser than on the terrace surface, and a tough sod mat probably did not form. The soils there, unlike on the terrace surface, would have been amenable to cultivation with a shell- or bone-hoe technology. Plant nutrients in those soils would have been periodically replenished by flooding. Many other resources would have been available within the meander belts.

Table 1. Smoky Hill Phase Sites in the Study Area

Site No (14SA---)	Size (acres)	Features	Ceramics	Projectile Points	Bifaces	Scrapers	Retouched flakes	Debitage	Bone	Shell
1	0.25	Cemetery	(See Roper 2006a)							
403	4	Lodges	(Report in preparation)							
409	35	Lodges	150	148	17	110	35		3	1
414	20	Lodges	(See Roper 2001)							
415	4	Lodge	(See Roper and Reed 2003)							
416	0.25	Lodge	62	10	7	15				
418	1		2	3	1		1	5	1	
419	0.25		4	1		1	1	6		
421		Pit								
429	0.5		6					13	2	4
430	0.25			1	2			16		
434	0.25		3					40		
440	0.5		1					1	1	5
441	1		1				1	10	2	2
442	0.25		1					3	1	
443	0.25		2						2	2
446	1		3					2	5	

Smoky Hill Phase Sites and Settlement Pattern

Table 1 collates several classes of data for the 17 Smoky Hill phase sites that Harold Reed knew in this study area, plus the Whiteford site cemetery. In most cases site size is taken from Reed's site forms and notes and is given as ¼ acre, ¼–½ acre, ca. 1 acre, ca. 2 acres, or larger than 2 acres. For the smallest sites, those listed here as falling in the ¼ acre size class, Reed usually estimated a diameter and listed it in number of feet. The sizes of larger sites are essentially the way he listed them. Feature listings are derived both from Reed's site forms and notes and from other sources, as cited in the appropriate places. Assemblage composition data are counts of material in Reed's collections and are based on data recorded during the ongoing analysis of those collections.

Three basic Smoky Hill phase site types can be recognized in the greater Salina area: lodge sites, cemeteries, and small campsites without features and with a limited amount and diversity of objects. This simple typology can be refined, though, and leads to deeper insights into Smoky Hill phase, or Central Plains tradition, settlement in the region.

The lodge sites have always been the best studied of Smoky Hill phase sites and, for that matter, of all Central Plains tradition sites in general. Not all lodge sites are alike, however. Although the site size data in Table 1 are not very precise and probably not highly accurate either, they nevertheless readily show a notable amount of variation among sites. The two largest sites are 14SA414 (the Kohr site) and 14SA409 (unnamed), each of which covers many acres and contains multiple lodges. One of them, 14SA414, lies on the northern side of the Smoky Hill River, just upstream from the confluence of the Saline River with the Smoky Hill River (Figure 6). Guy and Mabel Whiteford found this site, showed it to A. T. Hill and Waldo Wedel, and excavated two lodges there in the 1930s (Roper 2001:92-116). Recent records show that it covers about 20 acres. Records from the Whitefords' excavations and information on a sketch map filed by Richard Stauffer (14SA414 folder, Archeology Office, Kansas State Historical Society) suggest that it extends across at least twice that many acres and possibly more. Probably more pertinent, in their brief description of the site as a whole, the Whitefords did not give a site size in acres but instead indicated that it contained the remains of "no less than twelve" lodges (Whiteford 1941:18). Wedel (1959:513) reported the number as 12–15 lodges, noting even then (and he probably was



Figure 6. Smoky Hill phase lodge sites relative to general landforms.

drawing on observations made no later than 1940) that the lodge locations had been nearly obliterated by many years of plowing. By 1970, when Tom Witty tried to locate a lodge for the KAA to excavate, he was unable to find one. The situation has grown worse in the decades since Wedel's observation (Latham herein). Richard Stauffer's sketch map also indicated a concentration of lodges in this area without specifying or clearly implying a lodge count.

Several other Smoky Hill phase lodge sites are adjacent to and on the north side of the Smoky Hill River in the study area. These include, in order of increasing distance from 14SA414: 14SA415, 14SA416, and 14SA403 (Figure 6). Each of these sites is smaller in both estimated acreage and estimated number of lodges than is 14SA414. Site 14SA415 was excavated in 1970 by Harold Reed with help from others, including members of the KAA (Roper and Reed 2003). The excavated lodge appeared to be the only one on this site. Site 14SA416, though, lies near 14SA415. It is not excavated, but it too appears to have only a single lodge. Site 14SA403, the Winslow site, is a few thousand feet west of 14SA415 and 14SA416. Reed thought this site had two or three lodges, but the Stauffers, working there in the late 1950s and early 1960s, suggested that six or seven lodge mounds once were observable. They excavated a trench through one of them in 1956 (Stauffer 1957) and returned to the site at least twice over the next few years. The KAA excavated a lodge on 14SA403 in 1968 (Witty 1968).

Another possible small lodge site in the vicinity is 14SA421. This site is southeast of 14SA414, south of the Smoky Hill River, but within a meander loop and near an old channel scar. It is not out of the question that the river once was south of the site, so, if this were the case in Smoky Hill phase times, 14SA421 may have been part of 14SA414. Reed learned of and recorded 14SA421 only as it was being destroyed by land leveling, salvaging the contents of a pit at that time. This raises the possibility—although it is an inference rather than an observation—that the pit once was within a now-destroyed lodge on this location. Whether other lodges once stood there is not known.

Site 14SA409 (formerly 14SA2) is descriptively similar to 14SA414. It lies on the south side of the

Saline River, a couple miles upstream from the Saline River/Smoky Hill River confluence, thus obliquely across the V of land between the rivers from the Kohr site (Figure 6). Site 14SA409 is not well known. It is plotted on the 1:125,000 quadrangle map on which Whitefords recorded sites they knew (map in Whiteford Collection, Archeology Office, Kansas State Historical Society). There is no indication, however, that the Whitefords did much, if any, work there, and their collection contains no material from the site. Richard and Jim Stauffer also knew the site, as obviously did Harold Reed. Reed's collection from this site is entirely a surface collection, and it is extensive. In fact, it is the largest collection he had from any Saline County site and is nearly twice as large as the second largest collection. Of all his collections, only that from the Minneapolis site in Ottawa County is larger. The Stauffers excavated into at least two houses on 14SA409. Their site forms and maps (14SA2 folder, Archeology Office, Kansas State Historical Society) indicate that they observed at least 11 or 12 lodge locations on this site. Again, the estimate of 35 acres for this site may or may not be accurate, but the more pertinent figure is the number of lodges that may have once been observable there.

A few more sites, some possibly with lodges, are identified upstream along the Saline River from 14SA409. This area has not been systematically surveyed, and this may have something to do with it. However, moving upstream along the Saline River also means moving into an area underlain by the Hutchinson Salt Member of the Wellington Formation (Gogel 1980:Pl. 3). James R. Mead (1986:103-104), who had a nineteenth-century homestead along the Saline River wrote, "[T]he Saline River derived its name from its salty water, which comes from numerous salt springs along its course." Although the Smoky Hill phase subsistence system included many plant foods, corn was important in the diet, and corn is moderately sensitive to soil salinity (Loomis and Connor 1992:383). Given this, the extent of the Hutchinson Salt Member and water quality in streams that flow above it may have been a factor in the distribution of Smoky Hill phase sites in central Kansas. It should be noted that the north-south upstream portion of the Smoky Hill River in Saline County, along which lie numerous additional Smoky Hill phase lodge sites, flows beyond the edge of the salt member.

Sites 14SA414 and 14SA409 are alike in one another respect and contrast, so far as is known, with the other lodge sites in that each has evidence of a cemetery, another of the definable site types of the Smoky Hill phase. The cemetery at 14SA414 is the Whiteford site or Indian Burial Pit (14SA1). That this now has a separate site number is irrelevant, for the Whiteford site cemetery is formed in a small sand dune that lies in the midst of the concentration of lodges composing 14SA414. (Actually, it would be more accurate to say that the lodge site now has a separate number than the cemetery because the whole area once was designated 14SA1.) Similarly, the Stauffers' records indicate that they exposed a burial and counted 19 skulls in an area near the concentration of lodges at 14SA409. These interments were not made in a raised area, such as at 14SA1/414, but they do appear to be in a formal burial area not associated with any specific lodge, according to a sketch map on a January 11, 1961, letter from Jim Stauffer to Carlyle Smith of the University of Kansas (copies in Reed file for 14SA409; 14SA2 site file, Archeology Office, Kansas State Historical Society; and Archaeological Research Center, University of Kansas). The number of known burials (n = 19) at 14SA409 is far smaller than at 14SA414 (n = 151). On the other hand, no one has suggested that these 19 are all the individuals represented in the burial area at that site.

The boundaries of Smoky Hill phase lodge sites, though, are arbitrary. For example, some records (including the state site files) differentiate sites 14SA414, 14SA415, and 14SA416, while others place 14SA415 and 14SA416 within a single site that also includes either the western part of 14SA414 or an otherwise unrecorded lodge between 14SA414 and 14SA415. In a larger sense it is purely an administrative matter—the sites as designated are on land in separate ownership—and Smoky Hill phase sites (and other Central Plains tradition sites) have no sociological meaning. It should by now be understood that, in spite of early discussions of "villages" in the Central Plains tradition (e.g., Wedel 1959:562–564), the sites with multiple lodges really represent accumulations that may or may not have been (and probably were not) simultaneously occupied. Any given lodge did not have a long use-life. Rotting of posts in the ground, coupled with compression stress from the weight of the lodge construction materials, served to limit a lodge's period of serviceability (Roper 2005b). Historic period earthlodges did not last even 15 years, and it usually is presumed that the smaller Central Plains tradition lodges, with their smaller and therefore weaker posts, did not last more than perhaps 7 or so years. Thus, a family establishing a new household could have built and worn out two, three, or more lodges in their lifetime. If a replacement lodge was built near the old one, or if the household or another one returned to a place near an old lodge, then lodge remains

would gradually accumulate in that particular locus. Centuries later, an archeologist could readily get the impression that a village, albeit an irregularly planned one, had stood there. (Fowke [1922:165] recognized this and stated it in similar terms more than eight decades ago.) The possibility and even likelihood of non-contemporaneity of lodges is the reason that site reports that lump lodge assemblages for analysis or report "a date" for "the site," rather than individually considering lodges, are useless.

This does not necessarily mean that some lodges in a concentration were never contemporaneous, for it is possible that some were. William S. Dancey and Paul J. Pacheco (1997), writing of Ohio Hopewell, for example, have sketched a model of house accumulation in which a household is established and daughter households—rather literal ones—are established nearby as families grow and offspring mature, marry, and establish their own households near their place of birth. What the different site sizes may reflect in part is modern property lines, multiple surveys that recorded part of a concentration only after another part had already been defined, and possibly some differential preservation. It seems very likely, though, that the varying lodge density across space also reflects more persistent use of some places than others—in other words, apparently not all places were equally likely places for lodges to be built.

In sum, many lodge remains once were observable and differentially distributed within the study area. Estimates suggest that as many as 37 lodge remains may have been noted within this 12-mi^2 area by mid- to late-twentieth century observers. This does not indicate a particularly high population density at any specific time. If individual lodges lasted for less than a decade, the simultaneous occupation of only 2 lodges would have been necessary for 37 lodges to accumulate in the approximately 200 years (roughly A.D. 1100–1300) of the Smoky Hill phase residence in this area. Of course, it is likely that many more lodges were built in the area and then were eroded away by river channel changes, plowed away, or land-leveled before anyone could record them, or simply were never observed in modern times.

Additional Smoky Hill phase lodge sites, many of them recorded by Harold Reed, are distributed upstream along the Smoky Hill River to at least the Bridgeport area in the southern part of Saline County. Ceramic analysis (Roper 2005c and unpublished data) shows that the decoration details, which express community identity (traditional types do not do this), are similar among the lodges within the study area. Not yet undertaken (although coming) is a detailed analysis of the ceramics from the upstream lodges to determine how closely they are related to those in the river confluence area. It should be noted, though, that Reed collection ceramic rim sherds from 14SA409 in the Saline River valley, when taken as a whole, contrast with those from the Smoky Hill River valley sites. This is especially true of 14SA414, 14SA415, 14SA403, and 14SA1, of which only a portion are part of the Reed collection. These are part of Roper's (2005c, 2006b, and considerable unpublished data) broader findings that Smoky Hill phase ceramic assemblages are similar within, but different among, drainages. This currently is interpreted as reflecting separate communities, each of which maintained exclusive use of its lands (Roper 2006a:319–321; 2006b). Work to further document this currently is in progress.

Looking at the setting of the lodges, a plot of their distribution on the map of environmental zones (Figure 6) shows them characteristically located near the interface between the terrace and the river meander belt. The exact setting, although it needed to be on ground above flood level, may be less important than the characteristics of the lodge's immediate surroundings. Glenn Davis Stone (1996:14), in a study of the settlement ecology in a part of Africa, commented, "the greater one's need to access any landscape feature, the greater the premium on residing near that feature." These would be soils suited for agriculture in a system of intensive agriculture, such as the one Stone was studying. Stone (1991:349) also found, and other studies also have similarly found, that the maximum distance people regularly travel to agricultural fields is ½ to 1 mile, and that the majority of trips to the fields are less than ½ mile. In a system such as the generalized agriculture-and-plant gathering-and-fishing/mussel collecting-and-hunting/trapping of the Smoky Hill phase, the premium is placed not so much on being able to readily access any one landscape feature (resource zone) as it is on being able to readily access all or at least most of them, and the same distance relationship should hold if possible. Thus, it is appropriate to assess the resource potential of a ½-mile radius area surrounding lodge sites.

Figure 7 superimposes ½-mile-radius circles on the lodge site locations plotted on the landform map. It readily shows that, in their preferred position at the edge of the terrace, every lodge's inhabitants would have access to most major environmental zones of the region within a half-mile or less of the lodge. That is, within a half-mile of the lodge, they would have had access to the river, the river banks, the floodplain with its rich soils, the timber belts that probably lined portions of the meander belt and terrace edge, and portions



Figure 7. One-half mile circles superimposed on lodge sites.

of the prairie biome on the terrace. With the overall linear arrangement of biotic zones, each household would have had similar access to these resources. This has important implications for inter-household interactions and, ultimately, social organization.

The lodges, then, were the foundation of the Smoky Hill phase settlement system. The mortuary sites associated with them also were critical elements. The cemeteries may have been small in spatial extent, but they were vital to community identity and perhaps even served as a sort of ceremonial center for the community. While archeologists have always recognized the importance of the lodges and cemeteries, a third type of Smoky Hill phase site is definable in the study area: campsites. The campsites are small—of the 10 such sites in the study area, 5 are a quarter-acre or less in extent, and none are larger than an acre. The site type is best defined not strictly by its size but by its assemblage (Table 1). Assemblages are limited to a few ceramic sherds, perhaps a projectile point or biface fragment or two, perhaps a scraper or retouched flake, always debitage, almost always unmodified animal bone, and frequently unmodified mussel shell. Formal and informal tools are limited—often lacking—and usually represented only by fragments. Features are not indicated by surface evidence.

The distribution of the Smoky Hill phase campsites that Harold Reed recorded is shown in Figure 8. The sites appear to be concentrated within the meander belt along the lower Saline River, but this appearance probably is misleading. Reference to Harold's survey map shows that his coverage of comparable settings was low along the Smoky Hill River and in the immediate confluence area and high along the lower Saline River. More of these sites presumably lie in the unsurveyed part of the study area.

The frequent presence of animal bone and mussel shell, even in surface collections from these sites, suggests a rather specialized subsistence-related function. Specifically, they suggest that the sites were used for procuring mussels and other faunal resources of the streams, stream banks, and/or the sloughs and wetlands formed in old stream channels. In this case it should be expected that a premium would have been placed on locating near the zones that hold the specific resources being sought and not necessarily other resource zones. Indeed, Figure 8 readily shows that most Smoky Hill phase campsites are within the meander belt along the



Figure 8. Smoky Hill phase camp sites relative to general landforms.

rivers. Here, they often are associated with old river channel scars (remembering, of course, that what is now a channel scar could have been a main channel at the time of site occupation).

A recently excavated analog for the campsites might be the buried South Block occupation in the upper components at the Claussen site (14WB322) (Roper 2005a). Put differently, that particular Claussen site component might be what some small campsites would have looked like had they been buried and not been plowed repeatedly over many decades. However, an important difference between the Claussen site and these Saline County campsites is that the Claussen site was perhaps 30 miles or so from the associated lodge sites, while the distance from the Saline County campsites to lodge sites may have been no more than a fraction of a mile. The Claussen site component reflected a short but intense episode of food preparation, possibly for processing mussels in some quantity to return to distant lodge sites (Roper 2005a:115). Without further study, it is not known if the Salina-area campsites were used as intensely or less intensely than their analog at Claussen.

Even a smaller version of a food-processing operation, such as that represented at Claussen, is messy. Although evidence of freshwater mussel use is abundant throughout the Central Plains tradition, the remains of mussel processing are not usually associated with lodge interiors. In the Medicine Creek valley in southwestern Nebraska, for example, Central Plains tradition (Upper Republican phase) people used freshwater mussels in considerable quantity, but the processing areas were outside the houses in special activity areas separate from the houses, although by a few hundred feet at most. The Saline County sites may have been farther away from the lodges than were the equivalent activity areas at Medicine Creek, but they were far closer to the lodges than the Claussen site component was to its associated lodges. The Saline County site inhabitants were drawn to the wetlands and channel scars that may have yielded some of the resources processed in the camps. These Smoky Hill phase camps may represent similar specialized areas where mussels and perhaps other resources, especially aquatic resources, were processed for return to the house with the waste left at the camp. This would, in effect, make the Saline County campsites extramural activity areas associated with, even if spatially detached from, the lodges and associated house lots. Artifacts left at the campsites might represent those

used in preparing the foods for processing and/or for conducting other activities while foods were being processed. For many reasons, excavating one or more of these camps would be valuable. Unfortunately, the same processes that have nearly obliterated the lodges likely have even more seriously affected the integrity of the campsites. It may be difficult ever to assess in greater detail the role or roles of these sites in the Smoky Hill phase settlement system.

Conclusions

Harold Reed's study area is entirely in a riverine setting. It is possible, therefore, and maybe even likely, that Smoky Hill phase site types other than those discussed in this paper are scattered across other parts of the landscape of central Kansas. While the Smoky Hill phase adaptive system basically was bottomland-oriented, some important resources did come from other than the bottomlands and from farther than a half-mile or so from a household's lodge. Bison was one of these resources; chert and sandstone were others. Bison was not heavily used in the Smoky Hill phase, however, and bison bone comprises only a small proportion of faunal assemblages. Probably reflective of low bison use, shell hoes are notably more common than are scapula hoes on many Central Plains tradition sites in central Kansas (Roper 2001; Roper and Reed 2003). The Reed collection contains some fine specimens of shell hoes but few scapula hoes; the same is true of the Whiteford collection. Sandstone was available not too far west of the study area, but chert was available no closer than the Flint Hills to the east. It has been suggested that chert was obtained by exchange rather than direct procurement (Roper 2006b). Overall, then, while it is hard to imagine that Smoky Hill phase people were tied to their lodges or to a small region surrounding them, it also is hard to find reasons for them to have made extensive use of other parts of the landscape.

Also missing from this picture is clear evidence for trash disposal from the lodges. To the west, Upper Republican phase sites normally contain not only lodges and other special activity areas but also middens. Middens are lacking in central Kansas sites, leaving the interesting question of how and where trash was disposed. Some trash obviously was deposited in pits inside the lodges, but quantities are far too small for that to have been the main means of disposal. The negative is always difficult to demonstrate, and any suggestion is sheer speculation and not based on evidence, but one possibility is that trash was dumped into the river and washed away. Middens are not a site or activity area class currently defined for Smoky Hill phase sites.

In spite of these omissions, what is emerging for the Smoky Hill phase occupation of central Kansas is a picture that is different than some older literature would have it be. The lessons from this study are twofold. First, and maybe foremost from the standpoint of information available from the Reed collection, the lodges really are not the only Smoky Hill phase site type on the landscape. More study of the non-lodge sites is necessary, but obviously archeologists need to think about a Smoky Hill settlement *system* composed of several elements. Second, lodge density is differential across space. Rather than reflecting different-sized villages, though, this differential distribution is a product of several other factors, possibly including differential preservation, but also almost certainly representing a differential attractiveness of various places on the landscape. This differential attractiveness may be partially attributed to characteristics of the biophysical setting, but proximity to a cemetery that served not only as a place for burial of the dead, but also as a symbol of community identity, may have been a powerful draw. Archeologists know these things because people like Harold Reed so meticulously recorded the site information needed to model the settlement system.

Acknowledgments. My first acknowledgment is obvious: it goes to Harold Reed, who asked me several years ago to write up his collections. Harold is gone, and I am very sorry that happened before I finished, but I am persevering with these excellent (and voluminous) collections, and that study will be finished as soon as I humanly can do it. In Harold's absence Margie Reed has been helpful in answering questions and providing encouragement.

I also thank Anita Frank for getting me the site counts by county that I used in Figure 1. I mentioned information collected by Richard or Jim Stauffer, both of whom also are now deceased. All information from their records specifically cited here is available in the KSHS site files in Topeka, but I do wish to thank Don Blakeslee for showing me the Saline County portions of the Richard Stauffer collection at Wichita State University. Looking at that material and being able to discuss the records in that context helped me understand the work done in the Salina area between Guy and Mabel Whitefords' time, about which I have written extensively, and that of Harold Reed. I also thank Mary Adair for showing me some material that Jim Stauffer placed at the University of Kansas several decades ago.

But getting back to Harold, I have to say that his contributions to understanding the vanishing archeological record in the Salina area go beyond just the physical specimens in the collections and extend to the survey and site information he recorded as he collected this material. During the years that Harold was making these collections and records, archeology was moving beyond analyzing artifacts and sites as representing cultures and was beginning to study systems of human behavior as reflected in the material record—the quotation from Bruce Trigger in an early section of this paper reflects that, but there is much more. For this, we need careful records, such as those made by Harold Reed, and not just boxes of specimens. I hope that this paper, which describes no artifacts per se, has exemplified how, with proper attention to provenience and to the systematic recording of survey progress, the recording of all sites regardless of size, and attention to the descriptive characteristics of all sites, we can do far more than appreciate the physical objects and begin to understand their behavioral context. But the artifacts remain valuable for many things; so yes, Harold, in answer to a question you asked me a few years ago, the pottery in the collections is helping a lot with the ceramics study I allude to here, and that in turn is contributing to a better understanding of how Middle Ceramic period people were organized socially. This collection fills a giant gap in museum collections.

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Here Yesterday, Gone Today, No Tomorrow: Modern Agricultural Destruction of Smoky Hill Phase House Mounds

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During fall 2003 and winter 2004 a search commenced for a Middle Ceramic lodge site for the 2004 Kansas Archeology Training Program (KATP). During this time numerous previously recorded Smoky Hill phase sites were visited within Saline, Ottawa, and McPherson Counties, Kansas. These sites were thought to or known to contain intact subsurface lodge floors; however, after examining the sites, it was determined that most were destroyed by cultivation and subsequent erosion within the last 20 to 30 years. This paper gives a preliminary review of the impact that modern cultivation has had on Smoky Hill phase lodge sites in Kansas based on information gleaned from several sources and site visits. In essence, the lodge construction style characteristic of the Smoky Hill phase—unlike other Central Plains tradition phases that placed these lodge floors at or near the ground surface—has exposed these features to modern cultivation and ultimate destruction.

This paper was born out of the search for a Central Plains tradition house site in Saline County, Kansas, for the June 2004 Kansas Archeology Training Program (KATP) field school. Margie Reed and Cleve Mulder, former members of the defunct Saline County Historical Society, obtained the board's approval to spend the organization's remaining funds for the data analysis and report of an archeological investigation on a Central Plains tradition house site in the Saline County area.

Harold and Margie Reed were sure that a couple of sites along the lower Smoky Hill River contained house floors; however, when they cored the previously known location of the features, they found no evidence of the house floors. The house floors had apparently been destroyed by cultivation. The Reeds then called for assistance from the Kansas Anthropological Association (KAA) Mud Creek Chapter.

Members of the Mud Creek Chapter began surveying near the Forsberg site (14SA420). Three house floors had been excavated at the site in the 1970s, and it was not known if additional house floors were present. Intensive survey was undertaken along the southern edge of the site, which was considered to have the highest probability of additional house floors. Artifacts associated with the Smoky Hill occupation were identified, but they were concentrated along the terrace edge, clearly displaced by cultivation. Soil coring of the terrace showed that the A horizon was totally mixed, extending into the upper B horizon. Essentially, cultivation had displaced the artifacts and destroyed any house floors that may have been present. If any features of a house remain, they have been truncated. The typical subterranean storage features of the Smoky Hill phase were shallow, averaging between 20 and 30 cm below the house floor; therefore, continued cultivation and associated erosion could eliminate any remaining portions of features within a few years. The Forsberg field was chiseled in the past and was again after the survey was completed.

After the KAA members surveyed the Forsberg property and failed to find another house site, a study of previously recorded sites elsewhere in Saline County was undertaken. Cultivation had nearly destroyed 14SA410, 14SA412, 14SA427, and 14SA428 as well. Review of known site investigations in the study area

found that others, such as 14SA401 (Latham 1995) and 14OT302 (Indeck 1994), also were destroyed by agriculture. After site visits with Virginia Wulfkuhle and Martin Stein of the Kansas State Historical Society, concern over the destruction of these sites led the author to begin documenting the findings. A preliminary report was presented at the 2004 Flint Hills Archaeological Conference in an attempt to get critical comments and input for future investigations.

What Do Other Studies Show about Agricultural Impacts to Archeological Sites?

The destruction of archeological sites by modern cultivation practices is common throughout the world (cs. Haselgrove et al. 1985; Schofield 1991). A brief overview of the problem in agricultural regions of North America and in Kansas demonstrates the impact of various farming techniques on the archeological record.

In 1997 a nationwide review of the State Historic Preservation Offices' (SHPO) site records found 941,019 recorded archeological sites in the United States. Of these sites, 418,793 or 45 percent were on farmland. Cultivation activities reportedly affected 181,313 sites, or about 19 percent of all recorded sites (Gisiger et al. 1997). Considering that many of the documented sites are found in states with very little row crop agriculture, the percentage of sites impacted by cultivation obviously is much higher in states such as Kansas, which have a much higher percentage of cultivated land.

Similar Findings Reported in Arkansas and Illinois

A number of well-respected studies conducted in Arkansas show that the major impact to archeological sites was agriculture. As with any state with diverse land use, sites in specific areas of the state are the more frequently impacted, in this case, northeastern Arkansas. Along the Mississippi River valley archeologists surveying for sites in the early twentieth century described the fast rate at which surface sites were being destroyed by cultivation in alluvial valleys (Moore 1911:367). Specific studies of the alluvial valleys in Arkansas continue to document the large number of cultural resources destroyed by intensive cultivation (Ford et al. 1972; Limp 1987). This portion of the state is predominately agricultural, with an emphasis on leveled fields for rice production (Limp 1987). Nearly all Late Prehistoric sites that once populated the Mississippi River valley have been destroyed, with the notable exception of the sites now owned by the state or concerned private individuals. A recent study of the Plum Point site (3MS451) in Mississippi County of northeast Arkansas found that, even though the land had been cultivated for at least 150 years, the village site remained intact (Latham 2007). The village apparently was buried by flood sediments and remains in excellent condition. Such a discovery in an area where most sites were thought to be destroyed shows that not all sites are the same and that the post-depositional history of each site is formed independently. This observation is true for the Kansas study area.

Similar observations were made at sites in the American Bottom, a floodplain of the Mississippi River, in west-central Illinois. Studies in the American Bottom have revealed that agriculture has severely impacted a large number of surface sites. George R. Milner (2006) used historic documents to show that in the late nineteenth-century agricultural fields were densely scattered with artifacts. Comparing the nineteenth-century observations with current conditions shows that, not only are the features being destroyed, but also artifact size, density, and diversity are all reduced. Many plow zone studies suggest that each artifact type will be reduced to a certain size grade rather quickly upon the initiation of cultivation but will not appreciably reduce in size with subsequent cultivation (Dunnell and Simken 1995).

The author has conducted numerous investigations in the American Bottom and found that agriculture definitely has affected Mississippian villages and other sites (Latham 2004a, 2004b, 2005, 2007). However, cultivation is not the only impact to these sites. Surface collection by artifact collectors has depleted much of the surface evidence. Recent changes in cultivation methods have reduced the impact to cultural resources at or below the base of the plow zone, substantiating the plow zone model put forth by Robert C. Dunnell and Jan F. Simken (1995). The traditional way of looking at the plow zone has been to consider it as one unit in the stratigraphy of the site, essentially a disturbed zone of little research value.

Often multiple plow zones can be observed in soil profiles at floodplain archeological sites. For example, an Emergent Mississippian site (11MS1316) in the American Bottom, which was resurveyed multiple times over a three-year period, had very little surface evidence of the prehistoric occupation remaining. When the site was originally recorded in 1989, archeologists noted numerous pottery sherds and lithic

debris on the ground surface (Gums et al. 1989). Only three artifacts were found on the surface when it was resurveyed in 2004 (Latham 2004a). However, a series of backhoe trenches, excavated for a geomorphological investigation as part of the 2004 survey, revealed a Woodland period (A.D. 300 to 700) occupation at the north end of the site and possible house basins dating to the Emergent Mississippian component in the south half of the site (Hajic 2004). Since the geomorphology indicated that any intact cultural deposits on this landform would be revealed at the base of the plow zone, the test excavations involved the mechanical removal of the plow zone in a series of six block areas.

The 2004 excavations determined that the house basin revealed in the geomorphological trench had essentially been destroyed by cultivation; however, a second house floor was uncovered, and the ceramics in it clearly date to the Emergent Mississippian period. Based on these findings, the site was determined eligible for inclusion in the National Register of Historic Places (Latham 2005). To determine the extent of the subsurface occupation area, most of the southern half of the site was mechanically stripped to the base of the plow zone. Many features were revealed during the 2005 investigation, including 4 house basins, 23 storage pits, and a line of 8 post molds. The preliminary review of the ceramics revealed that this was an Emergent Mississippian hamlet. A result—vastly different than indicated by the surface manifestation—clearly shows that just because a site may appear destroyed, other sites may in fact be sealed below a series of plow zones.

From this brief discussion of agricultural impacts, it is obvious that many surface or near-surface sites in agricultural states have been severely affected by cultivation. In Kansas no broad study of agricultural impacts to archeological sites has been conducted to date; however, at least one regional study has been published. Jim Feagins (1975) found evidence of the destructive effect of agricultural on many archeological sites within the Little Osage River valley of eastern Kansas.

Destruction by Non-agricultural Means

In addition to cultivation, other forms of modern ground-disturbing activities and subsequent erosion destroyed countless archeological sites. Road construction, railroad construction, reservoir development, and housing and industry development also destroyed many Middle Ceramic sites in Kansas. Field leveling smoothed over the low mounds that once marked house or lodge floor locations and displaced the materials. While terracing protected portions of some sites, it destroyed others and is generally very destructive. Fortunately, many Middle Ceramic period sites are on landforms that do not require extensive terracing.

Sites or portions of sites also have been destroyed by linear construction, including section line roads in rural areas. Examples of this can be found at sites 14ML417 and 14SA305. At least one house floor was destroyed at 14ML417 by road and ditch construction, a pipeline, and cultivation (Latham 2004b).

Disappearing Smoky Hill Phase Resources

Examples of destroyed Smoky Hill lodges, and even entire sites, are numerous. As most of the sites are in rural settings, historic and modern agriculture is the most common cause of the destruction. This discussion will focus first on the number of Smoky Hill phase lodges and sites documented as being destroyed in the surrounding areas. The following discussion centers on documented site destruction in the project area and finally those sites investigated as part of the current study.

The initial impression archeologists have for most Middle Ceramic sites is the surface manifestation. As discussed above, this impression can be erroneous, yet it can also be very telling. A number of sites in the project area have been resurveyed with mixed results. Resurveying of sites such as 14SA410, 14SA412, and 14SA428 showed very little or no surface evidence. This was also found to be the case at 14SA476 (Blakeslee 2000). Does this mean that the sites have been destroyed?

Investigations of a number of sites around Tuttle Creek Reservoir (Schimts et al. 1987) revealed that historic and modern cultivation has caused impacts to six Smoky Hill phase sites. Test unit and backhoe trench excavations were used to gather the subsurface data and evaluate these and number of other sites. Two of the six sites (14PO2, 14PO3, 14RY8, 14RY355, 14RY356, and 14RY357) with Smoky Hill phase components appeared to have intact sub-plow zone features when they were investigated in 1985 and 1986. The Smoky Hill phase components in the other four sites appear to be limited to the plow zone (Schmits et al. 1987). These investigations showed that the impacts cultivation had on Smoky Hill sites was considerable more than 20 years ago and that the preservation of truncated features was dependent on the geomorphological setting of individual sites.

During the early 1990s two Smoky Hill phase

sites were reinvestigated about 50 years after lodge floors were excavated, allowing the investigators an opportunity to examine the effects of erosion and farming on two different types of deposition. Floyd Schultz excavated two house floors at the Moore site (14CY17) in 1934 and 1935. The plow zone was described as being 8 inches (20.32 cm) thick. Profiles indicated that the floor of Lodge 1 was 17 inches (43.18 cm), and Lodge 2 was 13 inches (33.02 cm) below the surface. Based on these numbers, the lodge floors were 5 to 9 inches (12.7 to 22.86 cm) below the plow zone, similar deposition to most other excavated Smoky Hill lodges. When test excavations were undertaken in 1991, artifacts were limited to the plow zone, and there was no evidence of features. In fact, it appeared that the 15- to 20-cm plow zone was cutting into the sterile subsoil (Ritterbush and Logan 1992). Essentially, the Moore site is another example of a plowed-out lodge site.

During the same investigations Ritterbush and Logan (1992) conducted test excavations at the Mugler Lodge site (14CY1). This site had a much deeper deposition when Schultz excavated it in 1928, as it appears to be in a setting conducive to alluvial deposition. A profile of the house floor, drawn by Schultz, showed that the floor was 60 inches (152.4 cm) below the surface. Overlying the house floor were three distinct soil zones. Immediately above the floor was a layer of black soil, which Ritterbush and Logan (1992) speculated was the roof fall. Above the roof fall was a 33-inch (83.82 cm) layer of sand, which was capped by shallow topsoil.

When the area of the Mugler Lodge was reinvestigated in 1990, a scattering of surface artifacts suggested to the investigators that this site might have been protected even though it was more deeply buried than most sites of this age that have been investigated. Discussions with the landowner revealed that portions of the terrace had been altered by irrigation and erosion control. The investigators witnessed some of these alterations at the site between the 1990 survey and the 1991 test excavations of the site. The test excavations revealed that portions of the site were indeed destroyed. However, some of their excavations revealed that other areas of the site were still intact (Ritterbush and Logan 1992). The Mugler Lodge site is evidence that even the buried Smoky Hill phase sites are threatened and impacted by agriculture, though not directly by tilling.

A number of Central Plains tradition sites, such as the Mugler Lodge Site, were buried by alluvium and aeolian deposits (Brice 1966). Such sites are known in both Kansas and Nebraska (Kivett and Metcalf 1997; Latham 1996, 2004b). The windblown (aeolian) silt that buried the Central Plains sites in western Kansas and Nebraska may have extended into central Kansas. It is possible that this soil, which was up to a meter in thickness, may have been eroded away by modern cultivation, and the house mounds reported at the sites are remnants of the aeolian deposits. The determination of the extent of these deposits is beyond the scope of this paper. Regardless of how the house mounds were developed, their distribution is limited (Figure 1).

Known buried habitation sites in the study area are limited to two examples; however, the presence of buried sites could indicate that many more are present. The first, 14SA305, was exposed by work on Kansas Highway 4. The second example, 14SA437, was exposed in the cutbank of the Smoky Hill River and ditches of a railroad corridor. The exposure of archeological sites during railroad work is not a coincidence, nor is it rare. Railroad grade construction requires a one-percent grade, which means the railroads typically follow rivers and streams, as did the area's early inhabitants. Therefore, railroads frequently cut through landforms containing Middle Ceramic sites.

Other sites that may have been buried have recently been exposed by wave action at Lovewell Lake in Jewell County (Logan and Latham 2005; Ritterbush 2005).

Much of our prime farmland is along the stream terraces that contain Middle Ceramic house sites. Subsequently the most prevalent impact to these Middle Ceramic sites is cultivation. The author began by asking three research questions to put the main premise into context:

1. How has modern cultivation and mechanization accelerated the destruction of house features?

2. How has the surface expression of Middle Ceramic house sites changed over time?

3. How many recorded Middle Ceramic sites are impacted by cultivation?

A major factor associated with the agricultural impact to archeological sites is the impact of tillage on archeological deposits (Dunnell and Simken 1995), often referred to as plow zone archeology. The study of tilled sites has increased with the requirements of cultural resources management (CRM), that is, archeological investigations mandated by historic preservation laws prior to many land-altering projects.

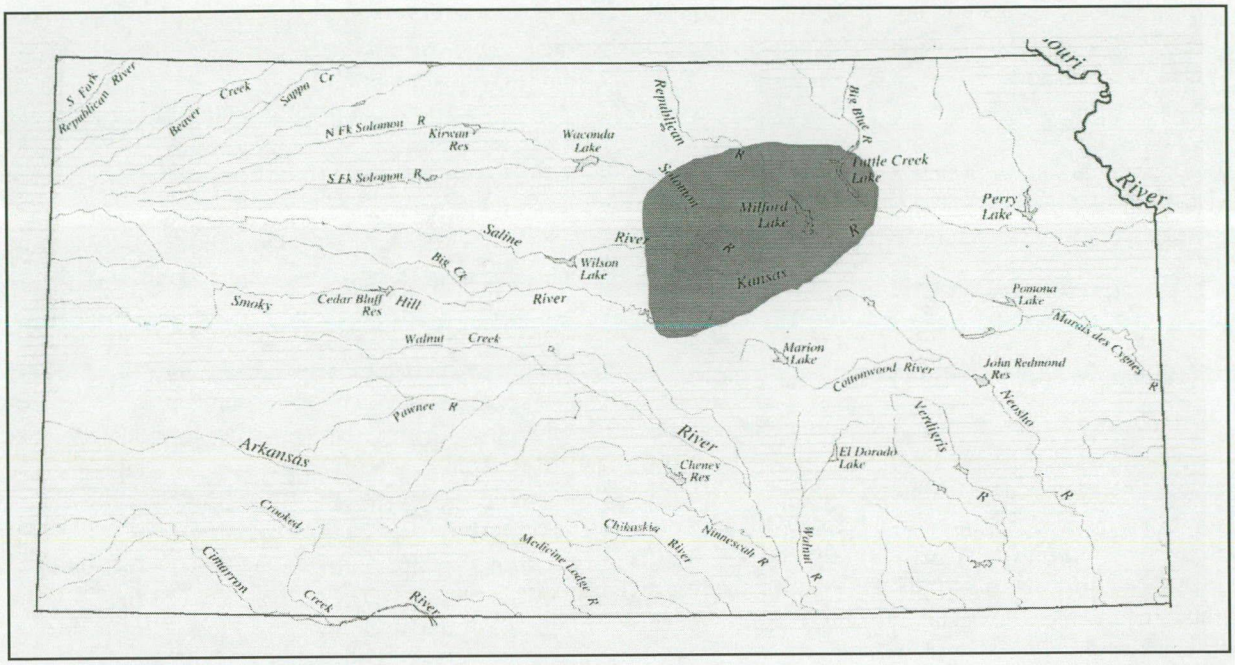


Figure 1. Distribution of sites with house mounds.

Traditionally, archeologists have viewed surface artifact concentrations in cultivated fields as indicators of subsurface or intact cultural deposits. This observation has proven accurate numerous times throughout the brief history of archeology in the United States.

In the past few decades, studies focusing on lateral displacement of archeological materials in plow zones also have been conducted and revealed horizontal displacement of artifacts. However, it is not typically a large amount (Ammerman 1981, 1985; Dunnell 1990; Frink 1984; Lewarch and O'Brien 1981a, 1981b; Odell and Cowen 1987; Roper 1976). Their conclusions support the traditional view that the artifact concentrations in cultivated fields typically denote where cultural features can be found under the plow zone, or at least where they use to be.

How Has Modern Cultivation and Mechanization Accelerated the Destruction of House Features?

Other plow zone archeological studies have focused on the reduction of artifact size caused by tillage (Dunnell and Simken 1995). This is a concern for the Central Plains sites being investigated, as these sites are less obvious than they were when they were recorded a few decades ago. Could these observations indicate that these sites have been destroyed, or is this a by-product of changing agricultural practices in the region?

Archeologists in the American Bottom area of western Illinois have noted, through a long history of investigations and historic accounts, that the deterioration of ceramic artifacts is directly associated with modern cultivation. Milner (2006) used late nineteenth-century accounts of the density of ceramic sherds. His study found that pottery sherds were once the most common artifacts found at Mississippian sites in the area.

The use of chemicals also has had an adverse impact on these artifacts. Essentially, modern agriculture has leveled the mounds, exposed the artifacts to immediate damage by tillage machinery and long-range damage by weather and chemical applications. Observations at many of the sites support the conclusion that as time passes these artifacts are reduced in size and ultimately destroyed.

The development of modern agriculture began with the Homestead Act of 1862, when homesteaders and farmers began to reach central Kansas. Reviews of the development of agriculture in Kansas show numerous areas divided by crops typically raised. Because the data is available by counties, these areas follow county lines rather than uniform farming practices (Hoover 1953). The tri-county study area—Saline, Ottawa, and McPherson Counties—is within two

sub-areas just west of the Flint Hills. These areas are described as "Area 6a - cash-grain, livestock, general. Wheat production is characteristic of this area. Corn and some grain sorghums are grown. Oats and alfalfa are important crops. Livestock are more important here than in the areas farther west. Area 6b - Similar to 6a. Slightly more wheat, less corn, pasture, and livestock but more dairying" (Hoover 1953:18).

How Did the Development of Mechanized Farm Equipment Contribute to Site Destruction?

Developments in farming equipment are among the most critical elements for this study. A significant development, of course, is the plow and its evolution through time. The steel plow was produced commercially by John Deere in 1850 (Hoover 1957:45). In two decades, when settlers were pouring into the study area, this plow was upgraded into a chilled iron plow. Developed by James Oliver, the chilled iron plow was both cheaper and better than the earlier steel plow, making it the tool of choice for the new settlers. By 1880 the two-bottom riding plow was commonly used, but it could not be used to break new sod (Hoover 1953:59).

Cultivation equipment used on Kansas farms was horse or mule drawn until 1915 when the first tractors were introduced, quickly gaining popularity in the central part of the state. Not coincidentally the number of horses and mules on Kansas farms peaked that same year. During this time cultivated fields were limited to easily tilled areas, such as the terraces along streams, and were generally limited to the vicinity of the homestead. By 1936 the number of tractors was nearly equal to that of horses and mules and continued to grow rapidly. The tractor allowed farmers to pull heavier plows and break more of the upland sod, drastically increasing the number of acres under cultivation.

By 1900 farmers were using steam plows in the wheat belt of Kansas. At the same time the first gasoline tractor was used on a Kansas farm. Gang-plows pulled by 25-horsepower steam engines were being used in 1904 but were replaced by the steam tractor in 1906. In 1916 Henry Krause developed the one-way disc plow. In 1933 the first chisel plows (Graham-Hoeme Plow) were developed. Throughout the Depression many tractors sat idle on farms while less expensive horses and mules were used. Tractor-driven cultivation boomed after the Depression with about 164,000 tractors on Kansas farms in 1950 (Bright 1956a). Chisel plowing became popular from 1950 to 1980, as more conservation-minded tillage practices were developed (http://www.tillageanswers.com/tillagehistory.htm, 2007).

The Ottawa, Saline, and McPherson county areas were first homesteaded for farming in the 1860s and 1870s. From 1862 to 1915, cultivation of the land was limited to areas easily tilled near the homestead. These areas included floodplains and slopes. Many of these sloped areas were subject to extensive erosion and soon were allowed, as the farmers say, "to go back to pasture."

Soil conservation was not a major concern for the early Euroamerican farmers in Kansas. Warnings against soil poverty in the early decades of settlement were ignored by most farmers, as they pursued the immediate economic return on their crops (Bright 1956b). After World War II, farmers began hiring or renting road machinery at a low cost for soil conservation work. Terracing and field leveling became quite common throughout the region (http://www.tillageanswers.com/tillagehistory.htm, 2007).

Mid-twentieth-century farmers used tillage in the preparing of seedbeds, eliminating weed competition and improving soil conditions. Types of plowing in the Plains and Midwest included shallow, deep, and subsoiling. Shallow plowing ranged from 4 to 6 inches (10 to 15 cm) below the surface. Deep plowing was below 7 inches (about 18 cm). The subsoiling was originally called knifing but now is called chisel plowing. This type of tillage does not turn the soil; rather it lifts it by means of a chisel shaft that extends below the deep plowed range and slices and lifts the soil. Another form of tillage called compacting was used to reduce wind and runoff erosion and to level fields to create seedbeds (Wolfe and Kipps 1959).

By 1954 agronomists were predicting major changes in tillage practices by 1965. A college textbook included these predictions for Plains farmers (Wolfe and Kipps 1959:163-164):

> 1. More attention will be given to the use of crop residues as mulches to help reduce wind and water erosions and rainfall runoff … .
>
> 2. Tillage operations will be simpler, but, if more complicated, fewer steps will be taken.
>
> 3. There will be less tillage, and the once-over system will be practiced to a greater extent.
>
> 4. Chemical weed control will be more widely used and will thus reduce the need for tillage.
>
> 5. **Plowing will be deeper**, especially in shallow soils and where soil compaction is a

factor. Where these factors are not of importance, depth of plowing may not increase.

6. A greater attempt will be made to control soil compaction or to correct it by **deep plowing**.

7. More consideration will be given to soil tilth. Less consideration will be given to producing a "fine" seedbed and more to one with a "crumb structure." [Emphases added.]

The development of irrigation had a major impact on the houses of the Smoky Hill phase. Many fields were leveled, including part of the Minneapolis site (14OT5), for a variety of irrigation styles. Examples of large terrace remnants were also leveled and dispersed across the field to level it for irrigation, essentially filling stream scars. An example of this was recorded by the author at site 14ML1590 (Latham 2004b). The Mitchell County site was on a large terrace remnant overlooking the Solomon River. When it was recorded, the terrace remnant, which stood about 20 feet higher than the surrounding field, was being removed by machinery and scattered across the nearby stream scars. The author noted the northeast portions of a circular house and an exterior refuse pit. Unfortunately, he was only able to make a quick sketch of a portion of the house, salvage the contents of the refuse pit, and sketch the plan view and profile before it too was removed and scattered. This habitation site, which included a Central Plains tradition house and a Late Plains Woodland occupation, has been totally destroyed. Walking across the field today, one can find several small artifact scatters, giving a misleading cultural landscape.

Common practices with American farmers were plowing-out and plowing-in. Plowing-out was the reduction of high spots within a field by intentionally plowing in a certain matter to level the area. Plowing-in was the technique used fill in low areas through plowing (U.S. Army Corps of Engineers 1992).

How Has the Surface Expression of Middle Ceramic House Sites Changed over Time?

The people of the Middle Ceramic stage (circa A.D. 900 to 1500) of the Central Plains were semi-sedentary horticulturists. They lived in semi-rectangular to circular earthlodges throughout most of the Central Plains. Their subsistence included raising crops of corn, beans, and squash; gathering many native vegetal foods; and hunting nearly every type of animal native to the area. This paper addresses how the remains of their houses have been preserved and identified by archeologists.

Smoky Hill phase house markers have evolved from the time of their construction to their ultimate destruction. How these features manifest on the landform surfaces can be used to determine not only the presence of a house floor, but also the integrity of those features. The geoarcheological evolution of house mounds is noted throughout the world. The evolutionary stages often are used to estimate age of the features (Kirby and Kirby 1976). Butzer's (1982: 117-120) overview of the geoarchaeological evolution of mounds, including house mounds, lists four stages of abandoned mound evolution:

1. compaction and weathering of the feature,

2. mass movements (including surface water and wind),

3. human intervention, and

4. stream activity.

All four of these stages affect Smoky Hill phase house mounds (Figure 2). The first stage is the compaction and weathering of the feature. In the first stage the voids in the mound—in our case the voids created during the collapse and deterioration the house materials—are filled with overburden. Collapsing of the house may have been rapid if the super structure burned, or it may have taken several years as the support posts slowly rotted. During this initial process the relief of the mound was deflated.

The second stage of mound erosion is mass movement or erosion caused by sheetwash and rillwash (a hill slope erosion process that occurs from rain runoff, which creates small channels cut out of the hillside or slope). During this stage the mound is further reduced in profile. Eolian accretion (accumulation of windblown silt) is also common (Butzer 1982:118), which appears to be the case for Smoky Hill phase house mounds (Wedel 1934, 1959, 1986).

The third stage is human intervention. With the leveling of the house mounds by modern cultivation, the house floors were marked on the surface by artifact scatters. The artifact scatters—like the mound—also evolved through time. The human intervention stage would be the disturbance of artifacts, such as bone, mussel shell, pottery, chipped and ground stone arti-

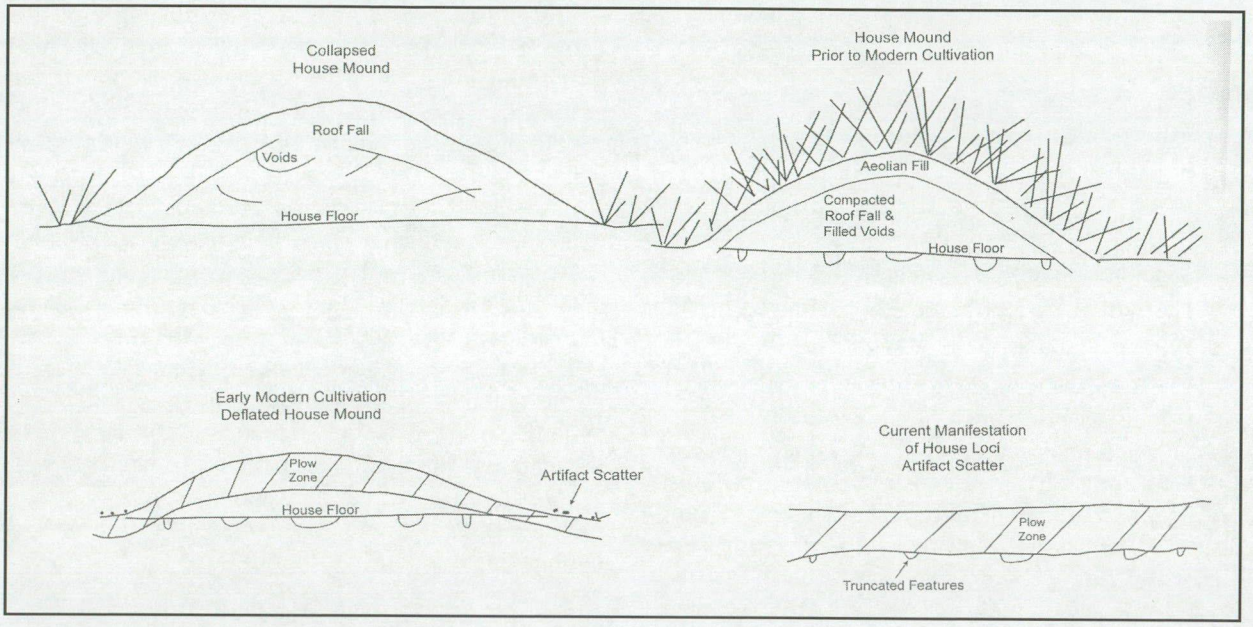


Figure 2. Evolution of house mounds.

facts, and daub. During the early to middle twentieth century, cultivation traffic increased, and equipment size resulted in crushing and expedited the erosion and deterioration of these artifacts. It has been reported that even foot traffic has trampled pottery sherds at house mounds at a predictable rate (Kirkby and Kirkby 1976).

In the late nineteenth and early twentieth centuries, slight elevations or house mounds (also referred to as occupation, settlement, or domiciliary mounds) marked lodges associated with the Smoky Hill phase (Table 1). The distribution of these sites on terraces overlooking streams or rivers is within prime farmland and, therefore, has been subjected to extensive cultivation for several decades. Wedel (1934:222-223) noted that the house mound is unique to the Smoky Hill phase among Central Plains tradition sites. The Upper Republican houses to the north and west had the same general construction but were constructed in shallow pits, whereas the Smoky Hill lodges were constructed on the ground surface or just below it. "To this difference may be attributed the absence of domiciliary mounds in southern and central Nebraska and their presence in northern Kansas. In the former, collapse of the lodge resulted in filling up the pit; in the latter, a low mound was formed. The clean soil constituting the upper portions of the mounds today is no doubt wind-blown material which was caught and held by grass growing over the ruins" (Wedel 1934:223). Wedel reports that B. F. Mudge (1896) documented such house mounds in Cloud County, "fifteen miles above Minneapolis on the Solomon River" (Wedel 1934:223). He also mentions that Failyer (1906) reported house mounds along the Republican River and Wildcat Creek. Wedel noted at least 24 house mounds at the Minneapolis site (14OT5) and concluded that cultivation had destroyed others when he visited the site in early 1930s (Wedel 1934). The house mounds were randomly distributed across the terrace. Excavation of three of these mounds showed a covering of humic soil 8 to 15 inches thick, with the house floor 16 to 20 inches below the mound surface. Mound diameters were 40 to 14 feet (Wedel 1934).

Table 1. House Mounds Associated with Smoky Hill Phase Sites.

Site	Number of Mounds Reported
Minneapolis Site (14OT5)	24
Kohr (Whiteford) (14SA414)	12-15
Griffing (14RY21)	19
Forsberg (14SA420)	2
Schwantes (14MP407)	3
Markley House (14OT308)	2

When Wedel visited the Whiteford site (known today as the Kohr site) in Saline County in 1936, he stated, "village remains consist of low inconspicuous elevations, or house mounds, scattered loosely over the terrace. These have been nearly obliterated by many

years of agricultural activities; and it is quite likely that the 12 or 15 mounds visible in 1936 represent only a fraction of the habitations that once stood on the area" (Wedel 1959:512-513). The Whiteford's excavation of a house indicated that the floor was 18 inches (45cm) below the ground surface (Wedel 1959:513).

At the Griffing site (14RY21), 19 elevated areas thought to be lodge locations were observed when the site was recorded in 1899 (Brower 1899). When the site was revisited and partially excavated in 1937 by the Smithsonian Institution, only a few of the elevated areas could be identified. The plow zone (top 16 inches) of an area of surface debris, thought to be from a house locale, was mechanically stripped away, yet no architectural features were exposed. The house was likely destroyed by cultivation, as only one pit feature was identified during the shovel skimming and troweling (Wedel 1959:178-180).

A second area investigated contained a slightly elevated area, which was trenched and revealed a 14-inch-thick plow zone with numerous artifacts such as daub, pottery, and lithics. The hearth was identified at 18 inches below the highest point of the elevation. The exterior post extended 6 to 14 inches below the house floor, while the interior posts were 21 to 24 inches deep. The lodge appeared to have been erected over a shallow pit.

Three houses were excavated at the Forsberg site (14SA420) each summer from 1974 to 1976 (Latham herein). After coring and marking the surface concentration of the artifacts in the cultivated field, the area was mapped, and a slight rise or mound was noted over House 1. No such mound was observed over House 2 or 3. Several circular depressions, possible borrow pits/areas for the house covering, were found within feet of Houses 1 and 2. The floors of Houses 1 and 2 were found just below the plow zone, somewhere between .8 and 1.5 feet below the ground surface. House 3 was more problematic, as it was on a slope. Though no mound was identified over House 3, nor were borrow area depressions present, a small depression was noted in the center of the house prior to the excavation. This depression was interpreted as representative of the central smoke hole of the lodge roof. The floor was defined at .4 feet below the surface across much of the house, but the north side was actually 1.93 feet below the surface (Whiteacre 1978). Because the house was on a slope, it may have been partially covered by erosion or cultivation. Tilling on side slopes is generally not as deep as on level surfaces, and this may account for the intact nature of even the shallow portion of the house (.4 feet below the ground surface).

When the house areas were defined, one of the most common materials identified was fresh water mussel shell fragments. When the site was resurveyed in 2003, no evidence of mussel shells was found on the surface of the site. This pattern of reduction of certain artifact types is also noted on other sites. Revisiting previously recorded sites led to the same observation.

Researchers also studied how architectural remains were affected by destruction of house mounds. The size, weight, and frequency of daub recovered in House 1 are substantially higher than the two houses that no longer exhibited house mounds. House construction techniques used by the Smoky Hill phase people, combined with the collapse of the structure, resulted in the highest frequency of the daub in the mound fill. As cultivation and other processes deflated this mound, daub would be easily shattered, scattered, crushed, and eventually destroyed. Within House 1 the daub had not been subjected to the weather elements and destructive impacts of cultivation. Daub pieces in House 1 included many over 15-cm in length and 10-cm thick, with log or roof support impressions. Daub fragments at the other two houses on the site were substantially smaller, and none had large impressions.

In 1970 Harold and Margie Reed began excavations on site 14SA415. With the assistance of the participants of the KAA spring dig, the house floor was completely excavated in three months by the end of June 1970 (Roper and Reed 2003:45). The depth of the house floor at site 14SA415 was just as shallow as that of the house at the Forsberg site.

In 1971 John Reynolds noted two possible house mounds just west of the Markley House site (14OT308), which had been excavated by the Whitefords. An unknown visitor to 14OT308 also reported several other slight mounds thought to be house remains (Roper 2001:116).

At the Kohr House site (14SA414) the Whitefords noted 12 lodge mounds near Kohr House 1 (Roper 2001:92). When Wedel (1959:512-513) discussed the site, he noted 12 to 15 "low inconspicuous elevations, or house mounds, scattered loosely over the terrace."

Mounds or slight rises were noted over the 14MP407 houses during the revisit and limited subsurface coring in 2003. Other houses likely were present, according to informants, on the western half of the site, but it had been cultivated for many years and recently terraced. During the 2003 survey only one distinct artifact concentration was found. When the area was cored, it was apparent that the plow zone included

the entire A horizon; therefore, it was concluded that any house floors were likely destroyed. The 2004 geotechnical survey of the site indicated an area in the wheat field where the discrete artifact scatter contained subsurface post patterns and pit features typical of a house. It also indicated that others may be present that were not manifested on the surface anymore.

The earthen coverings of the Upper Republican and Smoky Hill phase houses were likely borrowed from the immediate area of the house. In the case of the Upper Republican houses, this borrowed material likely came from the house floor pit. On the other hand, in many initial recordings of Smoky Hill houses, borrow pits were represented by a few nearby depressions that would often be most notable, holding water, after a rain.

As discussed above, not all house floors in the region were at or near the surface. Examples of buried house floors included sites 14SA305 and 14SA437. Many other examples are found in other neighboring localities.

How Many Middle Ceramic Sites in the Study Area Are Impacted by Cultivation?

To put into perspective the numerous lodges and sites destroyed in the project area, one must consider how many Smoky Hill phase sites are known. This study included the known Central Plains tradition sites in Ottawa, Saline, and McPherson Counties. A total of 68 sites were filed with the KSHS at the start of this study: 16 in Ottawa County, 34 in Saline County, and 18 in McPherson County. Sixty-two of these sites are classified as habitations/villages and six as campsites. All are on stream terraces and have been subjected to cultivation.

Many investigations were conducted on Smoky Hill phase and other Middle Ceramic sites in the eastern half of Kansas. Destroyed lodges were documented in the Tuttle Creek Reservoir area (Schmits et al. 1987) and on individual sites, such as the Mugler site (Ritterbush and Logan 1992).

A number of destroyed lodges were also recorded within the tri-county study area. Wedel's (1934) report of the Minneapolis site (14OT5) mentions that several lodges were destroyed by cultivation. Sites known to have been destroyed within the study area include 14OT302 (Indeck 1994) and 14OT401 (Latham 1995). During the current investigation many sites were investigated by visual inspection and soil coring. Fourteen were cored to obtain soil stratigraphy.

Conclusions

With the current land use patterns in the three-county area, it is clear that most, if not all, of the Middle Ceramic habitation sites have been impacted by cultivation. Based on information gathered, many, if not most, of the sites were subjected to deep plowing. Only a handful that contain any intact house floors may remain. Those noted to date are the eastern half of 14MP407 and a portion of the Minneapolis site (14OT5). Soil coring on many of the remaining sites needs to be conducted before it can be stated that these are the only two reported sites with house floors remaining. Investigations of the five sites that were thought to contain lodge floors (14SA412, 14SA415, 4SA420, 14SA427, 14SA428) show that the floors have been destroyed. Essentially, the collapsed house roof sealed the contents until they were exposed by modern agriculture. Often these house mounds were intentionally leveled by the farmers, but in many cases they deflated after a century of cultivation and chemical application. Chemical herbicides led to rapid degradation of organic materials. Deflation and cultivation also exposed the perishable artifacts to the elements, destroying most. Tilling, compacting, and leveling of the soil further destroys subsurface features.

In essence, the process of cultivating the fields has brought faunal materials out from under the lodge roofs and truncated storage pits to be exposed to forces that break down, oxidize, and decompose the specimens. Fresh water mussel shells were common among these faunal remains. When the sites were recorded in the mid-twentieth century, fresh water mussel shell fragments were commonly referenced as one of the main indicators of a site. Today, no visual evidence of mussel shells will be found. Bone, daub, and pottery fragments of any kind also are becoming increasingly rare.

A marked difference exits between the size of ceramic sherds collected from the site surfaces and the size of sherds found there today. Surface sherds now rarely measure larger than 2 cm across, whereas as late as the 1980s, one could still find large sections of pots. This impact is not limited to the Smoky Hill sites but affects all Ceramic period sites impacted by modern cultivation.

Many of the recently recorded Middle Ceramic sites include little indication of structures. The only artifact group that could be classified as architectural remains is daub, which, unfortunately, is becoming increasingly rare. Over the last 30 years a marked decrease in the size and frequency daub was observed

at many of the sites revisited for this study. Today, many sites in question no longer have daub present on the surface. It has deteriorated along with the faunal remains and pottery.

As time passes and these sites and others are continually cultivated, the archeological record will be destroyed or at least severely altered. As archeologists use artifact assemblages to help interpret the human activities or site functions, it is plain to see that future investigations may yield only stone artifacts. Smoky Hill phase villages or house sites will, in the archeological record, appear only as lithic scatters.

The author plans to continue this study of site destruction, gathering data from these rapidly disappearing sites. As discussed above, changes in the signature of Middle Ceramic sites may not only be caused by the destructive nature of tilling, but also may reflect changes in techniques, including shallow plowing and no-till methods. Such approaches would reduce the percentage of assemblages turned up each year, thus reducing the visibility of the site. To determine if these sites have truly been destroyed or if site signatures have been altered by changing cultivation practices remains to be ground-truthed, thus leaving a glimmer of hope that at least some portions of a few sites may still be intact. Truly, more work needs to be done on these sites in the very near future.

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The Forsberg Site (14SA420): A Smoky Hill Phase Habitation Site in Central Kansas

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The Forsberg site (14SA420) is one of many Smoky Hill phase habitation sites found along the Smoky Hill River of central Kansas. The site contained at least three Smoky Hill phase lodges, which were excavated in the 1970s by Dr. George Taylor, Kansas Wesleyan College, Salina. Undergraduate students and amateurs under the direction of Dr. Taylor excavated a house each summer from 1974 to 1976. These summer field schools each lasted less than three weeks, and much of the work was described as "rushed and haphazard, and ... much was left undone that is necessary to do good archaeology" (Whiteacre 1978:2). Unfortunately, Dr. Taylor died in February 1977 before he could analyze the artifacts and develop a report on the site. This paper aims not only to describe the results of three excavations but also to determine if the three houses could have been contemporary.

The search for a site suitable for excavation by the 2004 Kansas Archeology Training Program (KATP) field school resulted in the resurvey of portions of the Forsberg site (14SA420) (Figure 1). This author's interest in the site was peaked for many reasons; however, the most important aspect was that it contained multiple Central Plains tradition houses. During thesis research on the Solomon River in the Glen Elder locality (parts of Mitchell, Jewell, Smith, and Osborne Counties), the author intensely surveyed more than 20,000 acres and recorded nearly 100 Middle Ceramic habitation sites of the same time period. This exhaustive study and subsequent investigations provided insight into certain aspects of these sites and a thirst for more knowledge of the prehistoric people who lived there. The growing data on Middle Ceramic sites in central Kansas have convinced this author that these people lived in rural or extended communities; in other words, their houses were separated from their neighbors or other houses by at least 100 m (Latham 1996). Sites were typically individual houses/lodges on terrace edges near good sources of water and hardwood timber groves. The sites in the Glen Elder locality with more than one confirmed house were few, including 14ML5 and 14ML15 (Blakeslee 1999) and 14ML417 (Latham 2004); none had more than three identified houses.

Three Central Plains localities have a significant number of excavated house floors to allow a study of the architectural patterns and comparison of these data with differences in ceramic assemblages. Blakeslee (2005) reviewed architectural floor plans at the Glenwood (southwest Iowa), Medicine Creek (southwest Nebraska), and Glen Elder (north-central Kansas) localities (Figure 2). Sites in the Glenwood locality show a distinct pattern in the ceramic distribution, whereas no such pattern could be found at the Glen Elder locality sites. For example, sites with multiple house floors may have differences between the architectural patterns, but the ceramic dialects were essentially the same (Blakeslee 2005). The number of Smoky Hill phase house floors excavated have been widely scattered across north-central Kansas. No other localities have significant numbers of excavated house floors to compare with those of Glen Elder and the other localities discussed by Blakeslee (2005).

Some sites along the lower Solomon, Saline, and Smoky Hill Rivers typically have been called "villages" by archeologists because it appeared that they once contained many house remains. One of these villages is the Minneapolis site (14OT5), which had no less than 24 elevated areas thought to represent house mounds (Wedel 1959). The random scatter of house mounds traditionally has been considered a



Figure 1. General location of the Forsberg site (14SA420).

village (Fosha 1994; Lehmer 1954; O'Brien 1993; Wedel 1959; Witty 1978); however, recent analysis of ceramic artifacts from three houses demonstrated that this may not be the case (Beck 1998). Other examples of possible rebuilding or reoccupying the same site have been found in other localities, including 14ML417 (Latham 2004).

The Forsberg site is situated along the Smoky Hill River in the Salina locality. The meaning of an archeological locality can vary, but this author (Latham 1996) follows the definition developed by Willey and Phillips (1958). By this definition, a locality is the sum of the tributary basins feeding the area, including all of the landforms and resources available to the prehistoric inhabitants. Thus, the Salina locality is described as the portion of the Kansas River drainage that includes the confluence of the Smoky Hill and Saline Rivers and extends along the Smoky Hill River at the eastern edge of the Smoky Hills or Kanopolis Lake downstream to the confluence of the Solomon River. The locality contains the main stem of the Smoky Hill River and the lower portions of the Saline River and perhaps the Solomon River and four well-watered creeks: Sharps, Paint, Kentucky, and Gypsum, which flow north into the Smoky Hill River and Mulberry Creek, a tributary of the Saline River. A few miles up the Solomon River along well-water tributaries, another cluster of sites is referred to as the Minneapolis locality.

Forty-seven Middle Ceramic sites have been recorded within the Salina locality (Table 1); nearly all are within distinct clusters, located along the river terraces. The first cluster is found near the confluence of the Saline River, along it and the Smoky Hill River. A second cluster is noted upstream, separated by nearly 6 miles from the first cluster. A third cluster is even farther upstream, separated by nearly 4 miles from

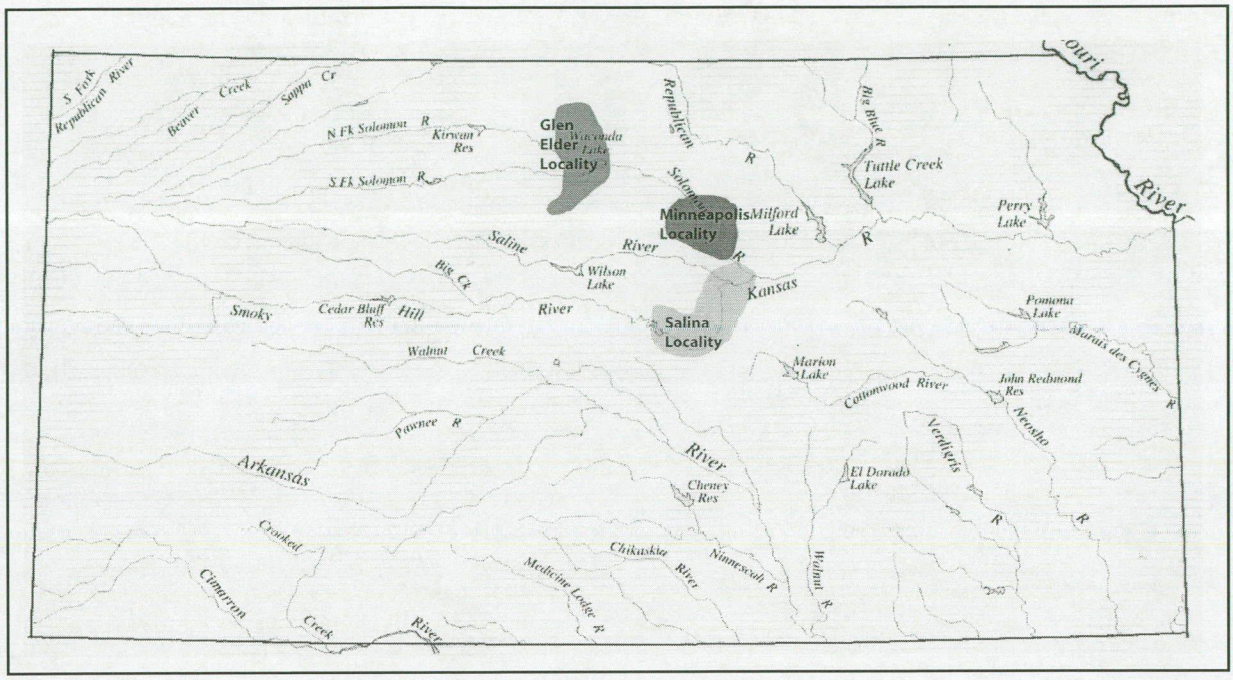


Figure 2. Distribution of Middle Ceramic localities described in text.

the second cluster. These gaps in the site distribution have not been subjected to an intensive survey. So, are the site concentrations representative of an actual settlement pattern—essentially dispersed communities—described for the Central Plains tradition? Or, are the gaps a result of insufficient survey data? Continued survey research is needed to address the questions of actual site distribution.

Another interesting hint about the nature of the settlement pattern or site distribution in the Salina locality is that Middle Ceramic sites occur far up at least a couple of the tributary streams: 14SA417 on Mulberry Creek and 14MP465 and 14MP410 on Gypsum Creek. The locations of these sites high up the creeks, which have not been subjected to intensive archeological survey, suggest that this locality might have a very high site density, like that found in the Glen Elder locality (see Latham 1996). Again, only intensive survey of the locality will substantiate the actual site distribution, and more excavations could define the settlement patterns adequately.

The Forsberg site is one of 11 sites found in the second site cluster discussed above. As with many sites in this locality, much insight on 14MP420 was gained by talking with Harold and Margie Reed, avocational archeologists affiliated with the Kansas Anthropological Association (KAA), who were involved in portions of the Forsberg site investigations. They remembered many details about the site that were not reported clearly in the field notes. Information from the Reeds sparked this author's interest in researching the site, finally convincing him to analyze the data and produce a report. The main focus throughout was to analyze every artifact and record and to prevent biasing the results by waiting to divide the data by house until the end. This method was pursued to determine if any evidence existed that these houses were contemporaneous. Strongly influenced by the 100+ sites of the same cultural tradition visited while working on thesis and subsequent investigations, the author leaned toward the belief that they were not.

The information contained in this report was gathered by the author through analysis of the artifacts, field notes, and informant information, along with historic maps and local and regional publications on the Smoky Hill phase, Kansas prehistory, indigenous plants and animals, and paleoenvironment. The field notes and other documents, such as Linda K. Whiteacre's (1978) student paper, are on file at the Kansas State Historical Society (KSHS). Ms. Whiteacre participated in the 1976 field school, and then in 1978, as a student at McPherson College in McPherson, she analyzed the artifacts and wrote a site report for an independent study course. Her resolve, work, and insight on the Forsberg site are greatly appreciated.

Table 1. Recorded Middle Ceramic Sites within the Salina Locality.

Site Cluster 1	Site Cluster 2	Site Cluster 3	Sites on Tributaries
14SA1	14SA301	14SA408	14SA417
14SA403	14SA302	14MP302	14MP410
14SA409	14SA305	14MP311	14MP465
14SA414	14SA401	14MP405	
14SA415	14SA406	14MP406	
14SA416	14SA407	14MP407	
14SA418	14SA410	14MP411	
14SA419	14SA412	14MP419	
14SA429	14SA420	14MP420	
14SA430	14SA427	14MP422	
14SA433	14SA428	14MP423	
		14MP424	
		14MP430	
		14MP432	
		14MP435	
		14MP437	
		14MP439	
		14MP442	
		14MP446	
		14MP447	
		14MP449	
		14MP455	
		14MP456	

Dr. George Taylor

The driving force for the three field school excavations and processing of most of the artifacts was Dr. George Taylor (Figures 3 and 4). Dr. Taylor was professor of sociology and anthropology at Kansas Wesleyan University in Salina at the time of the Forsberg site field investigation. Unfortunately, he did not live to finish the analysis and subsequent report of the Forsberg site. Dr. Taylor passed away in February 1977 after a long illness.

Information from the February 8, 1977, issue of the *Salina Journal* and from Kansas Wesleyan University catalogues from 1969 through 1975 provide a wealth of information about Dr. Taylor. George Taylor was born in Johnstown, Pennsylvania, on June 3, 1922. He received a Bachelor of Arts degree from Allegheny College, Meadville, Pennsylvania. He earned Bachelor of Sacred Theology and Doctor of Theology degrees at Boston University. As an ordained United Methodist minister, Taylor served as pastor in a number of churches in New England and in the Kansas communities of Wichita, Hays, Bison, and Salina.

Dr. Taylor became an associate professor of sociology at Kansas Wesleyan University in 1968. When he started teaching there, the lone class that dealt with anthropology was "Social Anthropology," offered by the sociology department. Shortly thereafter the class title changed to "General Anthropology." Other classes dealing with archeology were found a couple of years later, offered in Religious Studies ("Archaeology and the Near East") and in the Science Division ("Introduction to Geology and Archaeology of Mexico"). It is not clear if these classes were developed by or for Dr. Taylor; however, it is interesting that they were no longer offered after his death.

Dr. Taylor developed a keen interest in archeology, as attested by a very meticulous notebook on file at the Memorial Library at Kansas Wesleyan. This notebook details a class he took that toured the American Southwest. His daily log contained sketches and discussions of his observations, which included many of the pueblos, kivas, and other prehistoric and historic places that he visited. He entered a Master of Arts program in anthropology at Wichita State University (WSU). His thesis was titled *Defense Systems among the Prehistoric Pueblos of the San Juan Drainage*. His degree was awarded in 1974, the same year that he started excavating House 1 at the Forsberg site. His advisor Dr. Art Rohn came to visit the Forsberg excavations.

Dr. Taylor was a member of the KAA and was a founding member and first president of the Saline County Historical Society. As a member of the KAA, he participated on a limited basis at a few excavations. His first recorded participation in a KAA dig was in 1971, when he was present for one day of the three-day excavations at the Harmon site (14JF350), a Middle Woodland site (*KAA Newsletter* 1971:3). Apparently he did not attend the 1972 dig at Fort Zarah (*KAA Newsletter* 1972:4), which may indicate that his interest was predominantly in prehistory. KAA newsletters list him as a member from 1973 through 1975 (*KAA Newsletter* 1974:10, 1975:24).

While teaching at Kansas Wesleyan and studying for his M.A. degree in anthropology at WSU, Dr. Taylor led a group of Kansas Wesleyan students (Mary Ann Clifft, Susan Schuette, Robert B. Wiley, III, and Donald Vecchiolla) during the spring of 1972 on an excavation of a site (14SA501) in the Salina vicinity

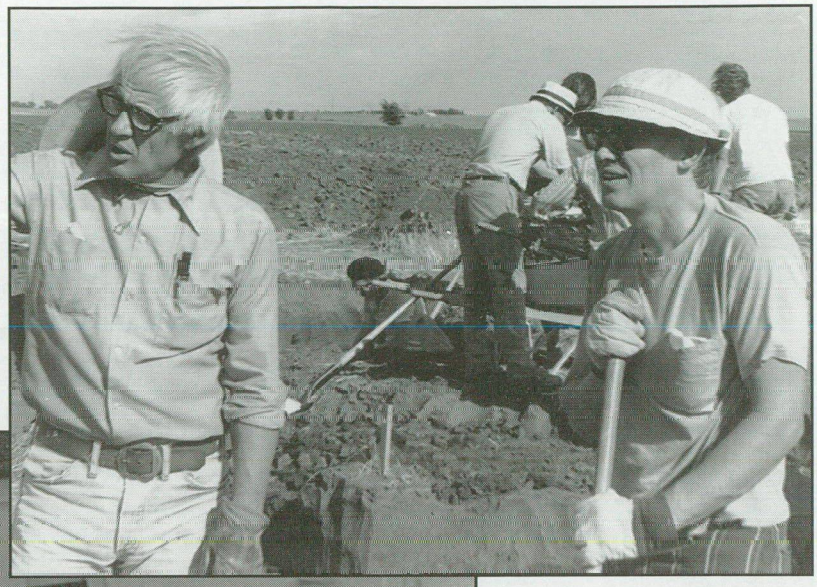


Figure 3. Dr. George Taylor during excavation of House 2, July 1975.



Figure 4. Dr. George Taylor labeling artifacts from House 2, 1975. (Photograph 14SA420-43)

(student papers on file at KSHS, 1972). The students took an independent study class under Dr. Taylor, titled "Introduction to Archaeology," and were required to write a paper describing the only feature that they found at the site, a hearth. The site was identified by a scatter of chipped stone flakes, bone, and burned earth on a ridge overlooking an intermittent tributary of Mulberry Creek a couple miles west of Salina. They hoped that the burned earth found in a concentration on the crest of the ridge was the remains of a prehistoric house. His disappointment with the site and his link to training in Southwestern archeology are evident in Dr. Taylor's "Field Report" (manuscript on file at KSHS), as he states "even though we didn't find another Mesa Verde we did locate a clue to the possibility of finding a possible settlement in our own area."

Dr. Taylor and the four students laid a grid of 5-foot squares across the ridge. The students then spent several days removing the plow zone from 13 of the 5 x 5-foot squares. The hearth was found under what they described as a small mound. This feature measured 45 inches (north-south) by 36 inches (east-west) (114 x 91 cm), and was 10.5 inches (27 cm) deep. Very little besides burned earth, charcoal, and ash was found in the feature, and no evidence of the house floor that they had hoped for was identified.

Dr. Taylor's WSU professor Art Rohn identified the cultural affiliation of the feature as Middle Ceramic period. A review of the artifacts collected at the site (curated at the KSHS) revealed only one diagnostic artifact: a triangular projectile point. This point was recovered from the surface of the site, along with a few biface fragments, retouched flakes, chipped stone tool production debris, sandstone, and bone. Some historic materials, such as clinker and road chat, were also found among the items collected from the surface of the site. Most of the lithic material was Permian chert; however, the triangular arrow point and a retouched flake were Smoky Hill jasper. The morphology of the projectile point likely suggests a Late Ceramic occupation.

In 1973 Taylor participated for only two days of the nine-day excavation at the Minneapolis site (14OT5). This excavation, led by State Archeologist Tom Witty, was the excavation of House 8 on this significant Smoky Hill phase village site (Witty 1974). It appears that this site was Dr. Taylor's introduction to the excavation of a Central Plains tradition house floor. It is unknown how much he read on the subject and discussed with other archeologists. Based on the many things he undertook in his life, Dr. Taylor appears to have been a very confident and energetic personality.

Site Description

The Forsberg site was recorded by Margie Reed in 1973. It was situated on a high terrace overlooking an old channel of the Smoky Hill River in central Saline County. The river channel is currently about .25 mile west of the site. The 1858 General Land Office (GLO) survey of the township depicted the river running nearly south to north to the west of the current channel (Figure 5). By 1955 the river had changed so much that a resurvey was required and showed that a sharp bend in the channel came much closer to the site. Based on the historic survey maps and the obvious channel scars in the valley floor, the river has been very active. Erosion control attempts have held the river in close proximity to the 1955 channel, but the river is still actively eroding and redepositing its banks and altering the landscape.

The high terrace containing the site overlooks old channel scars and a younger river terrace system. The field is currently in winter wheat, as it was when all three houses were excavated. Modern yards and houses are now along the northern edge of the field, which may include areas of additional prehistoric houses. Discussions with the landowners and Margie Reed, who served as crew chief during the 1974 excavation, indicate that evidence of lodges were found along the same terrace system to the north and west across the river. Some sources have mentioned looters excavating such lodges, but none was officially documented.

Excavation

The excavation areas for each field school were selected after surveying the site in search of elevated places or house mounds and distinct artifact scatters. Suspected house loci were tested for subsurface deposits with a soil corer, which in each case revealed darker or stained soil mixed with burned earth, charcoal flecks, and other items. Prior to excavation, a 10-foot (3.05-m) grid was established over the presumed location of each house floor (Figure 6). After establishment of the grid, crewmembers preceded to shovel-skim the plow zone (Figure 7). The plow zone was described as 24-30 cm thick. The 10-foot units were excavated in essentially four levels: 1) the plow zone, 2) a zone between the plow zone and house floor, 3) the house floor, and 4) cultural features. Excavation continued until the soil stains indicating post molds, interior storage pits, and a central hearth in each house were uncovered. Once this level was reached, the floors of the units were skimmed and troweled until they were even and smooth across the entire house area. Nearly

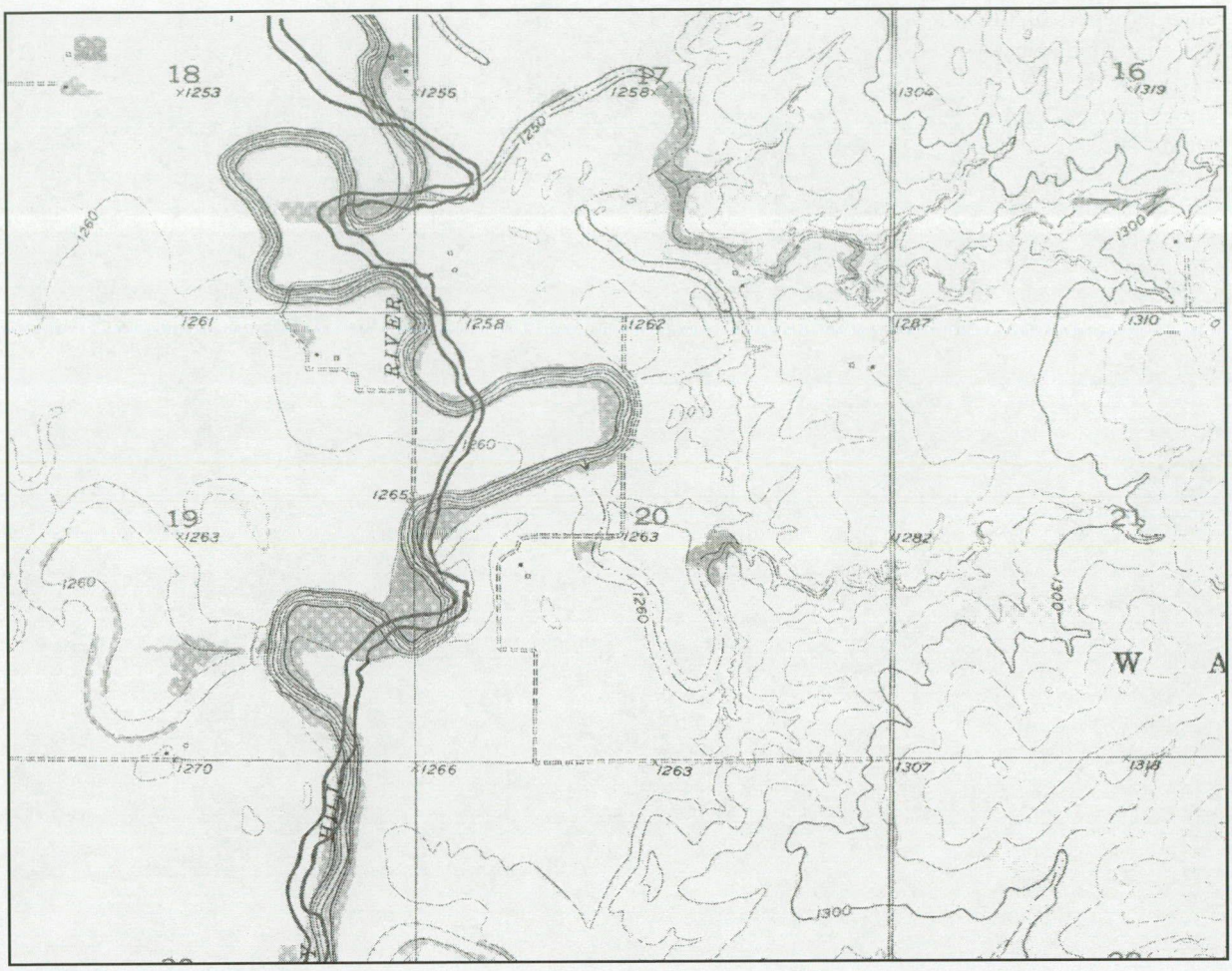


Figure 5. Topographic map showing stream channel meanders of the Smoky Hill River adjacent to the Forsberg site.

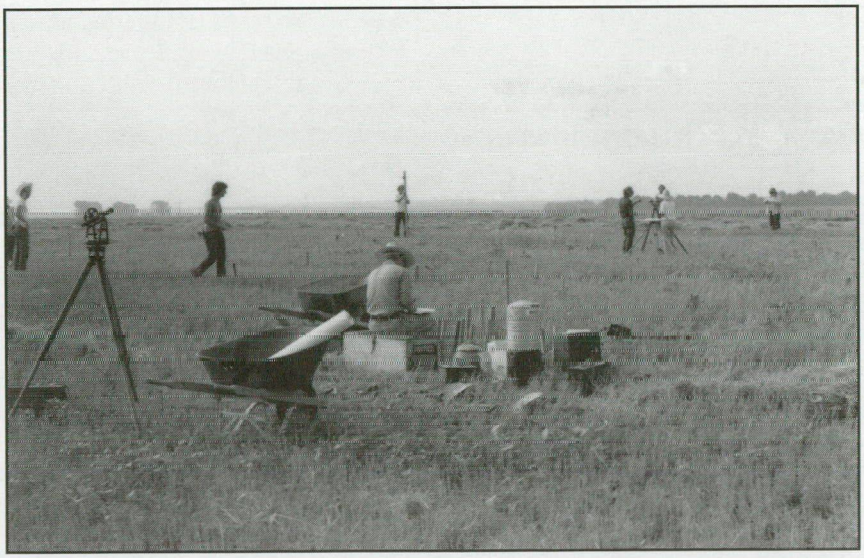


Figure 6. Crew laying grid for House 2 excavation, July 1975.



Figure 7. Crew shovel skimming floor of House 2 (note grid stakes), July 1975.

all the post molds identified were cored. All the storage pits and hearths in the houses were excavated, with each being sketched in plan view and profile. Unfortunately, some excavation records were lost. All measurements were taken in English standard units, which were converted to metric equivalents for this report.

1974 Excavation Area Description

The first house excavated at the Forsberg site was under the co-direction of Dr. Taylor (Figure 8) and avocational archeologist Margie Reed. The presence of a slight elevation or house mound and concentrated scatter of artifacts identified the location of House 1 (741). Before the grid was laid across the house mound area, a crucifix pattern of soil cores was conducted through the heart of the mound area. These cores were placed every 3 feet, and a clear pattern of subsurface cultural material was documented. This coring revealed strong evidence of an intact house floor. The excavation area was concentrated in the area of the house, covering 213.69 m^2.

At least two depressions were noted in the vicinity of the house floor during the excavation. A 3 x 3-m depression was found about 9 m north of the house. Another depression, measuring 3 x 4.5 m, was found 6 m to the south. None of these depressions were investigated but were speculated to represent borrow areas associated with construction of the house (Whiteacre 1978).

1975 Excavation Area Description

The House 2 (751) locus was identified by Harold and Margie Reed in April 1975 when they conducted random soil coring at the site. They found soil mixing typical of a house floor at a depth of 46-61 cm below the ground surface. They also observed that the wheat growing at the time was more sparse and shorter outside the area of soil mixing (Whiteacre 1978), where human activity had not contributed organic material to the earth. The excavation was restricted to the house floor, exposing a total of 166.30 m^2 (Figure 9).

When the house remains were excavated—after the wheat was harvested—the area was intensely surveyed to determine if any surface irregularities



Figure 8. House 1 floor at completion of 1974 excavation (looking west).



Figure 9. House 2 floor at completion of 1975 excavation (looking north).



Figure 10. Aerial view of House 3 floor at completion of 1976 excavation (looking south).

were evident. The crew found no evidence of a house mound but did observe a circular depression about 9 m to the north. It was hypothesized that this depression was the remains of the borrow pit associated with house construction. No test excavations were undertaken in the area of the surface anomaly (Whiteacre 1978).

1976 Excavation Area Description

The location selected for the 1976 excavation was identified during the 1975 excavation of House 2. A possible House 3 (761) location was identified by the observation of a discrete area of dark soil. No mound was identified, but a slight depression was observed, which was later determined to be in the center of the house floor. The low area contained a scatter of chert flakes and pottery sherds. Due to dry soil conditions, coring initially did not reveal subsurface evidence. However, soil coring during the spring of 1976 did reveal the soil mixing typical of a house floor in a zone about 55 cm below the ground surface. During the uncovering of the house floor, a total of 88.26 m^2 were excavated (Figures 10 and 11).

The ground surface sloped to the south, which created a unique excavation experience for the crew, compared with the level house floors found the two previous years. Based on the datum established near the northern end of the house floor, the house floor was 43 cm below the datum at the north end, sloping to 59 cm at the south end. Is it possible that this house was dug into the terrace slope like many historic dugouts? Whiteacre (1978) was present during the excavation of this house and, therefore, had some insight to the excavation. She reported that identifying the post molds in this house floor was much more difficult than in previously excavated floors. The presence of typical floor mix in the soil down slope from the landform indicates that much of the house floor had been washed or eroded away.

Architecture

House 1

House 1 was nearly square in shape, about 89.80 m^2, with 32 exterior posts identified during the 1974 investigation (Figure 12; Table 2). The walls were first identified as 60-cm-wide lines of burned earth/oxidized (yellow) soil and charcoal. The oxidized soil along the wall areas, combined with the recovery of large chunks of daub, indicated that the house had burned.

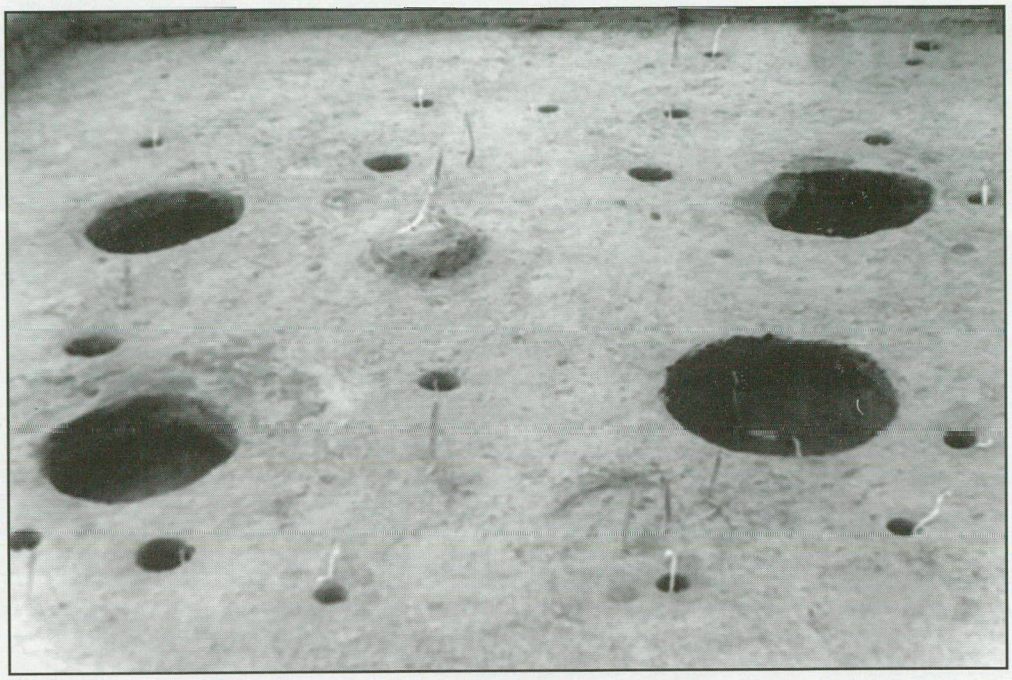


Figure 11. House 3 floor at completion of 1976 excavation.

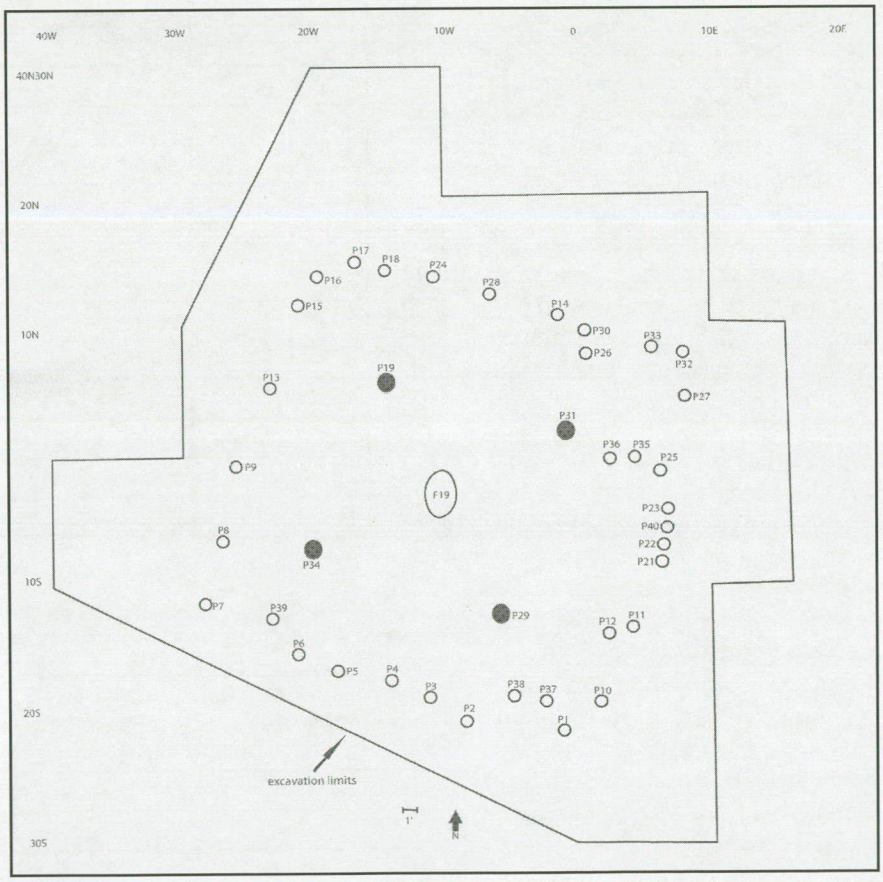


Figure 12. Map of House 1 floor, 1974.

After shovel skimming and trowel work through the oxidized soil, ash, charcoal flecks, and daub, individual post molds were identified. The post molds created a distinct lodge pattern, but no entryway was identified. The northeast wall was 9.03 m long and contained nine post molds. The southeast wall was 9.72 m long and contained 10 post molds. The southwest wall was 9.88 m long and contained eight post molds. Only five post molds were identified along the northwest wall, which was 9.24 m long.

Four center posts (P19, P31, P29, and P34) in a square pattern were identified around the central hearth (Table 3). These posts were in the same general alignment as the exterior walls. The distance between the posts ranged from 4.65 m (distance between P34 and P29) to 4.42 m (distance between P19 and P31). The other two inter-post distances were 4.47 m (distance between P34 and P19) and 4.45 m (distance between P19 and P31).

Four other interior post molds were identified at the southeast end of the house floor. The post molds were in pairs between the southeast wall and the central support/hearth area. Measurements on P35 and P36, which were in a set east of the central post, P31, were not recorded, as they were not excavated. To the south along the southwest wall were the other set of interior post molds (P37 and P38). Their diameters were 14 cm (P37) and 17.07 cm (P38). They were 4 cm (P37) and 14 cm (P38) in depth. Often such interior posts in this pattern are interpreted as drying racks or other interior furniture.

A central hearth, assigned feature number 19 (F19), was the only feature other than post molds for which documentation remains. The basin-shaped pit, oriented north-south, measured 1.17 m (north-south) x 78 cm (east-west) and was 13 cm in depth. The feature was ash-filled; however, no charcoal, burned earth, or evidence of oxidation in the soil lining the hearth was present. About 61 cm north of the hearth was a pile of burned limestone.

Three storage pits reportedly were found in the house but were not included in the house map. One of these features was described as a shallow basin along the southwest wall near the junction with the southeast wall. This basin feature was about 4 cm deep and measured about 82 cm north-south. The only other mention of the other two pits is in the report by Whiteacre (1978), who stated that all data concerning them were lost.

Grass- and stick-impressed daub was size-graded to assist in the analysis of the materials, following Latham 2004. For mass analysis a scale was developed to quickly record the sizes of the debris, recording the

Table 2. House 1 Wall Post Molds by Wall.

Wall	Post Number	Diameter (cm)	Depth (cm)
NE	17	24	21
NE	18	27	40
NE	24	20	27
NE	28	30	49
NE	14	29	55
NE	30	30	23
NE	26	30	32
NE	33	27	43
NE	32	30	38
SE	27	27	27
SE	25	30	34
SE	23	27	29
SE	40	9	15
SE	22	18	15
SE	21	30	46
SE	11	31	43
SE	12	23	35
SE	10	33	38
SW	1	30	37
SW	2	30	32
SW	3	23	23
SW	4	30	30
SW	5	30	24
SW	6	40	30
SW	39	27	29
SW	7	27	34
NW	8	30	40
NW	9	27	40
NW	13	27	34
NW	15	27	27
NW	16	27	24

Table 3. House 1 Central Support Posts.

Post Number	Position from Hearth	Diameter (cm)	Depth (cm)
19	NW	40	52
31	NE	35	46
29	SE	35	30
34	SW	35	37

largest measurement. Graded sizes are as follows:

1 = 4 inches (101.6 mm)
2 = 3 inches (76.2 mm)
3 = 2 inches (50.8 mm)
4 = 1 inch (25.4 mm)
5 = > .5 inch (12.7 mm)
6 = > .25 inch (6.35 mm)

Recovered from House 1 were 156 pieces of daub, weighing 3,877.4 grams (Table 4). This house contained the largest pieces of daub collected at the site (Table 5). Three of these chunks resemble adobe bricks with impressions of wall or roof supports. The largest of these brick-like daub pieces measures 14 x 11 cm and 9 cm thick. All the daub pieces have a number of grass and stick impressions, and a few have pole or log impressions. One pole impression was complete enough to determine that the chunk of clay was wrapped around a 2-cm diameter pole.

House 2

House 2 was square in shape, measuring 8.47 m north-south x 8.63 m east-west or about 73.05 m^2 (Figure 13). Only 18 post molds were found in the

Table 4. Number of Pieces and Total Weight of Daub Recovered.

House Number	Number of Pieces of Daub	Total Weight (g)
1	156	3,877.4 0
2	294	1,976.13
3	50	487.90
Total	**500**	**6,341.43**

Table 5. Size Grade of Daub Recovered.

Size Grade of Daub	Larger than Grade 1	2	3	4	5	Total
House 1	3	25	92	36		156
House 2		9	107	174	4	294
House 3			13	7	30	50
Total	**3**	**34**	**212**	**217**	**34**	**500**

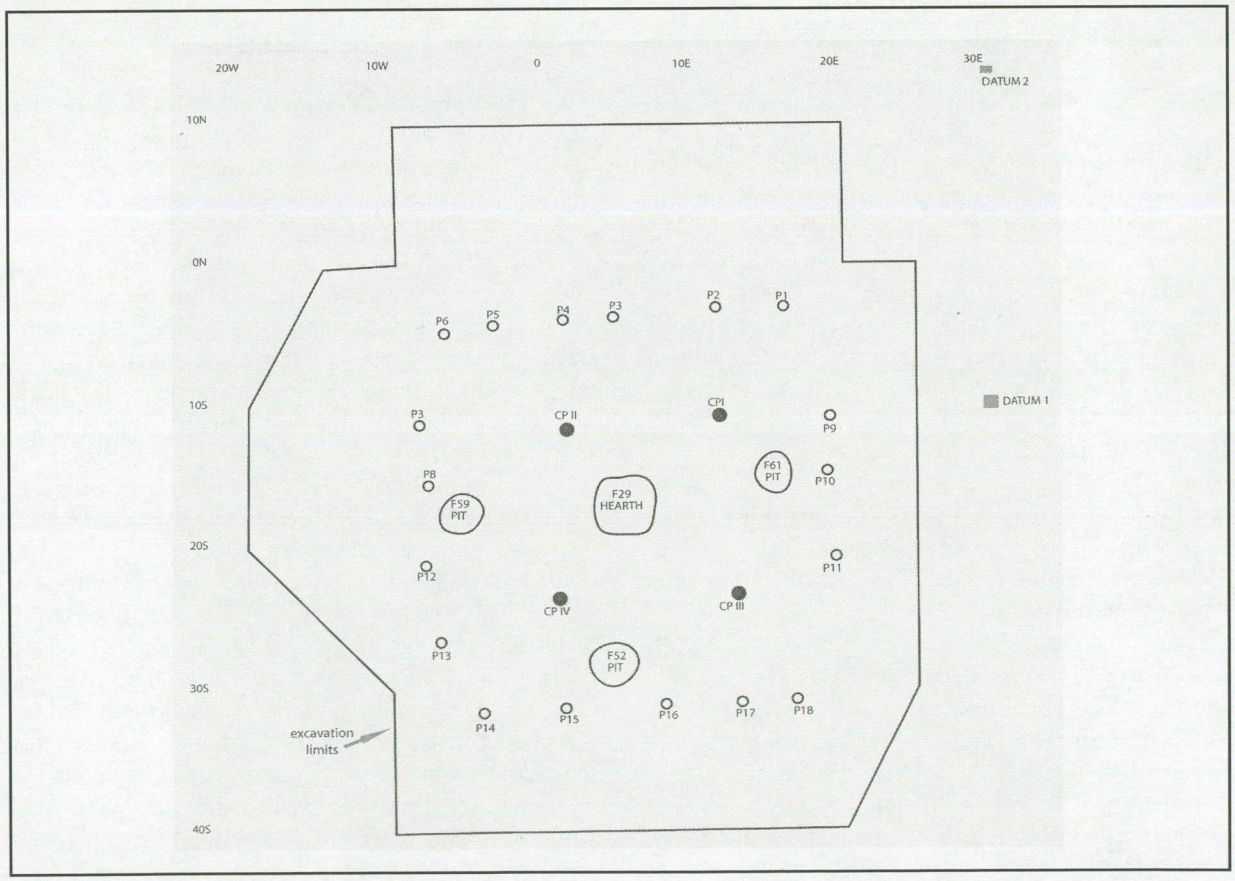


Figure 13. Map of House 2 floor, 1975.

Table 6. House 2 Wall Post Molds by Wall.

Wall	Post Number	Diameter (cm)	Depth (cm)
N	1	23	18
N	2	20	21
N	3	21	38
N	4	26	34
N	5	24	37
N	6	28	35
W	7	27	27
W	8	24	21
W	12	21	35
W	13	24	34
S	14	18	24
S	15	18	49
S	16	21	52
S	17	17	30
S	18	15	24
E	11	18	15
E	10	24	18
E	9	24	22

exterior walls during the 1975 investigations (Table 6). Six post molds were found in the north wall, ranging in diameter from 20 to 28 cm. Four post molds were found along the west wall, ranging in diameter from 21 to 27 cm. The south wall had five post molds, ranging from 15 to 21 cm in diameter. Only three post molds were found in the east wall, with one measuring 18 cm and the other two measuring 24 cm in diameter.

Four center posts in a square pattern were identified around the central hearth (Figure 13; Table 7). The distance between the posts ranged from 3.8 m north-south to 3.9 m east-west. The hearth was offset to the west but was centrally located north to south. No other interior post molds were identified during the excavation of the House 2.

Red and orange oxidized soil defined this slightly basin-shaped hearth (F29) that was found 24 cm above the base of the house floor (Figures 14 and 15). Excavators described the hearth as constructed on a central square earthen platform that extended 24 cm above the house floor. The feature measured 67 cm east-west x 76 cm (north-south), and the ash and oxidized soil were 9 cm thick. The hard oxidized soil was perceived as an excellent source for archaeomagnetic dating, and eight

Table 7. House 2 Central Support Posts.

Post Number	Position from Hearth	Diameter (cm)	Depth (cm)
CP1	NW	41	30
CP2	NE	29	27
CP3	SE	35	18
CP4	SW	37	30

samples were collected from the feature's eastern half; however, if these samples were processed, no results have been found.

Three interior pit features were identified: F52, F59, and F61 (Figure 14). F52 was found at the southern end of the house, 2.2 m south of the hearth. Its orifice measured 1.07 m (east-west) x 96 cm (north-south). The walls tapered gradually to a depth of 34 cm, at which point the basin floor began, for total depth of 46 cm. The pit matrix included charcoal and daub or burned earth. This feature originally may have been a storage facility, but later it became a depository for ash and other hearth debris.

F59 was the storage pit along the west wall and 58 cm west of the hearth (Figure 14). This pit measured 95 cm (north-south) x 88 cm (east-west) and 37 cm deep. The matrix included a high artifact density and mussel shells. Clearly this feature served as a trash receptacle at the end of its use life.

Storage pit F61 was between the central support area and the east wall (Figure 14). The pit was 52 cm west of the east wall and 1.34 m south of the north wall. Circular in shape, the pit had a diameter of 85 cm and was 73 cm deep. Artifact density was high at the house floor level, but few artifacts were found in the pit matrix.

By count, more pieces of daub were recovered from House 2 than from the other two houses combined (Table 4); however, these were generally smaller pieces than those in House 1, which yielded a larger mass of daub. This may result from the obvious intense fire that consumed the superstructure of House 1 (Table 5). House 2 also appears to have burned, but the fire was less intense. Another possible explanation is that the lack of a house mound at House 2 may suggest more post-depositional disturbance. The house mound at House 1 may have protected the fragile daub pieces, leaving many larger chunks. By weight, twice as much daub was recovered from House 1 than from House 2 (Table 4).

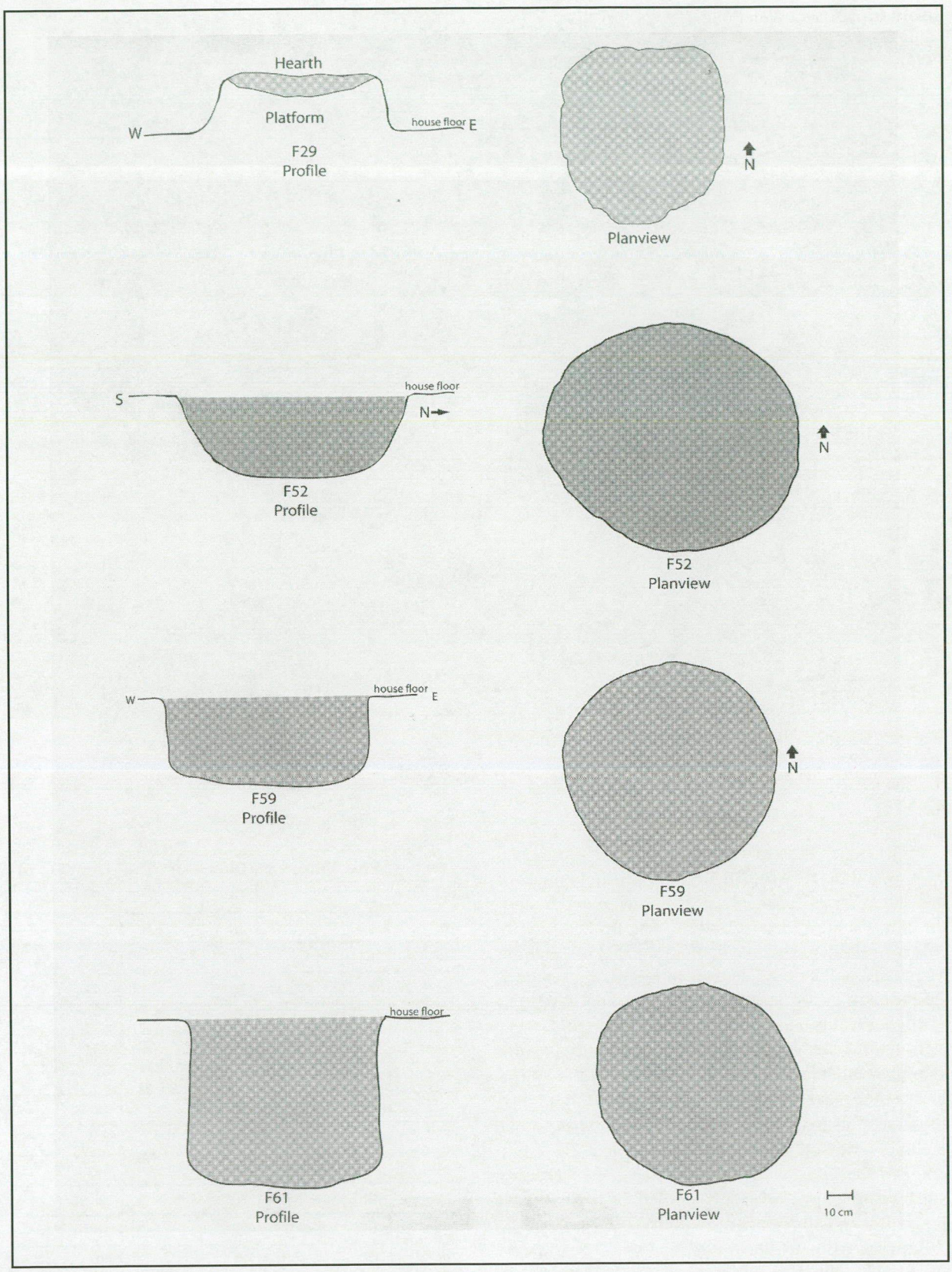


Figure 14. House 2 feature plan views and profiles.

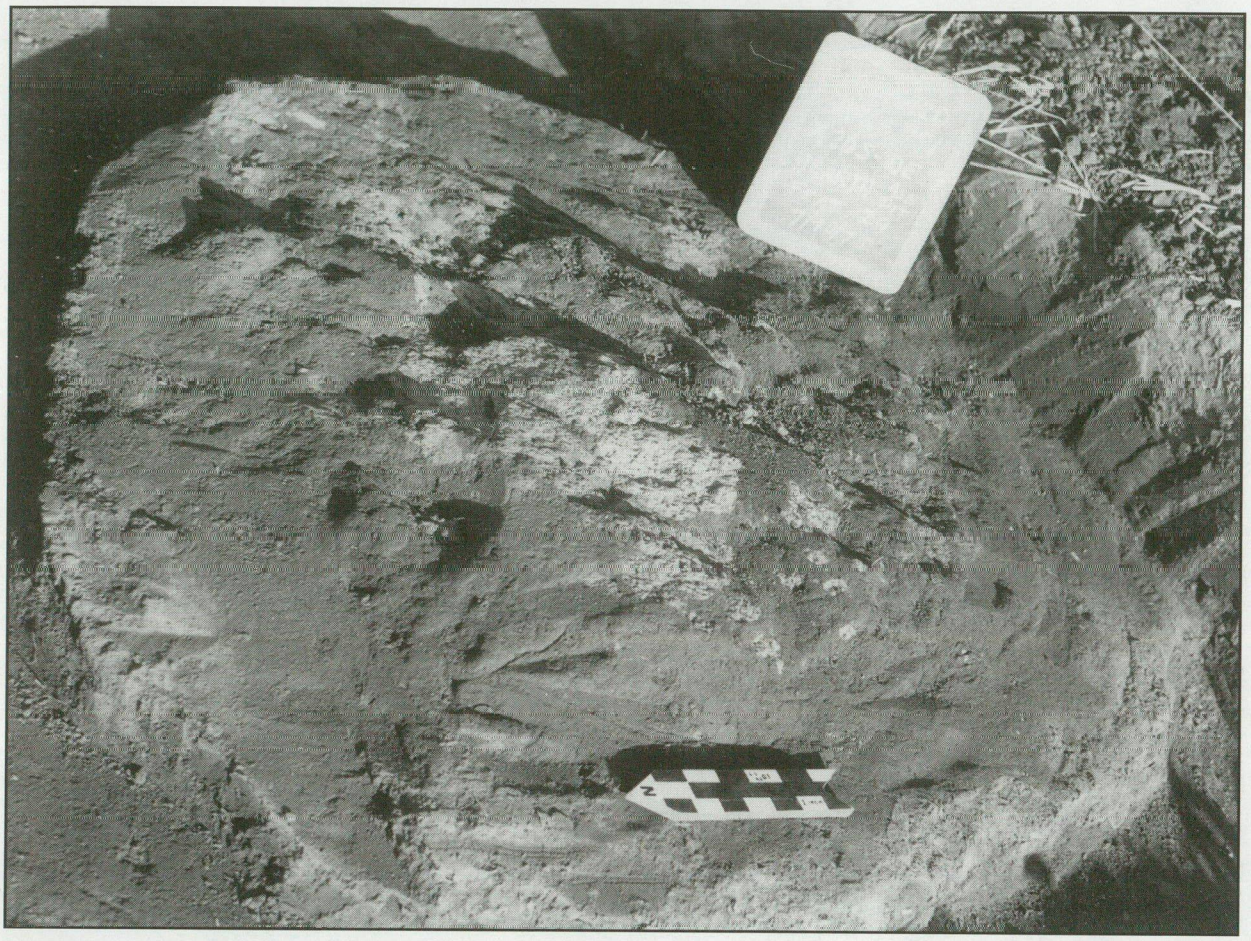


Figure 15. Platform hearth (Feature 29) in House 2.

House 3

The house floor excavated during the summer of 1976 was described by Dr. Taylor in his field notes of July 20, 1976, as "...an interesting house even if rather strange." The wall post pattern was nearly circular with a 5.7-m diameter and containing 25.3 m^2, making it a much smaller house than the other two excavated at the site. The house floor was found between 26 cm and 41 cm below the datum. Only 14 wall post molds were identified (Table 8), but 3 exterior post molds were identified outside the southwest portion of the house. These three posts may be part of an extended entryway, which would have extended from the southwest corner of the house, running to the south.

The distribution of the wall posts was sporadic. The numbering of posts started with the P1, which was at the north-central end of the house, and proceeded clockwise with the exception of the exterior posts (P10, P11, and P12). Five post molds were found along the northern portion of the house floor, ranging

Table 8. House 3 Wall Post Molds by Wall.

Wall	Post Number	Diameter (cm)	Depth (cm)
N	1	13	37
N	2	20	21
N	3	21	38
E	4	26	34
E	5	24	37
S	6	28	35
S	7	27	27
S	8	24	21
S	9	24	23
W	13	24	34
W	14	18	24
W	15	18	49
N	16	21	52
N	17	17	30

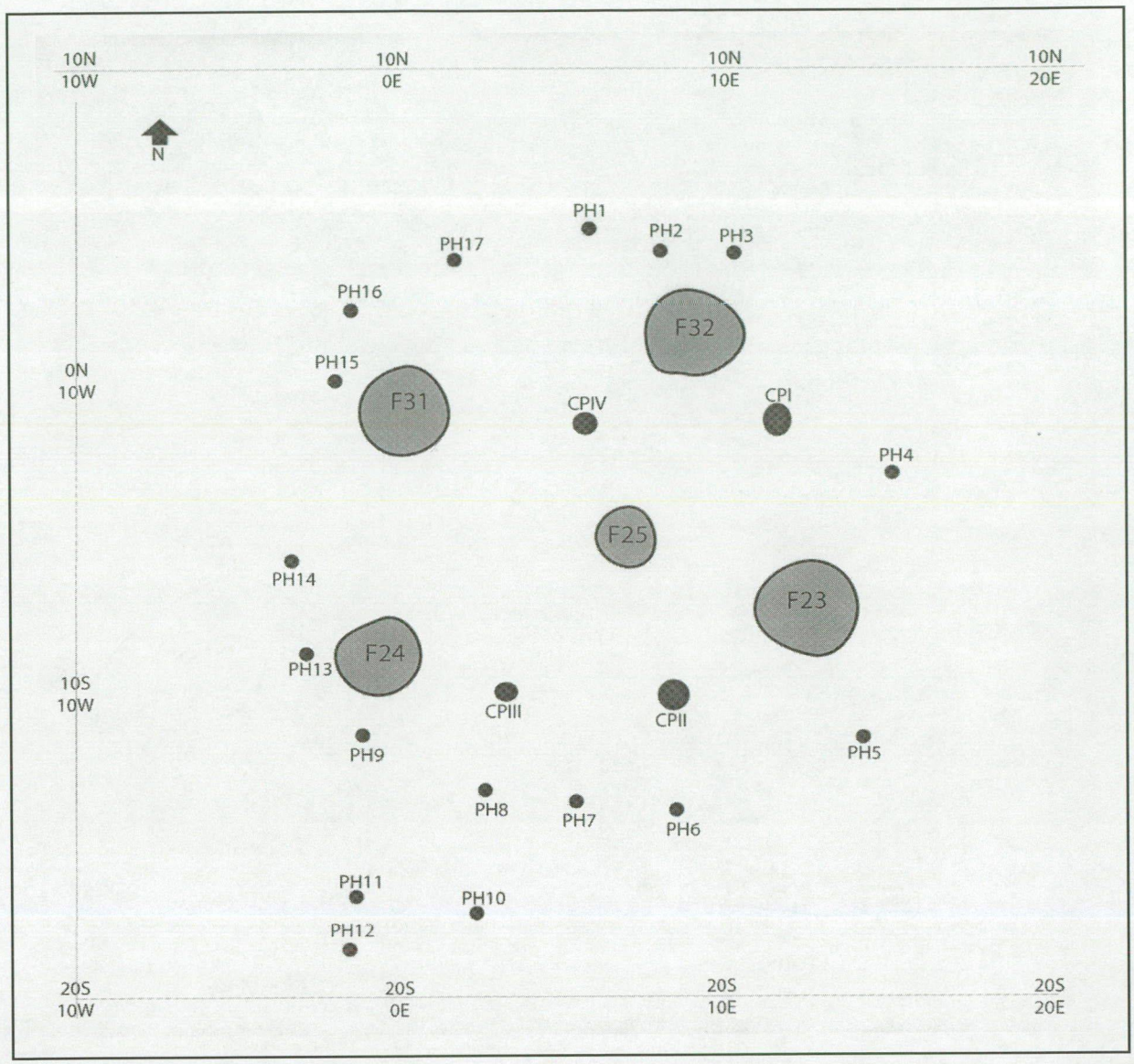


Figure 16. Map of House 3 floor, 1976.

in diameter from 13 to 21 cm. Two post molds, which were 24 and 26 cm in diameter, were along the eastern edge of the house floor. The south wall had four post molds that were 24-28 cm in diameter. Only three post molds were found along the west wall; two had 18-cm diameters, and the other was 24 cm across.

Four center posts were identified offset to the east from the center of the lodge (Figure 16; Table 9), yet flanking the nearly central hearth. The distance between the posts was longest on the northeast-southwest axis, measuring 2.72 m between CP3 and CP4 and 2.77 m between CP1 and CP2. The distance between the northern two central posts was 1.98 m, whereas the southern two posts were 1.67 m apart. No

Table 9. House 3 Central Support Posts.

Post Number	Position from Hearth	Diameter (cm)	Depth (cm)
CP1	NE	41	30
CP2	SE	29	27
CP3	SW	35	18
CP4	NW	37	30

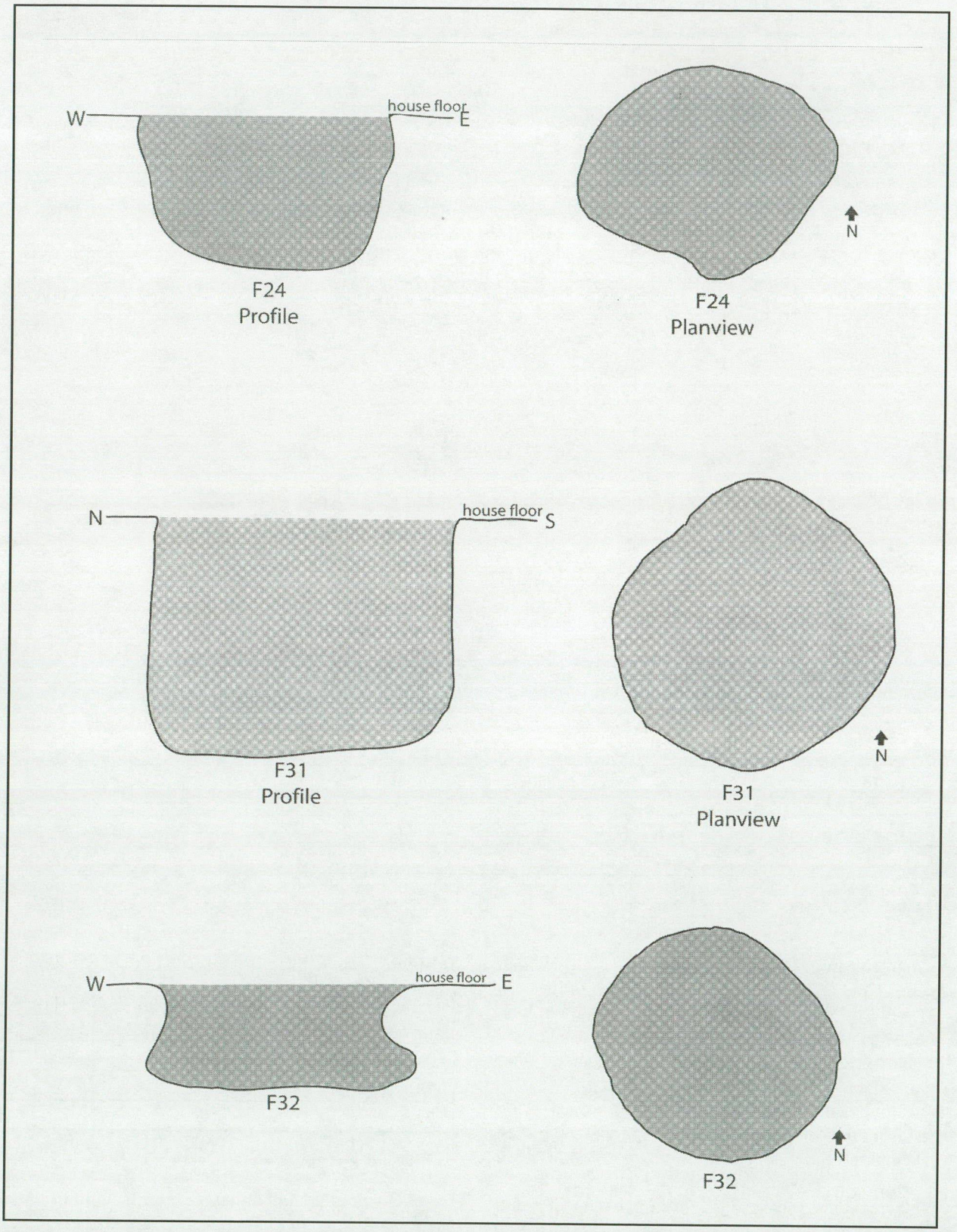


Figure 17. House 3 feature plan views and profiles.

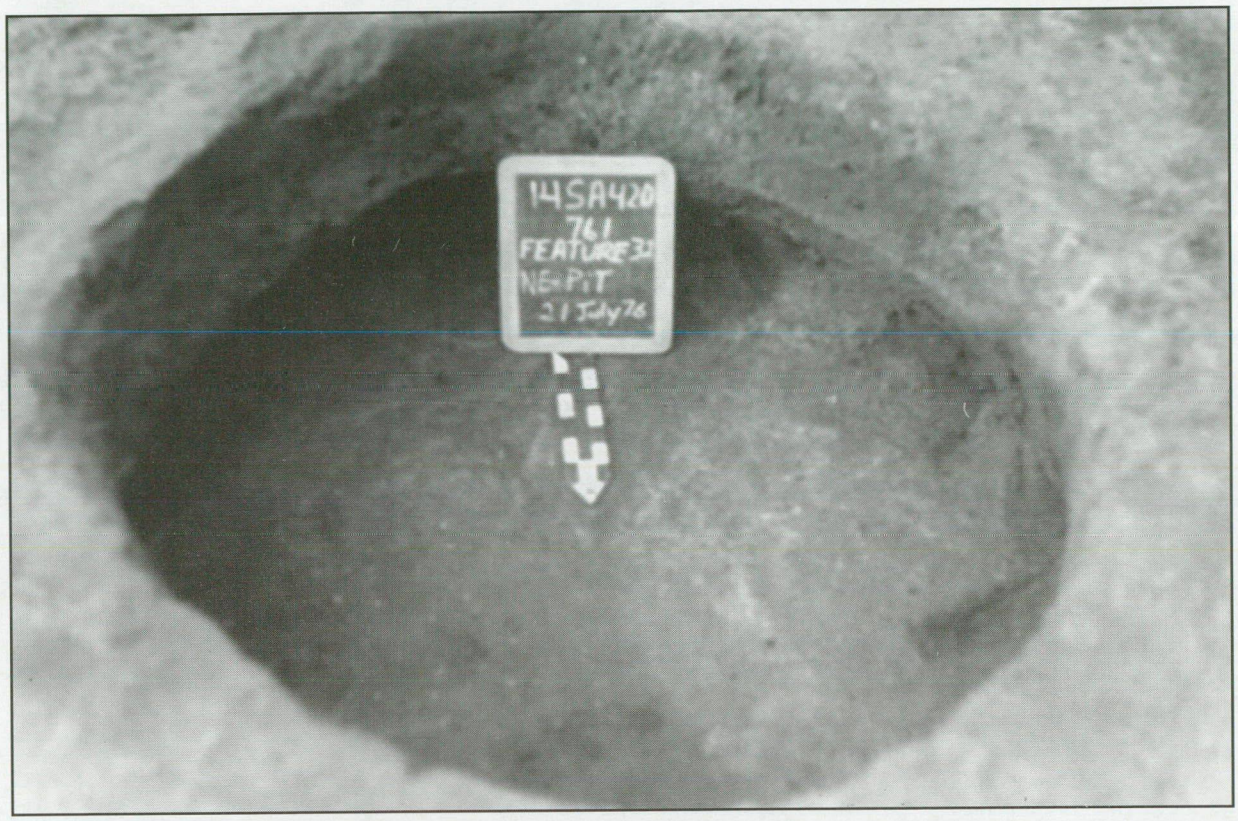


Figure 18. Feature 32 in House 3.

other interior post molds were identified during the excavation of the house. The diameters of the central posts were 29-41 cm.

The hearth (F25) was nearly centrally located on the house floor, but, as mentioned above, the central support posts were offset from the hearth (Figure 16). It was located about 2.29 m from the east wall, but dimensions and depth were not found in the excavation records. No artifacts were found in the hearth matrix.

Four storage pits were identified during the excavation of the house floor: F23, F24, F31, and F32 (Figure 17). These pits were distributed in the semi-cardinal quadrants of the lodge. The southeastern pit (F23) was circular, 94 cm in diameter, and 99 cm deep. The matrix included much charcoal, small pieces of burned sandstone, and caliche. At 91 cm below the floor a 3-cm-thick layer of burned earth was revealed. Several pieces of Permian chert were recovered from the pit, along with three body sherds and a few rodent bones but no mussel shell. In the center of the pit at the house floor level, a projectile point preform was discovered.

The pit feature in the southwest quadrant (F24) was slightly oval in shape. It measured 82 cm (north-south) x 93 cm (east-west) and was 59 cm deep. At the mouth was a large brick of daub. Upper portions of the pit contained a high density of charcoal. Other materials were few and limited to bone, shell, pottery sherds, and chert flakes.

The pit in the northwest quadrant of the house floor was F31. The north-south axis was 1.13 m long, and the east-west axis was 1.05 m. It belled slightly at the bottom and was 92 cm deep. Numerous pottery sherds, sandstone abraders, and chert flakes were recovered from the matrix. At 36 cm below the house floor was a bison scapula hoe. Many flecks of charcoal but only a couple pieces of mussel shell were observed. Evidence of wall slumping was noted, suggesting that the pit was not full when it was abandoned.

In the northeastern quadrant was F32, a bell-shaped pit with a 91-cm diameter orifice that constricted at the neck to 87 cm (Figure 18). A concentration of pottery was found on the house floor near the pit. The pit was 37 deep, and the upper portions contained hackberry seeds. Considering the high density of rodent burrows, the excavators assumed that rodents brought in these seeds. A few small pieces of pottery and chert flakes were found in the matrix. At the bottom of the pit were larger potsherds and a grooved abrader.

Table 10. Radiocarbon Assays.

Sample Number	House Number	Feature	RCYBP	D13C	Calendar Date
ISGS 5747	1 (1974)	49 (Center Post)	820 +70	-25.2	A.D. 1130
ISGS 5752	1 (1974)	36 (Pit)	800 +70	-26	A.D. 1150
ISGS 6038	2 (1975)	Center Post 1	1150 +/- 70	-24.3	A.D. 800
Teledyne	2 (1975)	61 (House Floor)	490 + 85	-	A.D. 1460
ISGS	3 (1976)	F24 (Pit)	1060 +/-70	-26.8	A.D. 890

Age of Occupation(s) through Radiocarbon Assays

According to the records on file at the KSHS, three wood charcoal samples were cleaned and sent to Teledyne Isotopes in 1976. Two of the prepared samples were from features in House 2, excavated in 1975. These House 2 samples were from an interior house pit (F61) and a central post (F31). The bags that once contained these samples are still in the collections held by the KSHS and are labeled in red: "Cleaned for dating 3/27/76 mailed to Teledyne." The third charcoal sample submitted to Teledyne was from House 3, excavated in 1976. This sample was taken at or near the house floor in excavation unit 10S/0W and was sent to Teledyne on October 20, 1976. Record of only one sample being processed by Teledyne Isotopes has been found. The F61 charcoal sample from House 2 produced an assay of 490 BP $\pm$ 85 (Whiteacre 1978).

Other attempts to date the prehistoric occupations of the Forsberg site included samples collected for archaeomagnetic testing. Six to eight samples were collected from two different interior posts in House 1. During investigations at House 2, eight archaeomagnetic samples were taken from the central hearth. Fourteen to 16 samples were sent for analysis. Whiteacre (1978) states that they were sent to Dr. Dubois at the University of Oklahoma; however, records on file at the KSHS indicate that Dr. Arthur Rohn and his daughter Cherie Rohn of WSU collected the samples from House 1. No reference to the test results was found on file at the KSHS or at WSU.

Four additional dates were obtained during the current analysis to determine if the archeological assemblage could reveal if the houses were occupied at or near the same time or if the area was re-occupied after an extended period (Table 10). Two assays were obtained from wood charcoal samples from two House 1 features excavated in 1974. These samples were collected from F49 and F36. F49 was a center post, and unfortunately the record describing F36, a storage pit, has been lost. One charcoal sample from Center Post 1 in House 2 also was submitted. The final sample was from F24, the southwestern storage pit in House 3. The dates obtained do suggest that not all the houses were occupied at the same time, as House 1 appears to be earlier than the occupation of Houses 2 and 3. These findings do not seem to match the differences observed in the architecture nor the ceramic assemblages.

Artifact Assemblage

Ceramic Artifacts

Seventy jars and four bowls or "coconut" jars were identified in the assemblages recovered from the Forsberg site houses. Rim forms of these 70 jars, divided among the three houses, are presented in Table 11. The number of jars in each house at Middle Ceramic house sites has varied considerably. Vessel counts at 14SA420 and those from other Middle Ceramic excavated houses in the region are compared in Table 12.

Five rim styles, reflected in profiles of the rims, were identified in the assemblage (Figure 19). Rims without complete profiles were not included. This chart shows four styles in the Houses 1 and 2 assemblages, whereas three are represented in House 3. Two of the forms found in Houses 1 and 2 are not present in the House 3 assemblage. Another distinct difference in the assemblages is that the House 3 rim forms include three rims with constricted profiles, which are not present in the House 1 and 2 assemblages. The most common rim form is Riley Flaring, as 55 percent of the 60 rims identified by form are flared. This division is misleading, as House 3 has 22 (66 percent) of the 33 flared rims, which is strikingly represented in Figure 19. Only four collared vessels are represented, essentially divided among three house assemblages.

Based on the style of rim form, it is obvious that distinct differences exist between ceramic assemblages of the houses excavated. This brings us to another question: Are there other measurable differences in

Table 11. Rim Forms.

Rim Form	House 1 (741)	House 2 (751)	House 3 (761)	Total
Collared	2	1	1	4
Flaring	5	6	22	33
Direct	5	4		9
Thickened direct	2	9		11
Constricting			3	3
Total	**14**	**20**	**26**	**60**

Table 12. Vessel Counts from Regional Middle Ceramic Sites.

Site Number	House Number	Number of Jars	Number of Bowls or "Coconut" Jars
Forsberg (14SA420)	1	19	0
	2	24	1
	3	27	3
14ML417*	1	50	2
	2	101	0
14SA415**		53	0
Kohr House *** (14SA414)	1	10 to 15	0
	2	28	
Markley House*** (14OT308)		63	0
Aerhart*** (14OT305)		11	0
Lamar House*** (14OT304)		5	0

* Latham 2004
** Roper and Reed 2003
*** Roper 2001

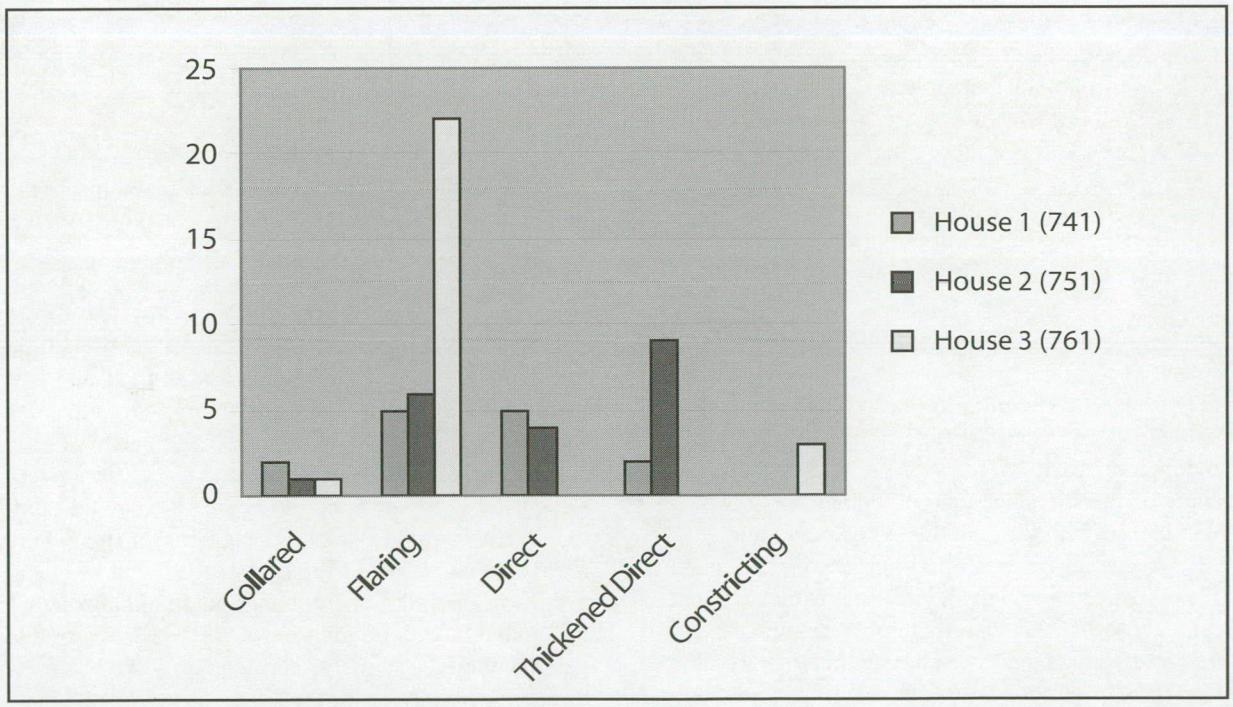


Figure 19. Ceramic rim styles by house.

the assemblages? To address this question, the height and thickness of the flared rims were examined because none of the other rim forms could be compared due to sample size and the lack of certain forms within the assemblages. The measurements presented in Table 13 show that the samples from Houses 1 and 3 have very similar rim heights. House 1 flared rim height ranged between 21.71 and 36.06 mm, while House 3 specimens ranged between 22.78 and 39.39 mm. House 2 flared rims were smaller, ranging between 20.02 and 30.72 mm. Clearly rim height varies substantially within each assemblage, and because of this variability, the assemblages of Houses 1 and 2 are not large enough to make these observations conclusive.

Table 13. Flared Rim Height Measurements by House Assemblage.

House 1 Flared Rims	House 2 Flared Rims	House 3 Flared Rims (mm)
31.46	23.82	30.64
36.06	23.31	34.85
31.41	23.47	38.38
21.87	30.72	36.02
21.71	25.88	37.4
	20.02	26.58
		34.12
		29.29
		34
		23.41
		22.78
		30.19
		31.87
		33.63
		31.37
		26.42
		31.45
		39.39
		32
		30.79
		30.58
		36.4
Median 31.41	**Median 24.54**	**Median 31.935**

From House 1

Thirty-five rim sherds were recovered from House 1, with 16 of these combining to represent six individual vessels. Six other rims are too small or incomplete to be included in the determination of minimum number of vessels represented. Considering the morphology and other factors, the minimum number of vessels—all jars—represented in the house collection was determined to be 19. Four different styles of rims are present, including 6 flared, 5 direct, 2 thickened direct, 2 collared, and 10 incomplete rims listed as unknown (Figures 20 and 21).

About two-thirds of the rims are smoothed-over cordmarked, while the remaining specimens are cordmarked. Only four of the rims are decorated beyond cordmarking of the exterior, and six other vessels have decoration on the lip. None of the vessels identified has both rim and lips decorated. One rim has vertical cordmarked lines on the upper rim, over the smoothed-over cordmarked rim face, which extends to the neck of the vessel. Two specimens are decorated across the central portion of the rim face, with one having tool cut and then pinched nodes, while the other has three horizontal incised lines. The potter produced the nodes by placing a single coil on the rim face and using a tool to notch it and shape the nodes, which were then finished by pinching or forming by hand. A similar technique was identified on vessels at site 14ML417 (Latham 2004). Three different techniques were used to decorate the lips of six vessels, all with flared rims. Three of the specimens are notched, two others have diagonal incised lines, and one has punctates.

Of the seven rims on which an orifice diameter could be measured—those rims that were 5 percent or more of the original vessel—three are flared direct, two are direct, one is thickened direct, and one is collared. The orifice diameter of the flared rims is generally 2 cm larger than the neck diameter of the vessel, as is the collared rim. The orifice and neck diameters of the direct rims are the same. The thickened direct rim has a slightly larger orifice than neck diameter.

Overall, the body sherds are cordmarked, but some are smoothed over (Figure 21). Temper for the vessels is usually grit or grog, or a combination of the two agents. A few sherds were identified that had larger particles of sand mixed with grog for temper. If the largest rim sherds recovered are considered to be among the last batches of pots made, the trend appears to be use of only grog or a mixture of grog and sand. None of the smaller or more fragmentary rim sherds recovered has sand as a tempering agent and few have grog. The paste is a fairly consistent, moderate quality gray clay; the exceptions are two of the more complete vessels, which are interpreted as among the last used or constructed by or for the occupants. This clay is a darker gray and very poor quality, most readily notice-

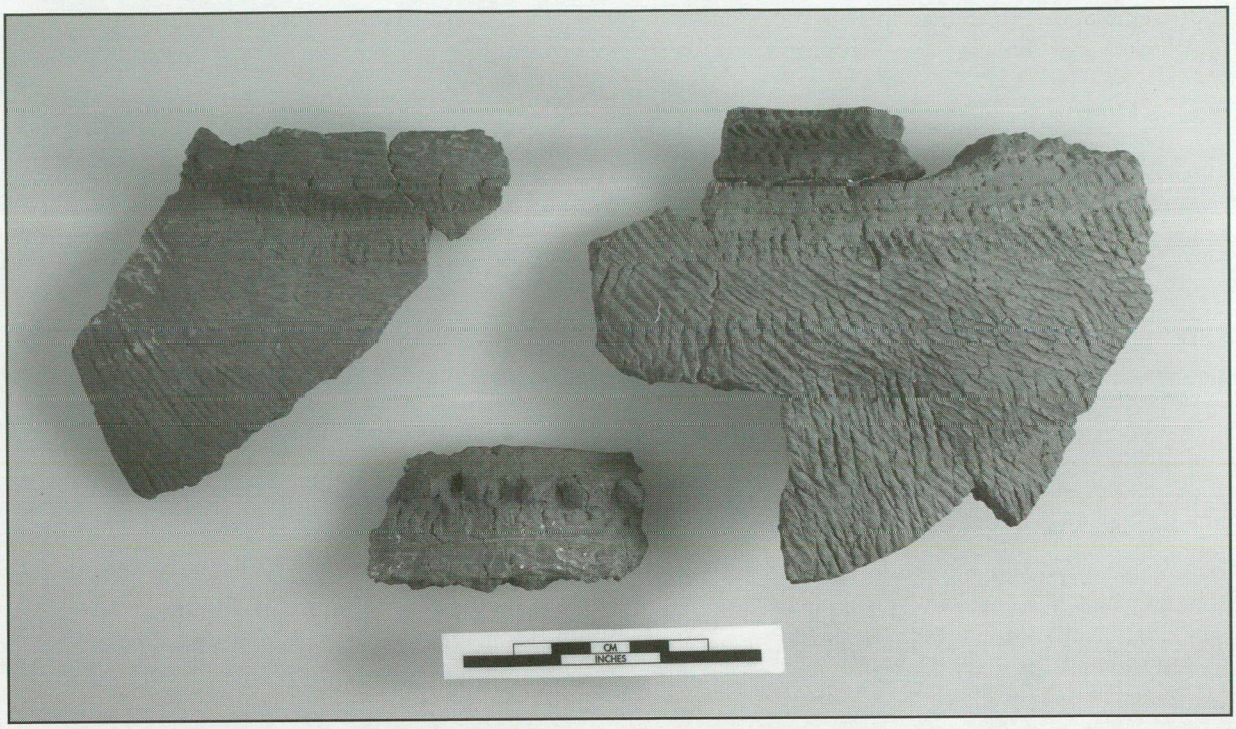


Figure 20. Selected rim sherds from House 1.



Figure 21. Burnished body sherds (upper row) and selected rim sherds from plow zone above House 1 floor.

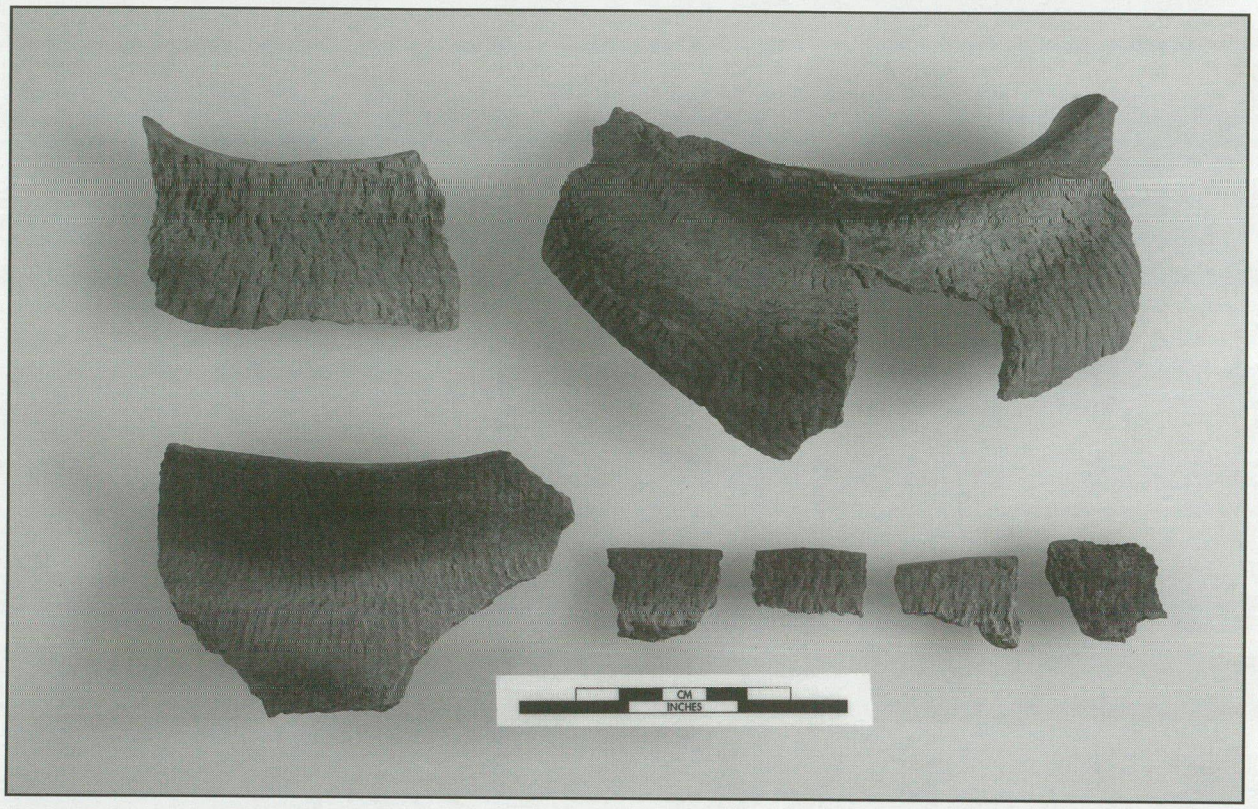


Figure 22. Selected rim sherds from House 2: upper left from F61, upper right from F63, and lower left from F65.

able by the cracked interior and exterior walls of the samples. It appears that the last batch of clay for pots was gathered from a poor quality source—perhaps a local source—and the higher quality pots made from clay obtained from a more distant source or through trade. This might be an indication of changes in the economic trade network of the community.

Four body sherds in the House 1 collection are of a different type. These sherds are smoothed with polished exteriors and are made from a finer paste than typical Middle Ceramic pottery. The grit temper is also finer. The pottery was fired at a higher temperature and broke along linear strips, indicating that this vessel was made differently: coiled rather than the paddle and anvil method typical of Middle Ceramic pottery. The sherds appear to be from a single Great Bend aspect pot. This pottery's presence on the site may be evidence of a second component, as the sherds were all found in the plow zone above the house floor.

From House 2

Thirty-seven rim sherds from jars and one rim of a bowl or "coconut" jar were recovered from House 2. Two of the rim sherds are too incomplete or lack sufficient attributes to determine if they match other pieces and, therefore, were not considered when tabulating the minimum number of vessels present. Sixteen jar rims were matched with others, representing five vessels. In sum, a minimum of 24 jars and a bowl or rim of a "coconut" jar were identified in the House 2 artifact assemblage. Four different styles of rims are represented among the jars, including six flared, four direct, eight thickened direct, one collared, and six incomplete rims listed as unknown (Figures 22 and 23).

Decoration on the jar rims is limited to nine of the rim faces and three of the lips. Those rims decorated on the faces are not decorated on the lips. Of the nine decorated rim faces all are thickened direct or collared, while the three rims with lip decoration are or appear likely to be flared. Eight of these rims have tool-cut notches or nodes on the upper rim or are notched on the lip, but one is decorated on the upper rim. Most of these nodes have a scalloped appearance. The only other decorated rim has tool-cut notches on the lower rim face.

Two of the three decorated lip vessels have incised lines, while the third has a large tab. One of these

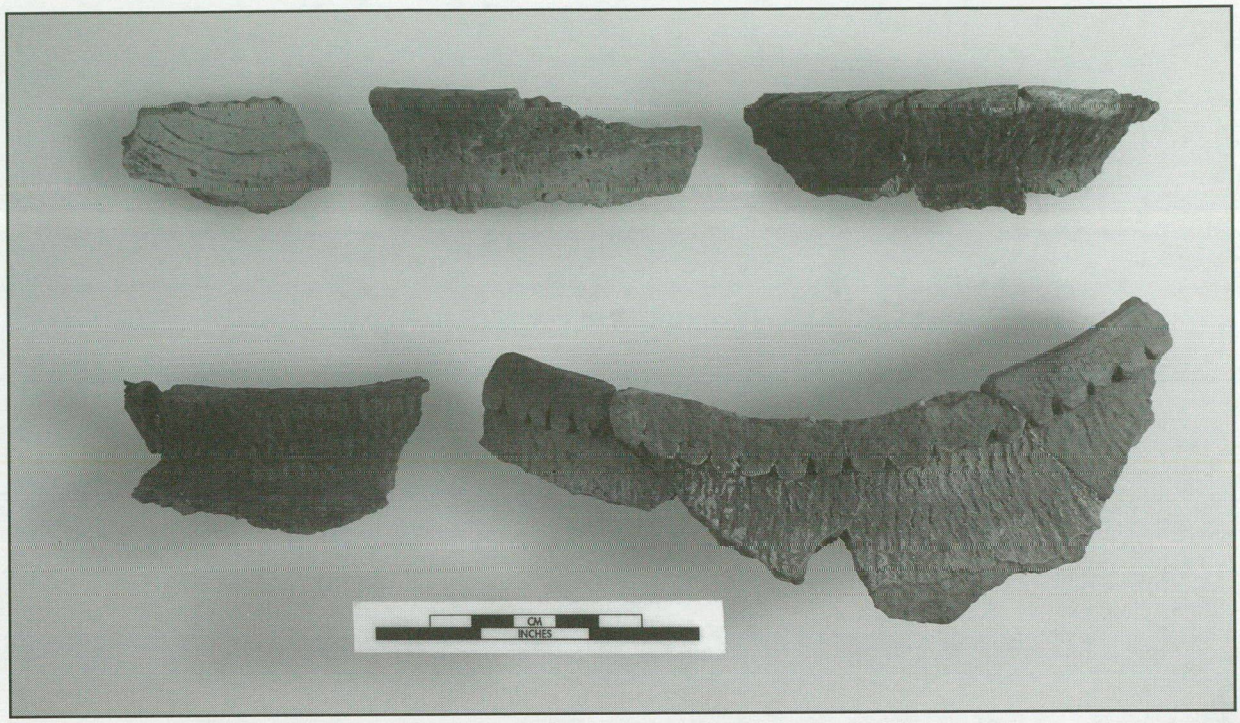


Figure 23. Unique body sherd and selected rims from plow zone above House 2.

incised vessels has diagonal lines running from the interior right to the exterior left of the lip. The incised lines are about 7 mm apart across, while the lines of the thinner walled vessel are about 4 mm apart and run from the interior left to the exterior right. These characteristics suggest that two different potters contributed to the ceramic assemblage of House 2.

Tempering agents are the same as in the House 1 assemblage. Orifice diameters for 14 vessels were determined, and the same ratios of orifice-to-neck diameters identified in the House 1 assemblage was found in the House 2 ceramics.

Only one unique body sherd was found in the vicinity of House 1: a smooth sherd with a series of curvilinear incised lines on the shoulder of the jar or bottle (Figure 23). This sherd was found on the surface and may not be associated with the house occupation. The lines are 1.99 mm wide and are placed about 6.5 m apart. The four lines visible on the sherd indicate that they do not extend onto the rim face. Similar sherds were documented at the Whiteford site (14SA1) (Roper 2006a; Wedel 1959:619), a Smoky Hill phase cemetery about 8 miles downstream from the Forsberg site. The incised lines on the Whiteford site specimens appear more finely incised. The sample from the Forsberg site has the same paste, temper, and firing as the other Middle Ceramic sherds recovered from the locality. It appears that the Forsberg sherd is not a trade item, but rather a remnant of a vessel made locally as a replica of an exotic style. This in itself is significant, as decoration is rarely seen on the body of Smoky Hill phase ceramics (Hedden 1992; Roper 2006a and 2006b; Steinacher and Carlson 1998).

From House 3

Most of the ceramic vessel fragments recovered during the 1976 excavation came from the storage pits, primarily the northeast pit (F32). Several other sherds were found scattered across the house floor. The sherds recovered are typical Middle Ceramic cordmarked ceramics, essentially Riley Cordmarked.

Whiteacre (1978) described one small sherd as a possible trade ware (Figure 24). This sherd has grit temper, paste, and the same level of firing as the other sherds but with a roughly smoothed-over, red-painted exterior. The paint dissolves easily in water, appearing to have been applied after the vessel was fired. Sherds found in the Glen Elder locality and other sites also have painted surfaces, mostly interior surfaces. The interior painted sherds are likely from vessels that contained paints or dyes. Exterior painted sherds are rare, but this sherd is too small to sufficiently define the shape and function of the vessel; however, it does not appear to be a trade item.

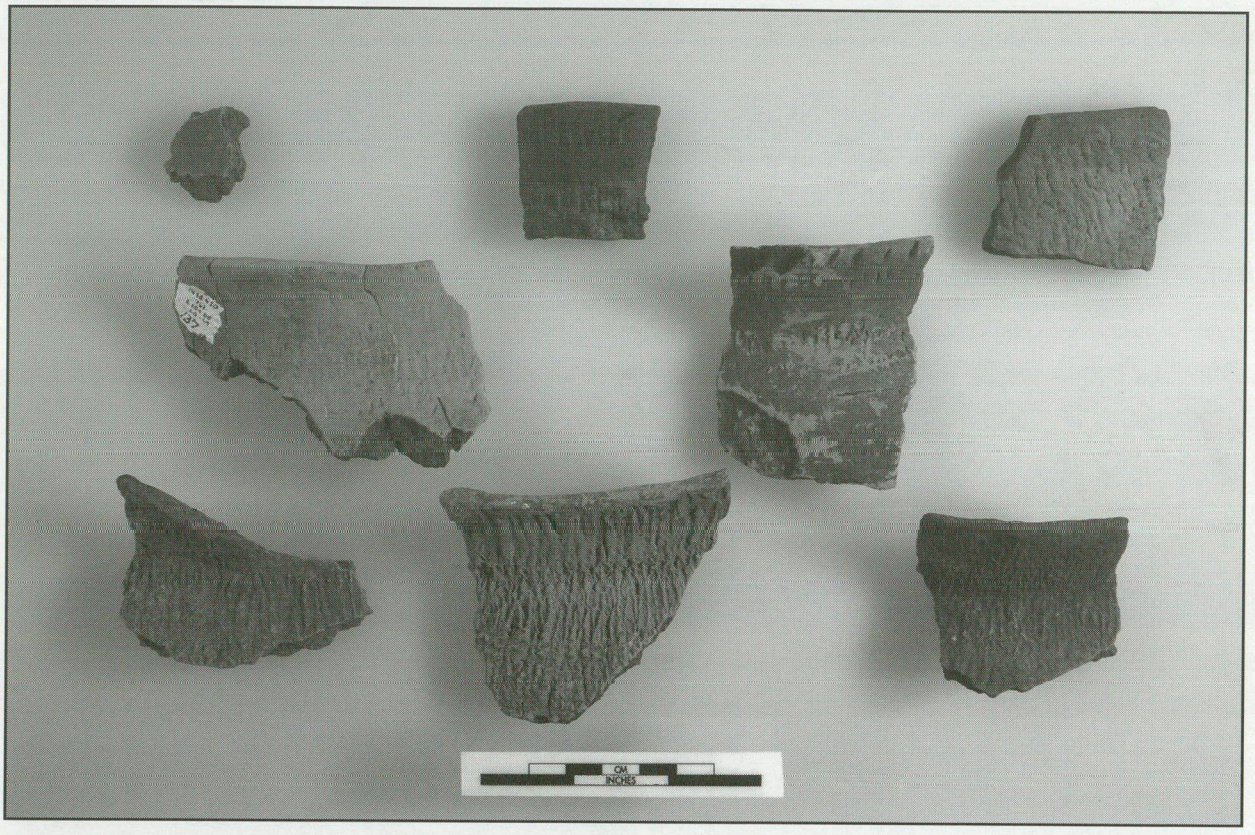


Figure 24. Unique body sherd (upper left) and selected rims from House 3.

Thirty different vessels were identified among the 32 rim sherds recovered from House 3 (Figures 24 and 25). Twenty-seven of these vessels are jars, while the remaining three are bowls or rims of "coconut" jars. Twenty-two of the jars have flaring rims with no decoration. Four other rim sherds are too incomplete to be conclusively identified, but they appear to be flaring. One collared rim, which is the only rim with a decorated face, was recovered from House 3.

Limited decoration or a form of lip treatment is found on four other rims (Table 14). Two of these have punctates into the exterior edge of the lip (5.30 mm wide). The other two rims have diagonal incised lines across the lips. On one sample the incised lines range in width from 3.24 to 2.26 mm, spaced between 3.99 and 6.78 mm apart, and were applied with a tool from upper right to lower left along the edge of the lip, which may imply a left-handed potter. A similar style was found at House 1, but it had two angles of application represented, implying a left-handed and a right-handed potter.

The 1990 KSHS survey found no pottery, and the KAA Mud Creek Chapter survey of the southern edge of the site in 2003 resulted in the collection of only three small, eroded pottery sherds. These small specimens are all grit tempered and have cordmarked exteriors.

Chipped Stone Artifacts

A total of 510 chipped stone artifacts was recovered during the excavation of the three houses. Of these specimens, 221 are tools, and 289 are debris from tool production or maintenance activities. Another 200 chipped stone artifacts were collected from the surface during the 1990 survey conducted by KSHS archeologist Randy Thies. More recently 17 chipped stone artifacts were recovered at the southern end of the site during the KAA Mud Creek Chapter survey in 2003. Permian cherts from the Flint Hills make up the vast majority of the chipped stone, including 95 percent of the tools and 96 percent of the chipped stone production and maintenance debris. In comparison at 14ML417, 60 percent of the tools are Smoky Hill jasper (Latham 2004). The Flint Hills uplift is only about 9 miles (14.5 km) east of 14SA420.

Seven projectile points were recovered during

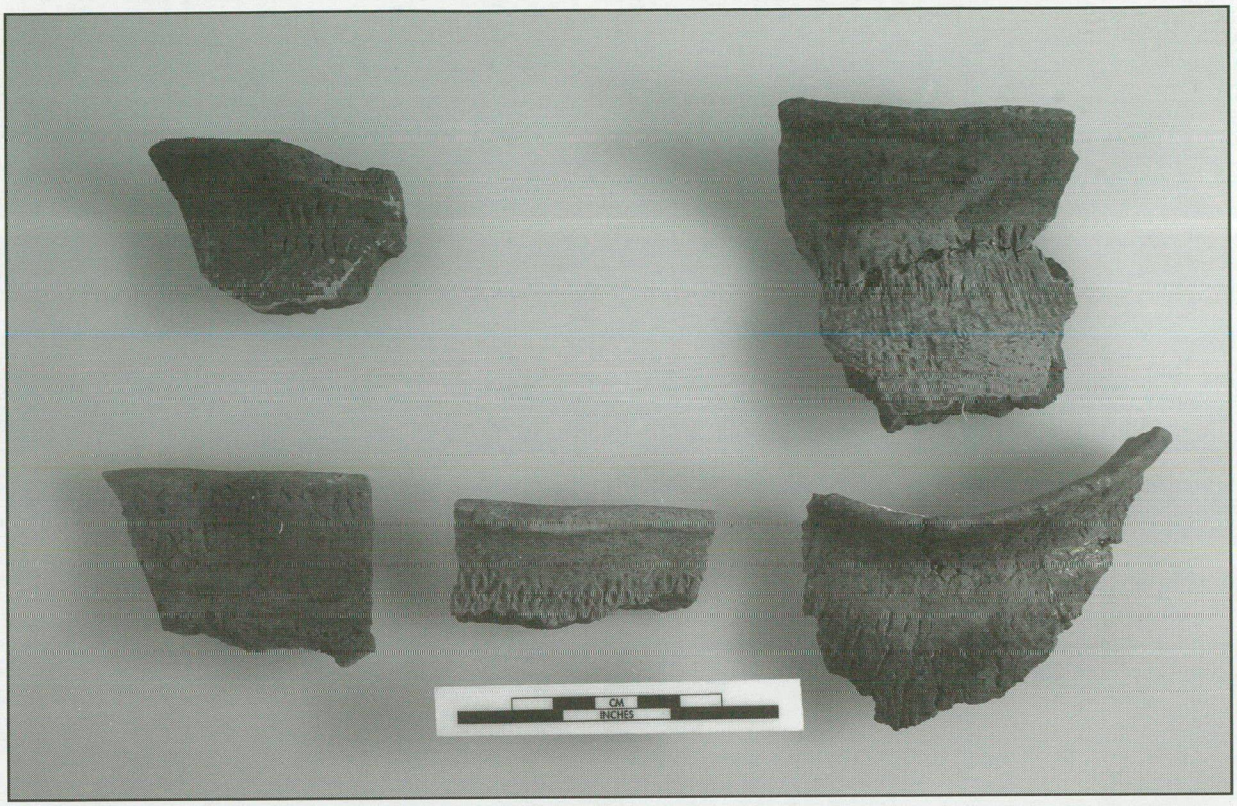


Figure 25. Selected rims from House 3: upper left from F14, upper right from F15, lower left from F24, lower middle from F31, lower right from F32.

Table 14. Percentages of Ceramic Rim Decorations.

	14SA420	14ML417*	Solomon River**	Smoky Hill**	Nebraska**	Upper Republican**
% Direct Plain	68.5	37.2	39.6	56.3	52.6	23
% Direct Decorated Lip	5.7	3.6	6.7	8.4	18.4	6.9^
% Direct Modified Edge	15.8	19.7	5.9	8.9	14	^
% Direct Decorated Face	4.3	19.7	1.1	0	0.03	1.7
% Collared Plain	1.4	9.5	35.6	9.1	2.2	20.1^^
% Collared Modified Base	2.9	2.9	2.2	16	7.6	^^
% Collared Decorated Face	1.4	7.3	8.9	1.3	5.3	48.3
Number of Jars in Sample	70	137	957	988	3,705	1,459
* From Latham 2004						
** From Blakeslee (1999:110)						
^ Direct rims with modified edges not described by Kivett and Metcalf (1997), but a few may be included in the direct rim decorated lip category.						
^^ Collared modified base not counted separately in Kivett and Metcalf (1997) , but a few specimens from a total of three sites are included with collared rims.						



Figure 26. Selected projectile points and performs.

the three excavations (Figure 26). Five points from House 2 are Permian chert. One of two points from House 3 is Alibates agatized dolomite, and the other is unknown chert. Of 10 projectile point preforms in the site assemblage, 9 are Permian cherts, and the remaining specimen is Alibates. Five preforms, including the Alibates specimen, were from House 3. Four other preforms were from House 2, and one was from House 1.

Four projectile point styles are present, including double side-notched, side- and basal-notched, double side-notched and basal-notched, and simple triangular. The five points from House 2 represent three styles: one double side-notched, two side- and basal-notched, and two simple triangular. House 3 projectile points are a double side- and basal-notched specimen and the tip of an unknown type.

End scrapers were the most common formal tools recovered at the site (Figure 27). Thirty-one of these unifacial tools were recovered during the house excavations, and 28 are Permian chert. Twenty-four of the end scrapers—22 of which are Permian chert—were divided between Houses 1 and 2. The remaining seven end scrapers, six of which were Permian chert, were from House 3.

Nine beveled knives, all Permian chert, were recovered during the excavations, two each from Houses 1 and 3 and five from House 2 (Figure 28). One chipped stone celt was found in House 1. (Two sandstone celts will be discussed below with other ground stone artifacts.) Other formal tools include a large biface, 16 unspecified biface fragments, and 11 unspecified uniface fragments. Nearly all of these tools are Permian chert, with one of the unspecified uniface fragments being the only exception.

The informal tools from the excavated houses are limited to spokeshaves (n = 8), gravers (n = 4), and retouched flakes (n = 133). Retouched flakes account for 60 percent of all the chipped stone tools in the assemblage. Six of the spokeshaves are Permian chert, while the other two are Alibates and an unknown chert. All of the gravers are Permian chert. Of the 133 retouched flakes, 130 are Permian chert, while the other 3 are Alibates, Flattop chalcedony, and an unknown chert.

Five tools are made of stone from the Texas/Okla-



Figure 27. Selected end scrapers: top row from House 1 and lower row from House 2.



Figure 28. Selected bifaces and cutting tools: top row from House 1, middle row from House 2, and lower row from House 3.

Table 15. Chipped Stone Tools by Material Type.

Raw Material/ Chipped Stone Tools	Smoky Hill Jasper	Permian Chert	Alibates Agatized Dolomite	Tecovas Jasper	Unknown Chert	Flattop Chalcedony	Total
Projectile Points		5	1		1		**7**
Beveled Knives		9					**9**
End Scrapers	1	28	1	1			**31**
Celt		1					**1**
Spokeshaves		6	1		1		**8**
Gravers		4					**4**
Unspecified Bifaces		16					**16**
Large Bifaces		1					**1**
Unspecified Unifaces	1	10					**11**
Retouched Flakes		130	1		1	1	**133**
Total	**2**	**210**	**4**	**1**	**3**	**1**	**221**

homa Panhandle region, including both Alibates (or Day Creek) dolomite and Tecovas jasper (Table 15). Of the four Alibates tools, three were from House 3. The other Alibates tool is the end scraper, which was recovered from House 2. Next to Permian chert, Alibates is the next most common raw material in the collection with a grand total of four tools or less than 2 percent of the assemblage. The lone Tecovas jasper tool is an end scraper recovered from House 2.

Raw material for chipped stone tools also came from sources to the north and west: Smoky Hill jasper and Flattop chalcedony. Both Smoky Hill jasper tools were from House 1, and the Flattop chalcedony retouched flake was from House 3.

From Houses

Even though House 1 had the least impact from modern cultivation, the number of chipped stone tools was significantly lower than from the other two houses. Seventy-four chipped stone artifacts were recovered during the 1974 excavation, including 40 tools and 34 pieces of maintenance and production debris. Four formal tool types and two informal types were identified in the assemblage (Table 15). The formal tool categories include beveled knives, end scrapers, large bifaces, and unspecified bifaces. The informal tools are retouched flakes and spokeshaves. The most common tool type was the retouched flake, totaling half the recovered tools.

A total of 216 chipped stone artifacts was recovered from House 2, including 72 tools and 144 pieces of production and maintenance debris. Three styles of projectile points were identified among the five Permian chert specimens: two simple triangular, two side- and basal-notched, and one double side-notched.

A total of 223 chipped stone artifacts were recovered during the 1976 excavation, including 109 tools and 114 production and maintenance debris. Two projectile points are a double side- and basal-notched Alibates point and a tip of another point of unknown chert.

From Surveys

Thies collected 201 chipped stone artifacts during his 1990 survey. As the distribution of this collection is unknown, the data is described separately from the house excavations. Chipped stone tool production and maintenance debris makes up 77 percent of the survey collection (n = 155). The 46 hunting and general utility tools include 18 formally produced specimens, such as a knife midsection, 9 unspecified biface fragments, 5 end scrapers, and 3 unspecified unifaces. Sixty-one percent of the tools were informally produced, including 27 retouched flakes and 1 graver. Ninety-seven percent, including all the formal tools, are Permian cherts. Other raw materials represented are one obsidian thinning flake, three flakes and a retouched flake of unidentified chert, and a retouched flake of Alibates agatized dolomite.

The 2003 KAA Mud Creek survey of the southern end of the site yielded seven chipped stone artifacts: five tools (three biface fragments and two retouched flakes) and two chipped stone tool production debris (an exhausted core and a tertiary flake). All seven artifacts are Permian chert, with four showing evidence of heat treatment.

Table 16. Abrader Characteristics.

Catalog Number	House	Sandstone Grain	Groove Shape	Groove Width (mm)	Groove Depth (mm)	Total on Specimen U-Shaped	Total on Specimen V-Shaped	Abrader Style
1010	House 1	Coarse	V	1.5	1.6	0	1	Fragment
6?7	House 1	Fine	U	7.54	2.20	1	0	Boat
112	House 2	Coarse	U & V	U=8.46 V=3.49, 7.24	U=3.83 V=1.48, 2.78	1	2	Boat
1568	House 2	Coarse	U (1 side)	7.45 7.16	3.43 3.42	2	0	Boat
135	House 2	Coarse	U	7.09	3.02	1	0	Boat
1722	House 2	Coarse	U	8.54	3.69	1	0	Boat
1616	House 2	Fine	U & V	U=6.86, 4.84 V=3.88 to 6.66	U=3.05, 2.50 V=2.54	2	1	Boat
1862	House 2	Coarse	U	9.25	3.02	1	0	Boat
591	House 2	Coarse	V (2 sided)	5.25 3.69 4.90	1.91 1.84 2.38	0	3	Fragment
838	House 3	Coarse	U	8.29	3.31	1	0	Boat
869	House 3	Coarse	U	10.79 7.84	4.71 1.85	2	0	Boat
305	House 3	Coarse	U	12.36	6.42	1	0	Boat
364	House 3	Coarse	U	8.72	2.56	1	0	Boat
578	House 3	Coarse	U	7.66	3.47	1	0	Fragment
820	House 3	Coarse	U (3 sides) & V (4th side)	U=7.99, 9.71, 11.68 V=3.15	U=4.66, 5.14, 3.79 V=1.22	1	3	Boat
596	House 3	Coarse	U	7.34	2.70	1	0	Fragment
573	House 3	Coarse	U	6.34 3.95	4.31 1.64	2	0	Slab
854	House 3	Coarse	U	7.45	3.49	1	0	Slab
402	House 3	Coarse	V	3.26	2.32	0	1	Fragment
1035	House 3	Coarse	V (2 sided)	Vary	Vary	0	8	Slab
1493	House 3	Coarse	U & V	U=5.92 V=1.2, 1.1	U=4.43 V=.9	1	2	Fragment
105	House 3	Coarse	U	5.89, 3.22	3.4, 2.89	2	0	Fragment

Ground Stone Tools

Limestone and sandstone are readily available material resources in central Kansas; in fact, sandstone is found in the hills flanking the Smoky Hill River valley, and large specimens are found scattered throughout the high terraces overlooking the river. This local sandstone was the most common found at the Forsberg site. Much of the rock recovered during the house excavations was in the form of small pieces of fire-cracked rock. These were counted, weighed, and then discarded.

The majority of the retained specimens are ground stone tools. The most abundant tool type is the sandstone abrader, which is common in Middle Ceramic habitation assemblages in the area (Blakeslee 1999; Latham 2004; Lippincott 1978a, 1978b; Roper 2001; Wedel 1959). Many of these abraders have U-shaped grooves and were used as arrow shaft straighteners.

As shown in Table 16, slightly more than half of the 22 sandstone abraders were recovered from House 3 (n = 13). House 1 had only two abraders, while House 2 had seven. Abrader styles include boat-shaped (n = 12) and simple slabs (n = 3), while

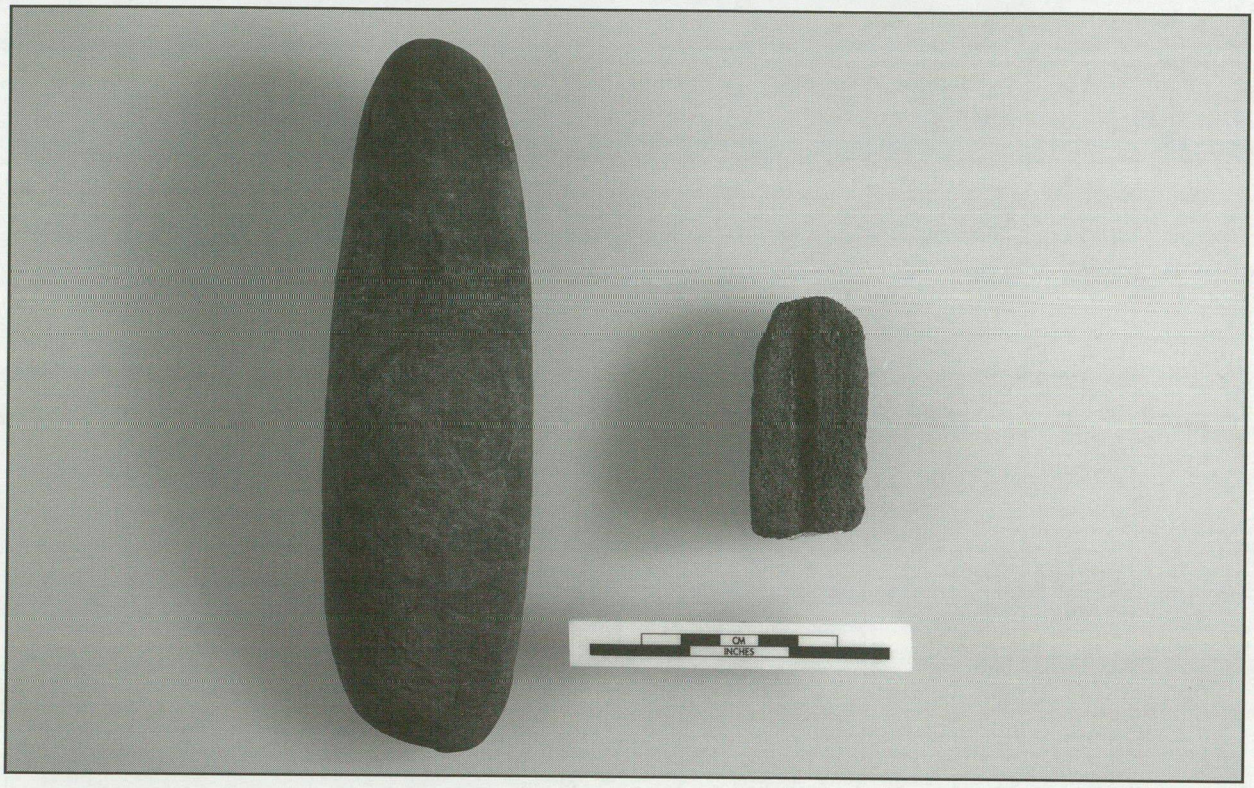


Figure 29. Abrader and sandstone celt from House 1.

the remaining specimens are small fragments (n = 7) (Figures 29-31). Nine of the 12 boat-shaped abraders are complete. Most of the abraders are fragments, and all but one have multiple grooves. Each of the boat-shaped abraders has a rounded base and a flat surface that contains the largest formally made groove. This large groove runs lengthwise across the flat surface and is U-shaped. The U-shaped groove is interpreted as a shaft abrader, a tool used to smooth or clean wood or bone shafts by clamping two pieces around the shaft and working back and forth (Adams 2002). Most of the specimens (n = 17) are only one side or piece of this two-sided tool. Several other grooves were observed on the sides and bases of these abraders. These shallow grooves are not as wide or deep as the shaft-smoothing groove, and they are V-shaped.

Another sandstone tool made from fine-grained sandstone is the celt (Figures 29 and 31). Two of these tools were recovered at the Forsberg site: a complete one from House 1 and a distal end from House 3. These were analyzed and discussed by Harold Reed (2003). Reed believed that these hafted tools were used for skinning and scraping large animal hides; however, he considered this a working hypothesis that needed to be tested through experimental archeology.

A variety of grinding slabs or metates and hand stones or manos is present in many Solomon River phase sites. The primary function of these tools is grinding seeds, such as maize. These ground stone tools usually were made from sedimentary or igneous rocks. Manos are often moderately sized, ovoid or rectangular grinding tools (Lippincott 1976a:114). Six manos were recovered during the house excavations, and one was found on the surface during the KAA survey. This latter specimen was made from local sandstone and has one polished surface, measuring 102.02 x 96.27 mm.

In addition to the two sandstone abraders and the sandstone celt, the House 1 collection includes two sandstone grinding slab fragments, two quartzite mano fragments, and two burnishing stones (Figure 32). House 2 yielded seven ground stone artifacts besides the sandstone abraders. Four are fragmentary: two small pieces that may be portions of abraders and two limestone grinding stone fragments, with one having at least one ground edge. Three hammerstones from House 3 appear to be manos as well, as they exhibit polish on their sides. Seven grinding stone fragments were recovered from House 3, one of which has a beveled, ground edge. A mano and nutting stone are also in this collection.



Figure 30. Sandstone abraders from House 2.



Figure 31. Sandstone celt section and sandstone abraders from House 3.



Figure 32. Ground stone objects (burnishing stones?) from House 1.

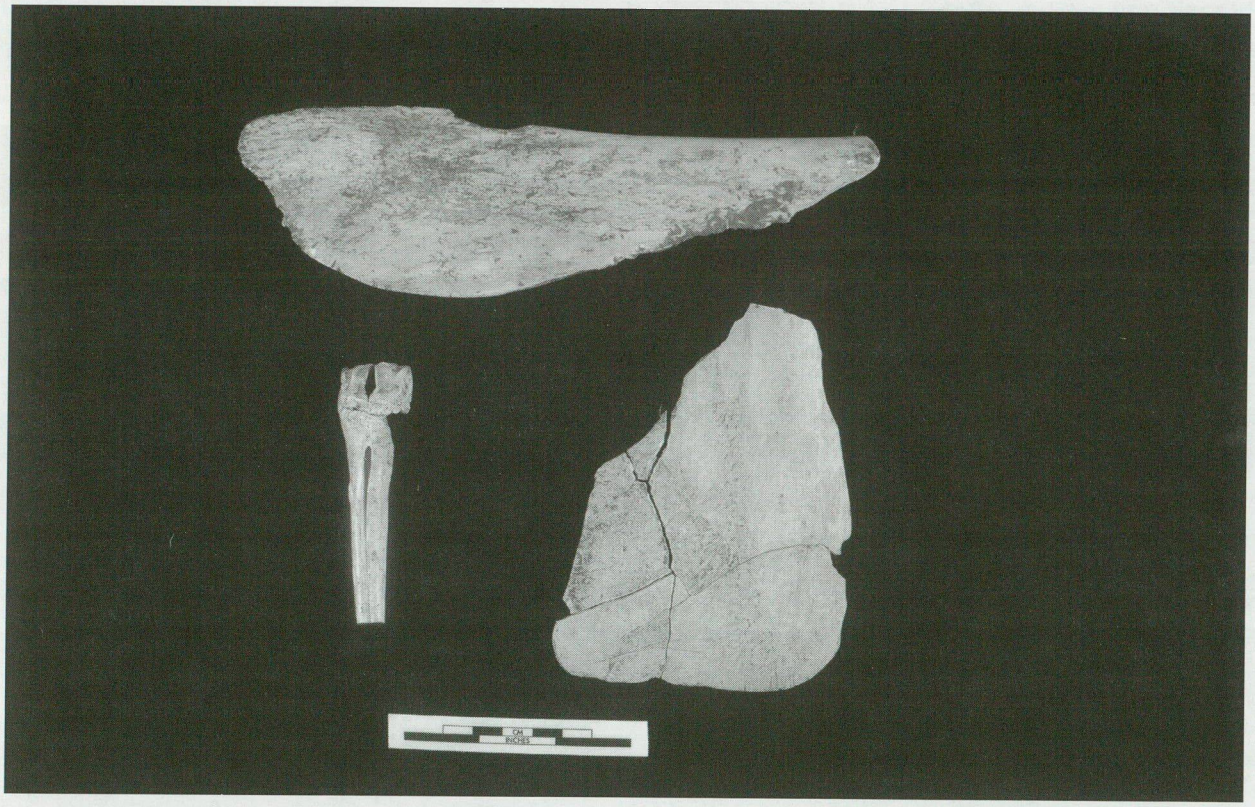


Figure 33. Selected bone tool fragments.

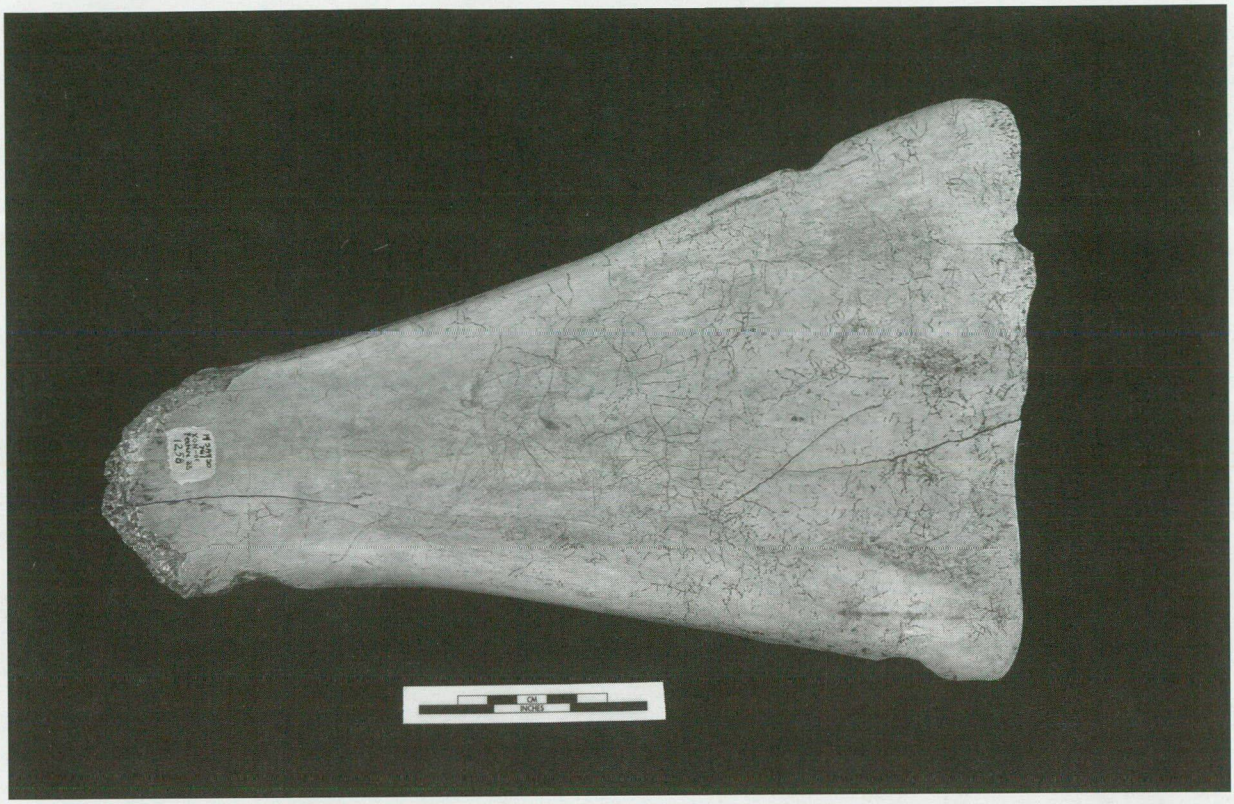


Figure 34. Bison scapula hoe from House 3.

Bone Tools

Tools made from bison scapulae are common in Middle Ceramic assemblages and comprise most of the small bone tool collection found at the Forsberg site (Figure 33); however, very few were recovered and none came from the House 1 area during the 1974 investigation.

Thirteen fragments of bison scapula tools were recovered from House 2. All exhibit high sheen, and some have striations, but none are complete enough to determine function or shape of the original tools. Four fragments retain portions of the scapula spines and show evidence of these parts being purposely removed.

Four bison scapula tools or tool fragments were found in House 3. A nearly complete scapula hoe was recovered from a pit feature (F31) (Figure 34). The spine is removed from this hoe, and the socket is missing. The entire blade of the tool is covered with a high sheen, and the distal end is beveled. The other three worked fragments of bison scapulae were found on the house floor in association with daub, charcoal, and flakes.

Shell Tools

Freshwater mussel shell hoes have been reported in many Central Plains tradition sites. These hoes are typically large, thick bivalves of freshwater mussels. A number of recently reported Smoky Hill phase sites within the lower Solomon and Smoky Hill River valley contained shell hoes, identified as three different species of mussel shells (Table 17).

While shell hoes are fairly common at sites in the lower Smoky Hill and Solomon River valleys, they do not appear as frequently at sites farther upstream. For example, only 5 of the 17 excavated sites in the Glen Elder locality had shell hoes, all utilizing the same species (*Tritigonia verrucosa*) (Lippincott 1978a). This may reflect the western extent of heavy shelled freshwater mussels.

A number of sites do not have any mussel shell hoes. The Minneapolis site (14OT5), where three house floors were excavated, had no shell hoes or any other worked shell tools (Wedel 1935). Another example is House 1 at the Griffing site (14RY21) (Wedel 1959). Both sites are considered type sites for the Smoky Hill phase.

Table 17. Fresh Water Mussel Shell Hoes Found at a Sample of Middle Ceramic Sites in North-Central Kansas.

Site Name/Number (by excavated house)	**Unknown**	**Washboard *(Megalonaias giganta)***	**Buckhorn *(Tritigonia verrucosa)***	**Floater *(Anodonta sp.)***	**Total Number of Hoes**
14SA1*	7				7
Kohr House ** (14SA414) No. 1	4	6	1	1	12
Kohr House** (14SA414) No. 2	7				7
Markley House** (14OT308)	4				4
Aerhart** (14OT305)		4			4
Lamar House** (14OT304)					0
14SA415***		4			4
14ML5****			3		3
14ML11****			1		1
14ML15****			4		4
14ML16****			2		2
14ML371****			1		1
Forsberg (14SA420) House 1		1			
Forsberg (14SA420) House 2		2			
Forsberg (14SA420) House 3	2				

*Wedel 1959

**Data from Roper 2001

***Data from Roper and Reed 2003

****Data from Lippincott 1978a

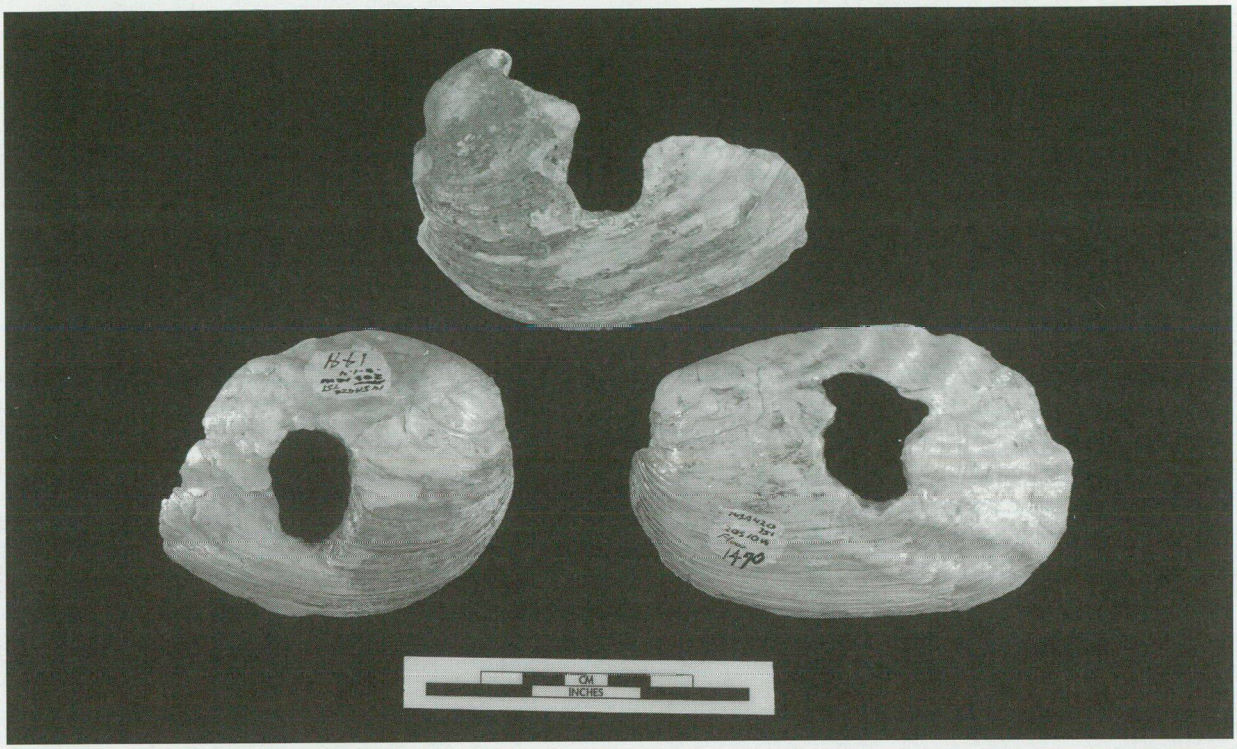


Figure 35. Selected mussel shell hoes.

Five freshwater mussel shell valves recovered from 14SA420 have distinct holes that appear artificially made (Table 17; Figure 35). Poor preservation makes it difficult to determine the degree of wear or sheen, but a few do show it. The three that are complete enough to identify species are Washboard (*Megalonaias giganta*). The hoe from House 1 is the only non-stone tool from that house; however, Whiteacre (1978) stated that two more non-stone tools might have come from House 1. These were not recognized in the collection, which may be a product of attrition of highly fragile specimens. Like the rest of the assemblage, the state of preservation of the bone and shell objects from House 1 was very poor.

A sixth shell tool was recovered from the floor of House 2. This left valve of an *Elliptio dilatatus* was cut and severely ground along the margin. Tools of this type have been referred to as spoons in Middle Ceramic assemblages (Lippincott 1978a).

Subsistence Remains

Faunal Remains

Studies have shown that Central Plains tradition people had a very diverse subsistence, essentially using nearly every animal available in the area (Blakeslee 1999; Bozell 1991; Latham 2004). The problem often encountered in analyzing collections from sites such as 14SA420 is that the field techniques used were not conducive to recovery of most small animal bones. In site investigations where the soil matrix was screened or processed by flotation, more faunal elements are recovered, resulting in a significant increase in the number of identified species (Bozell 1991; Mick 1983).

The low number of faunal remains in the Forsberg site assemblage directly reflects the excavation techniques and lack of screening beyond flotation of some fill of selected features. Poor bone preservation is another possible reason for the low number of identifiable faunal remains. Only 22 species of animals were identified with a minimum number of individuals (MNI) of 45.

Mammals

Tables 18-20 list the mammal elements from the three Forsberg site houses. Of the 27 bone fragments recovered from House 1, only 3 could be identified to the species level: 2 deer and 1 pronghorn antelope. Ten of the unidentifiable bone fragments are heavily burned, and two others have extensive rodent gnawing.

Table 18. Identified Mammal Elements from House 1.

	Deer	Pronghorn
Metacarpal	1	
Phalange	1	1
NISP	**2**	**1**
MNI	**1**	**1**

Table 19. Identified Mammal Elements from House 2.

	Bison	Deer	Pronghorn	Cottontail Rabbit	Beaver	Mink
Premolars		1				
Vertebra		2				
Thoracic Vertebra		1				
Cervical Vertebra		1				
Rib	1					
Scapula	1*		1			1
Humerus			1			
Femur				1L	1L	
Tibia				3L		
Navicular-Cuboid			1			
Metatarsal			1			
Metapodial		1				
Ostaris Cen		1				
Metacarpal		4				
Phalange		4				
Astragalus		2L1r				
Calcaneous		1r				
NISP	**2**	**18**	**4**	**4**	**1**	**1**
MNI	**1**	**2**	**1**	**3**	**1**	**1**
L = left side element						
r = right side element						
* In the form of hoes/bone tools						

House 2 had bone fragments representing six different mammal species, mostly from large mammals, such as deer and bison. Deer bones are the most common but represent an MNI of two. Most elements are too fragmented to identify.

House 3 had the highest density of faunal remains and the most diversity. Deer is the most common mammal species, but an MNI of only two is present (Table 20). Bison is also represented but with a minimum of only one individual. The two other recognized mammal species are cottontail rabbit and Apache pocket mouse. Cottontail rabbit has the highest MNI in the House 3 collection, with at least four individuals represented. The mouse and another unidentified small rodent could be post-depositional or intrusive into the cultural assemblage.

In summary, seven mammal species were identified at the Forsberg site; the most common species is

Table 20. Identified Mammal Elements from House 3.

	Bison	Deer	Cottontail Rabbit	Apache Pocket Mouse	Unknown Rodent
Mandible			4r	2	1
Premolars		1			
Molars		3			
Vertebra		2			
Cervical vertebra		1			
Rib		1			
Scapula	2*		1r 1L		
Humerous		1L			
Radius		1 L 1r			
Ulna		1L	4r		
Pelvis		1L			
Femur	1L	1r			
Tibia			2r		
Fibula	1				
Metatarsal	1	1			
Carpal		6			
Navicula Cuboid		1 r			
Astralogus		2 L			
Metacarpal		10			
Phalange		2			
Calcaneous		2 L			
NISP	**5**	**38**	**12**	**2**	**1**
MNI	**1**	**2**	**4**	**1**	**1**
L = left side element					
r = right side element					
* In the form of hoes/bone tools					

rabbit with an MNI of seven. A minimum of five deer was found, divided among all three houses. MNI of two bison is represented, one each in Houses 2 and 3. Two pronghorn also were divided between Houses 1 and 2. MNI of one each beaver, mink (House 2), and Apache pocket mouse (House 3) was identified.

Reptiles, Amphibians, and Fish

The largest variety of faunal remains was found in House 3, as it was the only provenience to include elements of reptiles, amphibians, and fish (Table 21). Very few elements of these animals were recovered, but MNI of one unidentified snake, two turtles, one toad, and one catfish were counted.

Birds

Only two bird bones were identified in the Forsberg site assemblage, both from the floor of House 2. Both elements are *tarsometatarsus*, one from an unidentified small songbird and the other from a Bob White quail. Other bone fragments are possibly bird, but they are so fragmentary that they could not be identified accurately.

Mussels

Several freshwater mussel shell fragments and complete or nearly complete valves were in the Forsberg site assemblage; however, most of the fragments

Table 21. Identified Reptile, Amphibian, and Fish Elements from House 3.

	Snake	Frog/Toad	Bufo (Great America Toad)	Unknown Turtle	Mud Turtle	Red-Eared Slider	Catfish
Cliethrum							1
Carapace Fragments				3			
Plastron Fragments					3		
Vertebra	5	4	6				
Scapula				1			
Coracoid						1	
Pelvis			1				
Humerus			2				
Unidentified Elements & Fragments			20				
NISP	**5**	**4**	**29**	**4**	**3**	**1**	**1**
MNI	**1**	-	**1**	-	**1**	**1**	**1**

Table 22. Identified Freshwater Mussels.

	House 1		House 2		House 3		
Subfamilies/Species	**Left Valve**	**Right Valve**	**Left Valve**	**Right Valve**	**Left Valve**	**Right Valve**	**MNI**
Ambleminae							
Quadrula nodutata			9			1	10
Quadrula quadrula	1					1	2
Quadrula metanevra					1	1	1
Uniomerus tetralasmus				1		1	2
Elliptio dilatata				1			1
Amblema plicata						1	1
Pleurobem sinoxia		1					1
Tritogonia verruscosa			1				1
Total	**1**	**1**	**10**	**2**	**1**	**5**	**19**

are not diagnostic and are in such poor condition that species determination was limited. Eight species of freshwater mussels were identified with an MNI of 19 (Table 22).

Plant Remains

The only plant seeds recovered at the Forsberg site were from House 3, all from F32, which was the northern pit in the house floor (Figure 16). The excavation crew thought that modern rodents brought the seeds into the pit (Whiteacre 1978). These seeds are hackberry (n = 4), velvetleaf (n = 7), and bedstraw (n = 100+). All three houses yielded wood charcoal, but to date the wood species have not been identified.

Discussion

The three houses have many similarities, yet some differences may indicate that they were not occupied contemporaneously. It appears that all three were abandoned prior to burning or collapsing, leaving few complete artifacts. Each had a central or nearly central hearth and four central support posts. These features are characteristic of Central Plains tradition earthlodges (Blakeslee 1999; Lehmer 1954; Roper

Table 23. Middle Ceramic House Shapes, Sampled from Central to North-Central Kansas.

Sites	Square	Rectangular	Trapezoid	Circular	Total Houses
Forsberg (14SA420)	2			1	3
Markley House * (14OT308)				1	1
Kohr House * (14SA414)		1			1
Lamar House * (14OT304)	1				1
Aerhart House * (14OT305)				1	1
14SA415 **		1			1
Griffing Site *** (14RY21)	1				1
Minneapolis 1**** (14OT5)	3				3
Budenbender ***** (14PO4)				1	1
Root Site + (14LC301)	1				1
Mugler Lodge (14CY1)++	?	?			1
14ML417□	1				1
14ML15□□		3			3
14ML5□□	2				2
14ML11□□	1				1
14ML306□□	1				1
14ML17□□		1			1
14ML371□□		1			1
14OB27□□			6		6
14JW48□□□		1			1
Total	**13 to 14**	**8 to 9**	**6**	**4**	**32**

* Roper 2001

**Roper and Reed 2003

*** Wedel 1959

****Wedel 1935

*****Johnson 1973

+Witty 1962

++Ritterbush and Logan 1991

□Latham 2004

□□Blakeslee 1999

□□□Logan 2004

2006; Wedel 1959). Lehmer (1954) was the first to define the three primary architectural characteristics of a Central Plains lodge:

1. typically square in shape,
2. central hearth, and
3. four support posts around the hearth.

Houses 1 and 2 have all three of these architectural characteristics; however, while House 3 had the central hearth and four support posts, the wall pattern was sub-circular. Circular houses are not unknown but are unique to Middle Ceramic-age sites in central to north-central Kansas (Table 23). On the ground surface House 1 was represented by a mound, and House 3 was marked by a slight depression. Could it be that square and rectangular houses were constructed on the ground surface or just below the sod, while some round houses were built over excavated basins, as found in later sites to the southwest?

Documented Central Plains tradition circular house floors share several architectural features (Table

Table 24. Excavated Middle Ceramic Circular Houses.

Sites with Circular Houses	Floor Type	Center Posts Placement	Entryway Orientation	Number of Internal Storage Pits	Diameter (m) –maximum measurement
Markley House * (14OT308)	Level	Semi-Cardinal Directions	East	4	8.53
Aerhart House * (14OT305)	Level	Cardinal Directions	Southeast	2	8.71
Budenbender ** (14PO4)	Shallow Basin	Semi-Cardinal Directions	South?	4	7.92
Pottorff *** (14LA1) House 1	Shallow Basin	Semi-Cardinal Directions	East	1	3.84
Pottorff *** (14LA1) House 2	Shallow Basin	Semi-Cardinal Directions	East	0	5.18
Forsberg (14SA420) House 3	Shallow Basin?	Varied	South?	4	5.70
*Roper and Reed 2003					
** Johnson 1973					
*** Wedel 1959					

24). Each had four central support posts and a central hearth. Most also had interior storage pits, ranging from one to four in number. Where entryways could be defined, they mostly extended to the east, but one house had an entryway extending to the southeast. Another example, the Budenbender site (14PO4), may have had a southern entrance. The Forsberg House 3 entrance may have extended to the south.

The diameters of the circular houses ranged from 3.84 to 8.71 m, with an average diameter of 6.65 m. The 5.7-m diameter of House 3 is just below the average size of Middle Ceramic circular houses in Table 24.

Circular house floors have been documented in other Plains Village sites. To the north is the example found at the Sweetwater site (25BF1), which includes both a square and a round excavated house floor. Even more intriguing is the floor plan of Sweetwater House 3, which has characteristics of both: two square walls and two rounded walls (Champe 1936). Southwest of the Forsberg site are some intriguing sites with predominately circular house floors, but these were found in excavated pits and are known as pit houses (Brosowske and Bevitt 2006). Nearby to the west, but later in time, are the early Great Bend aspect houses in the Little River focus sites, which also contain small circular house floors in pits (Blakeslee and Hawley 2006; Wedel 1959:351).

The house styles and pottery characteristics at the Forsberg site seem to support the hypothesis that not all the houses were occupied contemporaneously or by the same group. Houses 1 and 2 have the same square floor pattern, even though House 1 was aligned with the semi-cardinal directions, and House 2 was aligned with the cardinal directions. The wall posts of Houses 1 and 2 were similar in diameter and distribution. The northeast and southwest walls of House 1 had close, evenly spaced posts, while the west wall had fewer and more widely—albeit evenly—spaced posts. The same pattern is found in House 2. Unfortunately, the distribution of interior storage pits cannot be compared, as all data defining distribution and location of House 1 storage pits have been lost.

Additional houses likely were situated on the same high terrace as the three that were excavated. The artifact scatter found by the KAA Mud Creek Chapter in 2003 was at least 50 m south of the three excavated houses. These artifacts were concentrated along the edge of the terrace, overlooking the old river channel scar. Any houses at this end of the site probably have been severely damaged by cultivation, and remains would consist of truncated features.

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Notes

14MP407, A Great Bend Aspect Site In McPherson County, Kansas

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Site 14MP407 is part of a cluster of Smoky Hill phase sites along the Smoky Hill River near Lindsborg, Kansas. Unlike many Smoky Hill phase habitation sites that have been subject to decades of tillage resulting in the loss of former living surfaces and house floors, part of this site remains well preserved in a pasture. Other areas of the site have been subject to long-term cultivation. A geophysical survey was conducted to identify anomalies with likely cultural associations. Numerous potential features were identified, including three large anomalies that corresponded with visible mounds in the pasture. Believed to represent the remains of collapsed structures, one of these mounds was the focus of the 2004 Kansas Archeology Training Program field school. Throughout a period of 16 days, the central mound area and several outlying anomalies were investigated. As a result, portions of a Smoky Hill phase lodge, including an intact house floor, were closely studied and documented.

Adaptations during the Middle Ceramic period are often recognized for the widespread presence of horticulture as a component of the subsistence base. Hunting and gathering continued to be important as well, with a wide array of fauna present in excavated collections of habitation sites in the region. Botanical remains are limited in part by collection bias, although plant gathering is apparent from existing assemblages. Flotation sampling has become an important part of more recent excavation strategy, and the resulting data suggest that a broad spectrum of wild flora were utilized in addition to cultigens, including maize, beans, squash, sunflower, chenopod, little barley, and tobacco, among others. Adair (2003:311-312) has suggested that this diversity of cultigens becomes more limited among western sites of the period.

The Central Plains tradition (CPt) was defined by Lehmer (1954:143-147) as one of three Plains Village patterns (including Middle Missouri and Coalescent traditions) based on data from Upper Republican and Nebraska aspect sites. Today the CPt is generally recognized to include the Upper Republican, Smoky Hill, Nebraska, St. Helena, and Itskari (formerly Loup River) phases; in a recent synthesis Roper (2006a) included the Steed-Kisker and Initial Coalescent phases as well. The Solomon River phase represents an additional taxonomic distinction, separated originally by Krause (1969) from the "classic" Upper Republican sites in Nebraska, and has been discussed by Latham (1996) and Blakeslee (1999) in summarizing recent investigations near Waconda Lake in north-central Kansas. Roper (2006a:106) suggested that the taxonomic divisions represent arbitrary geographic divisions of material culture variation that may relate less to cultural differences and more to spatial gradation of a widespread cultural tradition. The core areas are most easily distinguished from one another, but the peripheries become increasingly vague.

Components now generally identified with the Smoky Hill phase have been known to collectors and avocational archeologists since at least the latter years of the nineteenth century. J. V. Brower (1898, 1899) described and illustrated some sites in the region within the context of his "Quivira" and "Harahey" that are clearly Middle Ceramic period Smoky Hill phase components, including one of the type sites of the phase, the Griffing site (14RY21). Later, notable avocational archeologists Guy and Mabel Whiteford and Floyd Schultz recorded and investigated many important sites in the area (Hawley 1993; Ritterbush and Logan 1991; Roper 2006a). Their work ultimately was important to efforts to define, report, and later

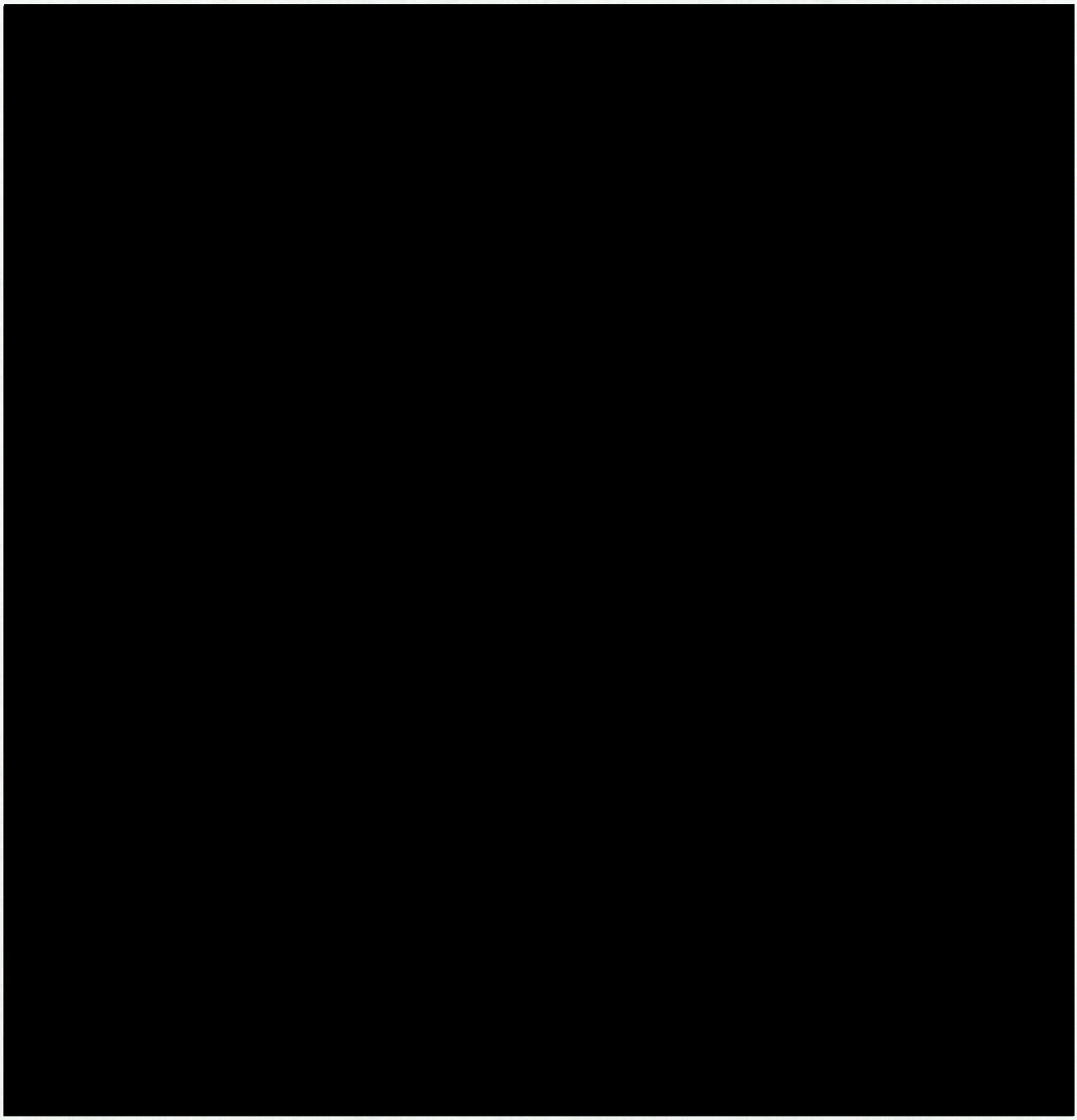


Figure 1. Location of 14MP407 in the central Smoky Hill River valley of central Kansas.

refine the components collectively within a taxonomic framework (Roper 2006a, 2006b; Wedel 1940, 1959), and their early work in the field continues to offer opportunities for study even today (Hawley 1993; Ritterbush and Logan 1991; Roper 2001, 2003). Over the years Smoky Hill phase sites have been a continuing focus of field research, particularly by the Kansas Anthropological Association (KAA), either through the Kansas Archeology Training Program (KATP) or efforts of individual avocationals. Excavations involving the KAA include work at 14BT420 (Graves and Button 1964), 14SA403 (Winslow site) (Witty 1968), 14OT5 (Minneapolis site) (Witty 1971, 1974), and 14SA415 (Roper and Reed 2003; Witty 1970).

Smoky Hill material culture is similar to that of most other Middle Ceramic/Plains Village period groups in the region. Indeed, the trait list commonly used for characterizing archeological complexes up through the mid-twentieth century is general enough that it might apply to any of several Middle Ceramic period complexes on the Central Plains (compare Wedel 1959:563-564). The toolkit associated with sites of the period is often very similar across wide areas. Small side-notched (Washita type), side- and basal-notched (Huffaker and Harrell types), and unnotched (Fresno type) arrow points; small endscrapers; diamond beveled knives; and drills of various forms are commonly noted chipped stone tools. Pecked and ground stone tools include manos, metates, hammerstones, celts, and arrow shaft abraders. Items of bone include beads, awls, and digging implements made from bison ulnae, tibiae, and scapulae. Shell was fashioned into ornaments (beads and pendants), and more robust bivalves were used as hoes.

Ceramic artifacts are ubiquitous on Smoky Hill phase sites and are typically cordmarked or roughened, a variety designated Riley Cord-roughened ware (Wedel 1959:183-184). Hedden (1992) further differentiated distinct types based on variations noted in assemblages from Smoky Hill phase sites in the region. A wide range of vessel sizes is apparent from area sites, ranging from miniature vessels to vessels with capacities greater than several gallons; vessels of approximately 1- to 2-gallon capacity are common. A globular jar with rounded shoulders, constricted orifice, and direct, often flaring rim is typical. A recurring, but uncommon, form is a globular, neckless jar or bowl, colloquially called a coconut jar. Collared rims are frequently noted as well. Decoration, typically restricted to the lip and exterior of the rim, takes the form of tool impressions and pinching to form distinct patterns. While not particularly common, decorated ceramics are prevalent at some sites or groups of sites (Minneapolis locality, 14OT5, for example). Ceramic temper is often sand or grit, though crushed sherds or grog and shell can vary in presence and frequency across the Smoky Hill phase geography. Attempts to use Smoky Hill ceramics as a relative chronological ordering technique (seriation) generally have failed to depict adequately the progression of traits through time. This may point to the need for additional dates across the area, but ultimately the variability is more a reflection of geography and local social organization than the passage of time (Roper 2005; 2006b).

Chronologically, the Smoky Hill phase can confidently be considered to encompass a span of time from A.D. 1050 to 1350, based on radiometric dates from sites across the area (Logan and Ritterbush 1994; Roper 2006a, 2006b).

Site Description and Setting

Site 14MP407 is part of an extended, loose cluster of Middle Ceramic period habitation sites attributable to Smoky Hill phase occupation of the central reach of the Smoky Hill River valley in central Kansas (Figure 1). This cluster of about 20 sites is located along the Smoky Hill River and adjacent lower reaches of several minor tributaries near Marquette and Lindsborg. Together these sites represent the southern extent of widely recognized Smoky Hill phase sites in central Kansas.

The site has been known to local artifact collectors for more than 50 years and has been subject to occasional subsurface investigation by them in the past. KAA member Harold Reed originally recorded the site in February 1971. Another KAA member, Richard Stauffer, also collected from the site prior to and around that time. In the early 1970s, Stauffer noted the presence of approximately a dozen dark stains, presumed to be features, just off the crown of a ridge in the cultivated portion of the site. Stauffer's collection from that area included a large section of grass- and stick-impressed daub, indicating the presence of a structure on that middle ridge finger. Richard's brother Jim and Jim's son Brian hand-excavated a controlled trench in the eastern portion of Mound 2 in the pasture area in the early 1990s. Part of that collection was loaned for study during the analysis of the 2004 fieldwork. A large crater, centered on Mound 1, was excavated sometime in the mid- to late-twentieth century.

As defined, the site occupies three separate ridge fingers that generally trend to the north-northeast toward the Smoky Hill River valley and occupy approximately 17 acres (Figure 2). These fingers are



Figure 2. Aerial view, looking west across 14MP407, shows the setting of the site in relation to the surrounding countryside. The excavation area is shown in the upper left and the Smoky Hill River is on the right.

closely associated with the Smolan silty clay loam, a deep soil typically found on ridge tops and adjacent gentle side slopes (Rott 1983). Bridgeport silt loam and Roxbury silty clay loam dominate terrace settings in the adjacent valley of the Smoky Hill River. The western portions of the site area are cultivated fields, while the eastern end is currently a hay meadow. The broad upland surface extending back to the south was once an upland prairie of mixed and tall grasses and forbs. The adjacent riverine setting consists of a gallery forest with cottonwood, elm, hackberry, and oak, species often noted in General Land Office survey notes for the area. The wide valley floor of the Smoky Hill River today consists of large agricultural fields. Prior to settlement, this area would have been dominated by tall grass prairie, interspersed with ribbons of trees and various weedy annuals and sedges in disturbed areas and along abandoned river channels turned seasonal reservoirs and wetlands.

The surface expression of artifacts denotes little, if any, continuation of material from one ridge to the next. Each ridge is, in essence, a separate component or site, separated by short, north-flowing intermittent drainages. The westernmost ridge yielded artifacts attributable almost exclusively to the Great Bend aspect occupation of the area: plain and simple stamped, sand-tempered pottery; mostly plain triangular arrow points; and lithic raw material types in amounts similar to those recognized along Sharps Creek. This is hardly surprising considering the presence of the expansive Sharps Creek site (14MP408) in the uplands to the south. The northern part of 14MP408 extends northward along a higher portion of the uplands toward the Smoky Hill River valley. The western ridge finger of 14MP407 is associated with that ridge, and that part of the site is probably more properly identified as a northern extension of 14MP408.

The central and easternmost ridge fingers, by contrast, have yielded primarily artifacts attributable to the Smoky Hill phase: cordmarked, grog- and occasionally sand-tempered pottery; prevalence of side-notched arrow point types; and lithic artifacts dominated by local or near-local raw materials (i.e., Flint Hills cherts). The central ridge finger was cultivated for decades and was contour terraced in the 1970s. These practices undoubtedly affected the integrity of the site in this area, but as the geophysical investigation revealed, cultural features remain to be studied on this ridge.

The easternmost ridge is the most intact portion of the site and is currently in grass. Comprised primarily

of brome rather than native grass species, the pasture likely was cultivated briefly at some point in the past. Apparently this area was not subject to long-term cultivation or deep plowing, as the cultural deposits are quite shallow and appear to have integrity. Three low mounds are still readily visible along the crown of the ridge upon which this portion of the site is situated.

Field Investigations and Methods

Remote Sensing/Geophysics

In April 2004 geophysical investigations were undertaken on part of the site, including the eastern-most ridge finger encompassed by the pasture and the adjacent (middle) ridge finger then planted in winter wheat. The geophysical investigation, conducted by Archaeo-Physics, LLC of Minneapolis, Minnesota, included both electrical resistance and magnetic field gradient surveys. A total of 8,100 m^2 were investigated. In the pasture area 6,300 m^2 were surveyed by both methods. Due to rain during the latter portion of the survey period, an area of the site in an adjacent wheat field was the subject of only a magnetic survey because moisture collecting on the wheat would have adversely affected the collection of resistance data, skewing any results. A total of 1,800 m^2 was surveyed in the wheat field. The two forms of geophysical survey used and the technical results of that work are described elsewhere in this volume (Maki herein). Basic results of the work are described throughout this report when appropriate.

The geophysical survey held promise as a useful tool for the upcoming excavations even from the most preliminary interpretations in the field. Survey results yielded important additional information about anomalies that may be of cultural origin and also shed light on the three visible mounds in the pasture. Based on the survey, Mound 1 and Mound 2 clearly had similar magnetic signatures, suggesting that structures in both locations likely had burned. Mound 3, on the other hand, had a very different magnetic signature, indicating that perhaps it had not been subject to massive burning. Several anomalies away from the mounds were identified as having a high potential for being cultural features.

In May 2004 groundtruthing was accomplished with the assistance of equipment and expertise provided by the Natural Resource Conservation Service. High potential anomalies consistently had a strong correlation between the magnetic and resistance data, as these anomalies were readily visible in both data sets. Soil cores were removed from the vicinity of several of these anomalies, confirming the presence of cultural features in every case. Also cored were other anomalies that had either a magnetic signature or an electrical resistance signature with little correlation between the two. Cultural features were identified in approximately half these instances and, when identified as such, were generally recognized to be more subtle in appearance (e.g., lighter disturbed fill and fewer instances of charcoal and burned earth). Basins, storage pits, and portions of Mound 2 were cored and studied in the field. The results offered many avenues to pursue during the upcoming investigations associated with the KATP field school.

Excavation

In June 2004 the KATP field school conducted excavations, focusing on the Mound 2 vicinity, as well as several anomalies scattered across the site. The grid utilized for the geophysical survey was re-established, allowing for location of select anomalies away from the mounds. Units were opened in a staggered series across Mound 2 to create trench-like cross sections for later profiling. Units were typically excavated in 10-cm intervals below a datum established as the ground surface elevation of an individual unit's southwest corner. Excavated soil was screened through ¼-inch mesh hardware cloth.

Beginning with the second level, excavators collected a 2-gallon (approximately 8-liter) soil flotation sample from the southwest corner of each unit with the hope that processed samples would offer some standardized data on charred botanical remains and other small materials from across the excavation area. These samples were processed in barrels with flowing water used to agitate the samples and separate light fraction (floating objects typically consisting of charred wood and other botanicals, as well as present-day debris like grass roots) from heavy fraction materials (heavier objects such as chipped stone, ceramics, bone, and other debris). Excavation proceeded until sterile subsoil was encountered. Additional units were opened adjacent to the initial units, both along the trench and in various portions of the resulting quadrants, as work continued and offered insight into the direction that excavation should proceed.

In order to identify and demonstrate an intact floor zone, should the remains of a structure be encountered, all identifiable tools and ceramics were piece plotted. Additionally, other artifacts—generally over 3-4 cm in diameter, including larger debitage, miscellaneous stone, and bone—were mapped and plotted on level forms when found in situ. This allowed researchers

to track locations and elevations of other debris across the mound excavation.

Features were assigned unique numbers and excavated apart from the unit(s) in which they were found. Typically features were cross-sectioned as a single level to identify fill episodes or other variations in profile. After mapping the profile, the other portion of the feature was excavated, except in limited instances when a feature fell partially outside the open block excavation. Soil flotation samples were collected from all features. The number of samples varied with feature size and perceived potential to yield material; however, sample size remained consistent with that used in the general excavation. Beyond samples from specific features, flotation from areas of the house floor zone that offered particularly good potential for yielding material also were collected.

Documentation of this work consisted of standard unit/level excavation forms with fields for recording pertinent information on the soils, artifacts, and identified features, as well as noting any photography related to the unit/level. If necessary, the completed level floor was mapped to identify notable aspects encountered in the excavation. Feature excavation used similar forms specifically created for non-unit excavations. A generic record form was used for progress reports, comments on excavations of units and/or features apart from the standard form, and other work on the site not conducted within established units or in association with identified features.

Analysis Methods

Ceramics

Body sherds initially were grouped according to size. Those with surface areas of less than 3 cm^2 were not analyzed except to note decoration, temper, or surface treatments that were not observed or were infrequent in the remaining collection. The resulting body sherd sample was analyzed for size, minimum and maximum thickness, exterior surface treatment, and temper. Observations on the general section from which the sherd originated (i.e., neck, shoulder, body, base), along with any other comments, also were recorded.

Surface treatment categories included plain and cordmarked variations. Plain surfaces were those with no visible evidence of modification. Cordmarked surfaces were identified as those with no evidence of modification after application of the cordmarks. Smoothed cordmarked surfaces included a wide range of lightly to almost completely obliterated impressions, almost exclusively caused by wiping the cordmarked surface while the clay was still pliable. In all cases cordmarking was smoothed to some degree, with no specimens exhibiting unaltered cord impressions.

Determination of temper was aided by a 10X hand lens and a binocular microscope capable of magnification to 70X. When present as a tempering agent, sand particles were measured using a scale and terminology developed by C. K. Wentworth (1922).

General characteristics of individual sherds included size (surface area) and occasional comments on vessel section represented. Typically, sherd curvature was the primary criterion for distinguishing between the various regions of a vessel, although sherd thickness and exterior surface characteristics were often identified as correlating variables. Sherd size was determined by a simple sorting of individual sherds to the nearest square centimeter. Both sherd curvature and size were thought to provide some qualitative information useful for determining breakage patterns and the degree to which sherd lots were representative of vessel completeness, thereby helping to indicate potential vessel size of some unrestorable vessels. Positive evidence of coil breaks on sherds was also noted.

Rim sherds were analyzed to determine form and orientation. Specific measurement of the orientation from vertical was taken when possible. Rim height was measured when both the lip and the neck/shoulder juncture were present. Diameter of the vessel at the lip was measured when possible by placement of the sherd on a template. Sherds that were especially small or otherwise exhibited a potentially deceptive arc were excluded from this measurement. Lip types were recorded as rounded or flat. Decorative treatments were noted when present. Punctating and oblique incising or impressing of lines into the lips were the only recognized styles. Individual sherd decoration was measured to provide a range of variables for comparative purposes, such as placement and orientation on the sherd, distance between elements, and general size of elements.

Chipped Stone

As a reduction process, chipped stone tool production typically results in varying quantities of debris through the creation and useful life of a stone tool. Chipped stone debitage was studied to better understand the lithic reduction strategies of the site inhabitants. A number of variables were included in the debitage analysis. Topics of exchange and mobility can be addressed to some degree through the identification of raw material types. Relative distances to sources are important variables. In the 14MP407

analysis, however, local/near-local cherts comprise nearly the entire assemblage, limiting the discussion of this topic.

The presence of cortical debris was noted, as it can indicate that the raw material was not significantly reduced elsewhere prior to the creation of flakes in the assemblage at hand. When present, the general location of cortex on a flake was noted. Platforms were observed generally for a series of variables. Platforms can contribute data about the reduction trajectory and percussion method. General platform modification and removal angle were used to differentiate intermediate to late stage biface reduction from early stage biface or blocky core reduction. Platform modification, or the lack thereof, can provide some general measurement of a knapper's experience and allow inference of the reduction trajectory (Odell 1989; Tomka 1985). Typically, platform faceting and edge modification are associated with biface reduction. The absence of these attributes may represent either early biface reduction or simply core reduction. Removal angle also can provide insight into the general nature of the size and form of the material being reduced. The platform angle measurement in this study is comparable to Curtis Tunnell's (1978) "vertical removal angle" and consists of the arc of intersection of the platform plane with the plane running the length of the ventral face of the flake. Steep removal angles are associated with core and early biface reduction, while relatively shallow removal angles suggest later stage biface reduction.

Chipped stone tools were analyzed using a set of basic variables, including functional tool type, raw material type, presence of thermal alteration, and standard measurements of length, width, thickness (when applicable), and weight. In addition, general bifaces were described as early, intermediate, and late stage. The terms blank and preform were applied to distinguish intermediate and late stage bifaces with no obvious signs of utilization. Distinguished tool types included arrow points, drills, perforators, knives, beveled knives, end scrapers, side scrapers, and modified flakes.

Pecked and Ground Stone

Pecked and ground stone artifacts were examined to determine functional type, raw material type, description of worked edges and faces, and, when possible, measurements of length, width, thickness, and weight. In special instances additional measurements were acquired, such as variation of width and depth of grooves associated with abrasive wear.

Master craftsman in stone toolmaking Don E. Crabtree (1967:69, 1972:68) noted the utility of abrasive stones in a flintknapper's tool kit. In an experimental study involving the manufacture and use of both flintknapping and arrow shaft abraders, J. Jeffrey Flenniken and Terry L. Ozbun (1988:46) indicated that several distinctive wear patterns were recognizable on flintknapping abraders. One consisted of relatively linear V-shaped grooves of varying depth, a pattern consistent with the collection of flintknapping abraders discussed here.

Abraders with rounded or U-shaped cross sections were identified as having performed an abrasive shaping function in manufacturing arrow shafts. The proposed manufacturing process, as depicted by Flenniken and Ozbun (1988:39-41), included shaping of the raw material into a predetermined form, followed by grooving and splitting of the stone to create a matching pair. The pair was then grooved with a stone tool to create channels into which the arrow shaft "blank" was placed. The shaft was run back and forth while being rotated to create a uniform dimension for the arrow shaft, which varied from 6 to 9 mm in diameter (Flenniken and Ozbun 1988:41). When the groove became too large to perform its function, the abrader pieces were rubbed together to reduce the depth and subsequently the width of the groove. This method of manufacture and rejuvenation resulted in shaped, matched abrader pairs. While most of the specimens in the collections discussed here are fragmentary, nearly all examples are shaped forms with ovoid to rectangular cross sections. Some of these tools may have been utilized individually rather than in pairs, as the grooved areas would not provide adequate contact zones for an abrader mate.

Flenniken and Ozbun (1988:48) described a third type of abrading technique in which lithic pieces were drawn perpendicular to the chipped stone margin. This method often created irregular concavities across the utilized face of the stone. A similar pattern was recognized on some flat abraders described in following sections. These tools also might have functioned as whetstones. It is proposed that these tabular stones could have been used to maintain working edges on at least some categories of bone tools, including scapula hoes, "squash knives," and tibia digging stick tips.

Bone and Fauna/Flora

All bone was scrutinized for evidence of functional use. Utilized/modified specimens were subject to identification of tool type; measurement of length, width, thickness, and weight; description of modified edges and faces; and identification of element and species when possible. Unmodified bone was rare and limited the utility of a formal faunal analysis.

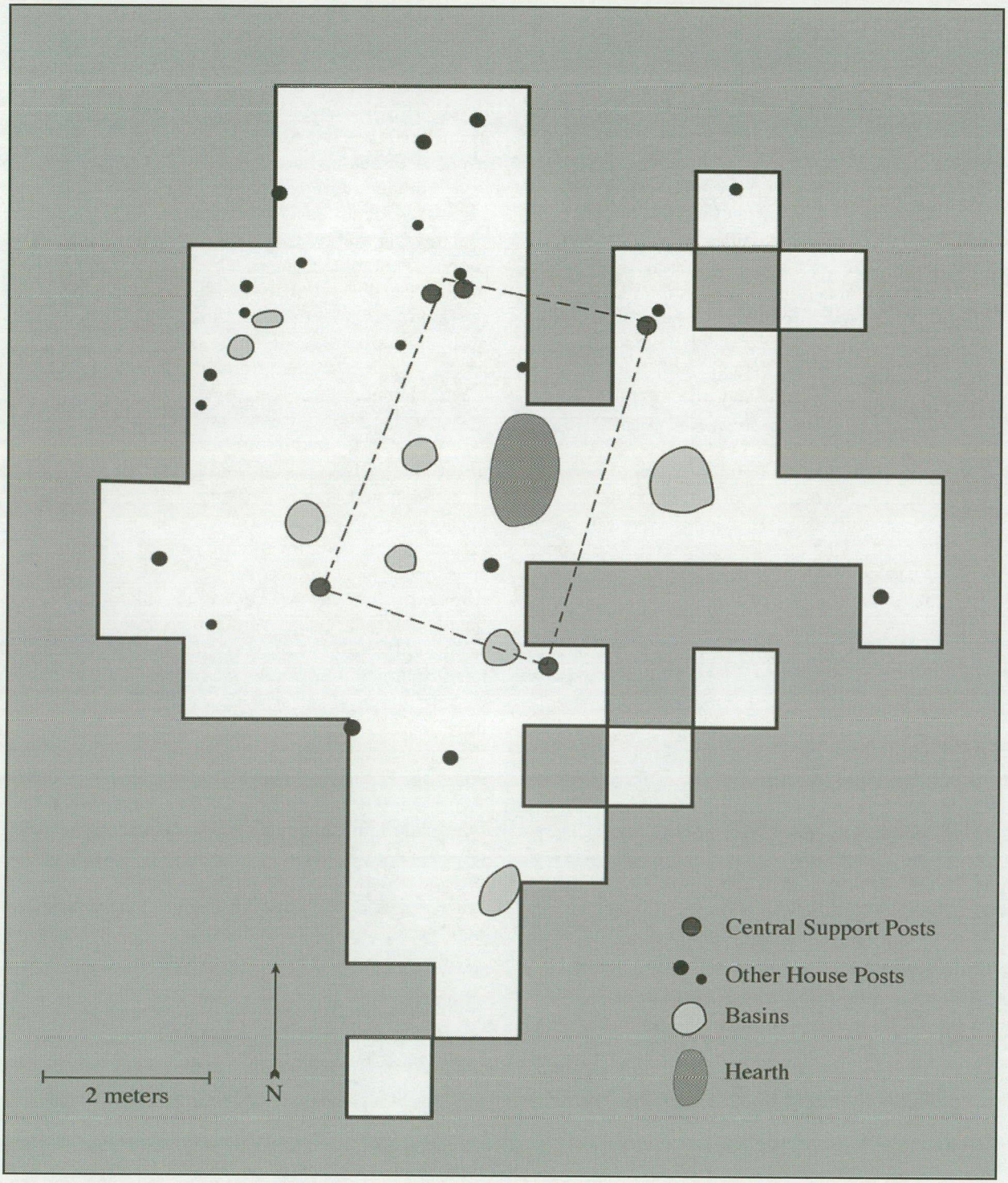


Figure 3. Excavated portion of House 2.

Floral remains collected from the sites include those hand-collected from several proveniences during the excavation and those recovered as the result of soil flotation. General comments are made in the description of the analysis of identified remains. A formal analysis of the flotation samples and hand-collected specimens has not been conducted to date.

Architecture

The excavated portions of House 2 at 14MP407 indicate a roughly square structure, measuring 8.6 m long (northwest to southeast) by 8.1 m wide (southwest to northeast) (Figure 3). These dimensions place the structure within the average size range of excavated Smoky Hill phase earthlodges and among a cluster of at least eight previously excavated Smoky Hill lodges in the region.

The footprint of the lodge was apparently stripped of its sod, resulting in a slightly subterranean floor. This was particularly evident in unit N70/E25, where sterile subsoil was encountered in the northwest half of the unit (located outside the west line of wall posts) approximately 5 cm higher than it was on the lodge interior that was situated in the southeastern portion of the square (Figure 4). A similar disparity in the depth to subsoil was noted in the west wall profile of units N64/E26 and N65/E26 near the Feature 68 perimeter post, also profiled in that wall (Figure 5).

During excavation it became clear that the house floor remained largely intact. A broad scatter of debris, consisting of ceramics (including several large sherd complexes) and occasional lithic artifacts, bone fragments, and charred botanicals (maize kernels and cob fragments and isolated beans) was identified at nearly the same elevation in the western and northwestern portions of the structure (Figure 6). It was also apparent that the floor represented by this debris scatter was some distance above the point at which contact with sterile subsoil was made. For example, in excavation unit N69/E25 the house floor debris layer was encountered from primarily 28 to 34 cm below datum. In units N71/E26 and N71/E27 debris was encountered abruptly at about 23-25 cm below datum and continued to 30-33 cm below datum. Occasionally features were identified within this floor zone, although typically delineation did not occur until contact with sterile subsoil. The depth below ground surface to this floor varied across the mound from approximately 20-25 cm near walls to between 40 and 50 cm just south of the center of the house floor. During collapse the house may have shifted to the south, as the central portion of the mound is offset to the south by as much as 2 m from the center of the house.

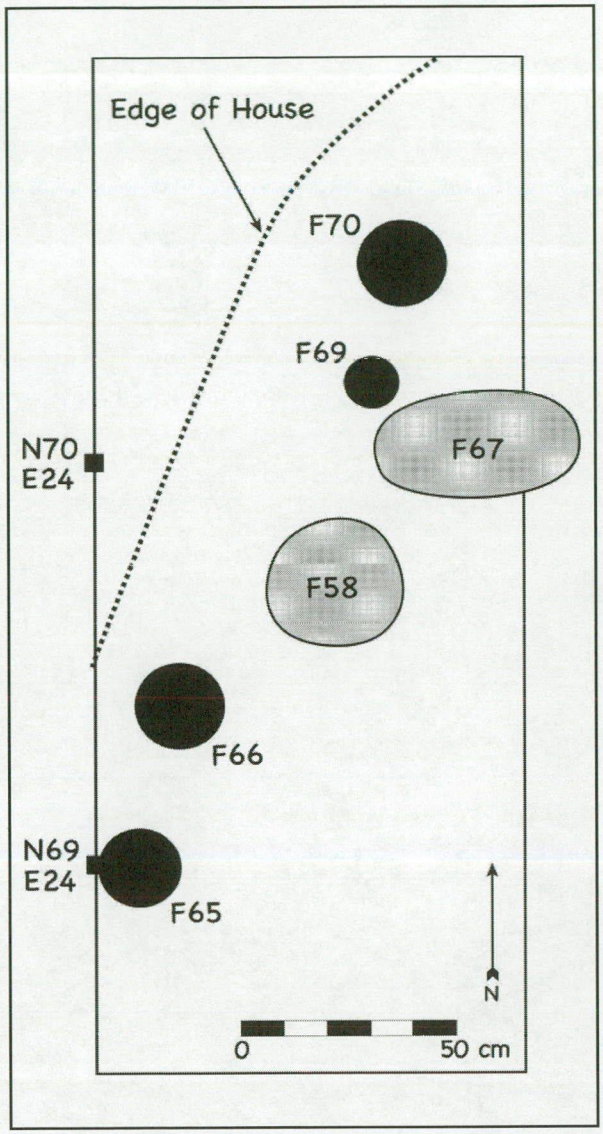


Figure 4. House 2 west wall posts.

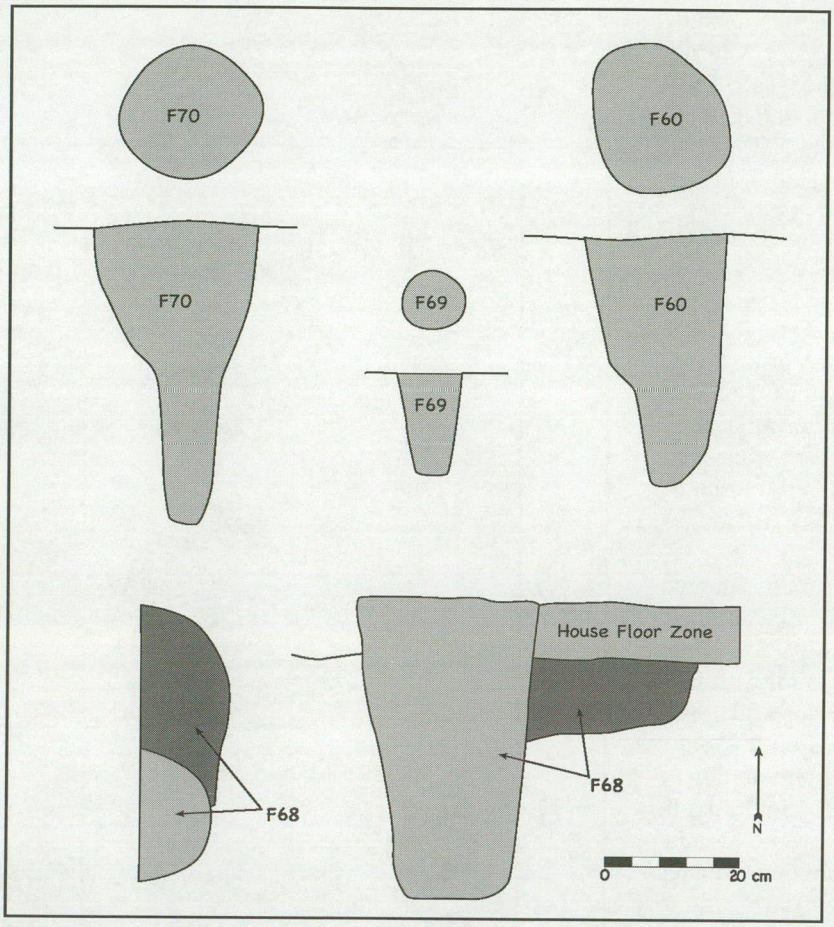


Figure 5. House 2 perimeter posts.

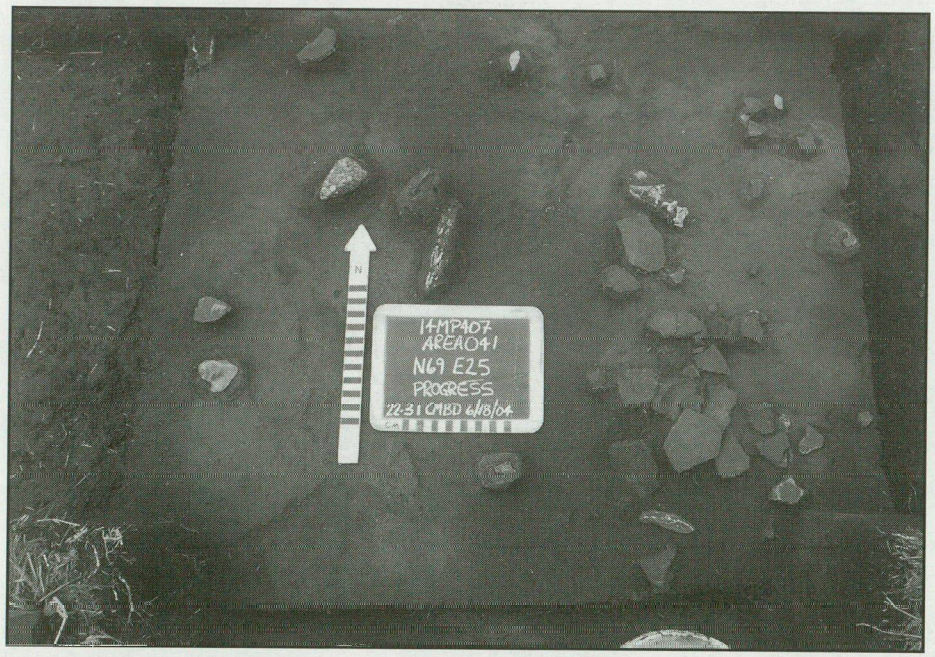


Figure 6. Debris scatter on floor of House 2.

Perhaps this shift is related in part to the structure's partial burning, which was most apparent in the northwest quadrant of the lodge.

No evidence of an extended entryway was identified during the excavation along the west and south walls. Considering the orientation of the structure and its physical setting in the landscape, a southeast entry is considered most likely. This would represent the most common orientation for entryways in Smoky Hill phase (and other CPt phases). Unfortunately, if this were the case, much, if not all, evidence of an entryway probably was destroyed by the deep swale immediately east of the House 2 mound.

The lodge exhibited a typical pattern of four central interior supports, oriented around the hearth area (Figure 3, Table 1). While the house was roughly square in floor plan, the support post pattern was rectangular, with the long axis oriented southwest

Table 1. House 2 Post Molds, Basins, and Hearth.

Feature Number	Position	Diameter (cm)	Depth (cm)
54	Interior Post	13	10
60	Perimeter Post	20	22
61	Interior Post	13	24
65	Perimeter Post	19	27
66	Perimeter Post	20	7
68	Perimeter Post	22	48
69	Perimeter Post	10	18
70	Perimeter Post	22	48
72	Interior Post	14	30
73	Perimeter Post	22	50
74	Central Post (NW)	18	27
75a	Central Post (NE)	20	48
75b	Central Post (NE Brace)	14	30
79	Perimeter Post	24	56
81	Perimeter Post	9	18
83	Interior Post	20	37
84	Central Post (NW Brace)	20	39
85	Central Post (SW)	20	39
86	Perimeter Post	28	27
89	Central Post (SE)	20	30
92	Perimeter Post	16	22
93	Perimeter Post	18	43
94	Perimeter Post	24	33
95	Interior Post	18	30
96	Central Post (NW)	22	40
52	Conical Basin	31	18
53	Oval Basin	82 x 40	18
56	Hearth	125 x 92	18
58	Basin	36 x 31	12
62	Oval Basin	67	22
67	Basin	45 x 30	12
71	Basin	28	11
76	Basin	74 x 66	36
77	Basin	66	22
78	Conical Basin	37	14

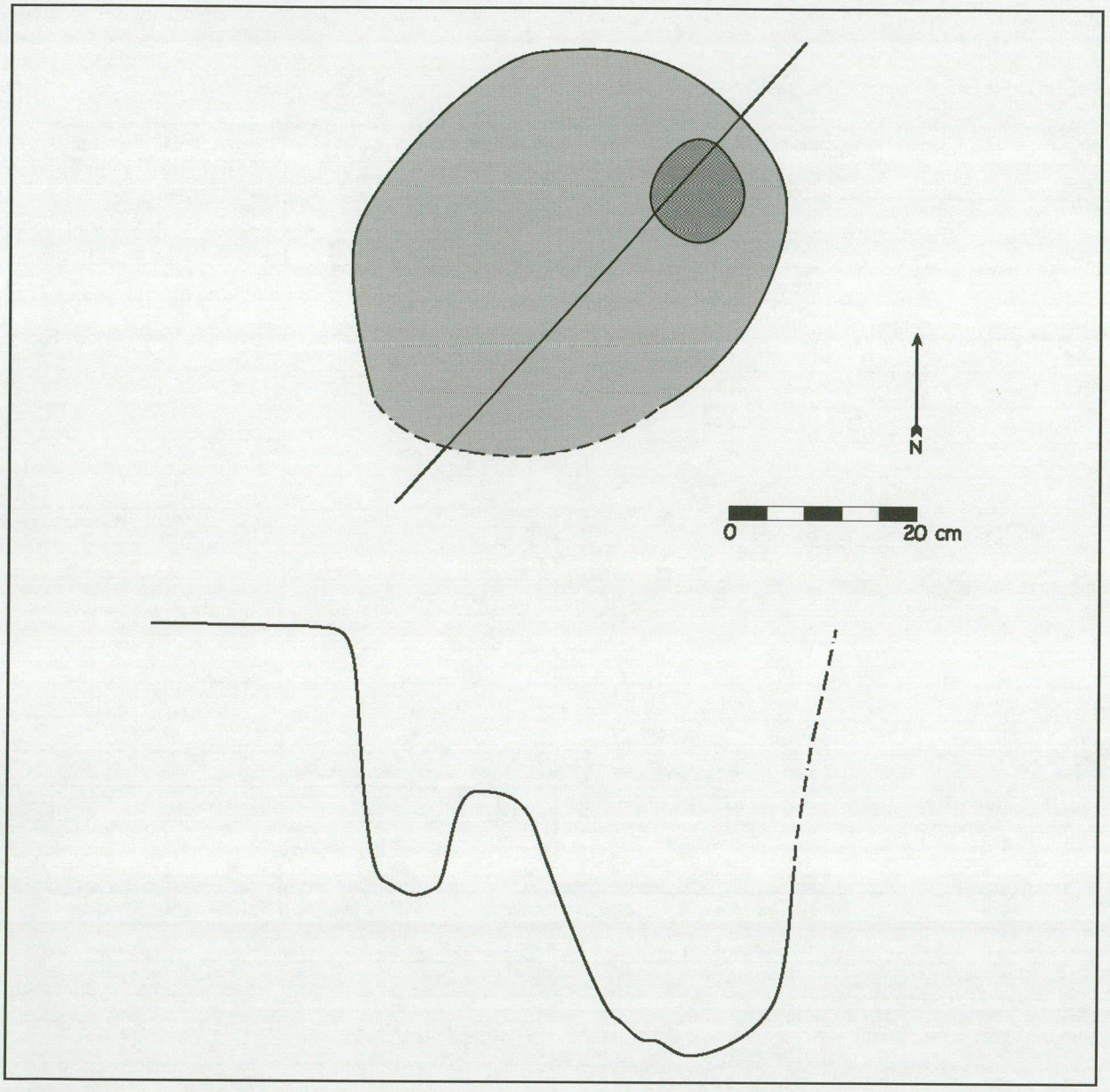


Figure 7. Plan view and cross section of a large interior support post (Feature 75a) and a smaller ancillary post (Feature 75b).

to northeast, perpendicular to the long axis of the house floor. The House 2 central posts had several interesting characteristics relating to the structure's construction, support, and maintenance; and perhaps secondary evidence of its occupation length. Both the northwest- and northeast-oriented large interior support posts (Features 96 and 75a, respectively) had smaller ancillary posts (Features 84 and 75b) immediately behind the large posts, effectively creating outside braces (Figure 7). This bracing was not identified on either of the southern central support posts. Additionally, evidence showed that the large northwest-oriented post was replaced at some point after construction with another large post (Feature 74). Sandstone metate fragments were recovered from Features 75 and 96, suggesting that these post excavations were open simultaneously to receive these pieces. It is assumed that the Feature 74 post was set prior to removal of the Feature 96 post. No brace post was associated with the replacement post. The original northwest support brace post (Feature 84) apparently was left in place. This post—as well as Feature 74

and a nearby interior post (Feature 83)—was heavily burned, presumably at or sometime after abandonment. No evidence of burning was associated with Feature 96, indicating that it certainly was gone when the surrounding structure burned.

Besides the large interior posts, five smaller posts were scattered around the interior of the house (Table 1). Based on their locations within the structure, tentative associations of these posts were identified. Features 83 and 95 were located in the northwest quadrant of House 2 and are considered to represent structural elements, possibly related to house furniture (i.e., storage rack, bed, etc.) rather than additional interior supports. Their orientations roughly parallel to the major wall posts in the northwest corner suggested some connection with the corner/wall of the structure. Feature 54, a single post, located roughly in line with the two western central support posts (Features 85 and Feature 74/96) was probably linked to the central living space in some manner. Finally, Features 61 and 72 were located equidistant from the north and south sides of the central hearth (approximately 55 cm) and are presumed to be associated with that feature.

Thirteen posts were associated with the perimeter of the structure (Figure 5, Table 1). These wall posts varied considerably in size. Evidence indicated that some of the larger posts were spaced regularly along the walls with smaller posts set in line among them. For example, the distance between Features 60 and 68 along the south wall was 1.2 m; likewise, the distances between Features 65 and 70 and Features 70 and 79 along the west wall were also 1.2 m. The distance between Features 65 and 73 was approximately 2.4 m, with the 1.2-m break falling in the southeast quadrant of a unit that was not excavated.

Using this derivative elsewhere, it is interesting to note that the distance across the space enclosed by the central interior supports was approximately 2.4 m northwest to southeast (distance x 2) by 4.2 m southwest to northeast (distance x 3.5). That distance across the area enclosed by the central supports was equal to the distance between the east wall (represented by the Feature 93 post) and the approximate center of the hearth. The distances between the northwest and southeast central supports and the southwest and northeast central supports were about 4.5 and 5.0 m, respectively, or approximately four times the noted spacing. In other words, it appears that there was a standard unit of measurement for establishing the basic framework of the structure, from spacing of exterior wall posts to the association of key interior elements, such as the central living space encompassed by the central interior supports and the distance from the approximate center of the hearth to the eastern wall/front entryway.

As noted previously, evidence showed that the structure at least partially burned. The most extensive evidence of this burning was associated with the northwest quadrant of the lodge. In that area several heavily burned posts (most notably those nearest the central interior portion) were present. Burned earth was much more prevalent in this area within the mixed fill above the house floor, and at least one mass of grass- and pole-impressed daub was identified near the west wall near Features 65 and 66. Elsewhere evidence of burning was more limited, though in no portion of the structure was this evidence completely lacking. Prior to submitting samples for radiocarbon dating, Dr. Mary Adair at the University of Kansas briefly examined examples of wood from several posts. While specific identifications were not attempted, it was apparent, based on microscopic examination, that juniper was not represented in the sample. This cursory examination is consistent with species identification of structural elements at 14SA415, which included oak, cottonwood, and hackberry (Roper and Reed 2003:49-50). These species commonly are noted in modern adjacent riverine settings and would be expected among the more commonly utilized species in prehistoric lodge construction.

House 2 Features

Apart from features associated with the physical structure itself, the excavated portion of House 2 and adjacent areas contained nine other features: a central hearth and seven basins of varying dimensions on the interior and one ovoid basin just outside the south wall of the structure.

Feature 56 (Central Hearth)

Located at the center of the lodge was a large ovoid basin hearth, measuring approximately 125 cm north-south by 92 cm east-west and 18 cm deep near the center (Table 1). As the house floor zone was cleared, the feature became apparent as a mass of burned earth pellets mixed with ash and occasional charcoal fragments. A similar mix of material was noted approximately 5-10 cm higher, but until the base of the house floor was reached, the feature was not easily distinguishable from the surrounding house floor zone. Several burned sandstone fragments were collected from the north end of the feature.

Features 52 and 78 (Conical Basins)

These features were located within the southwest

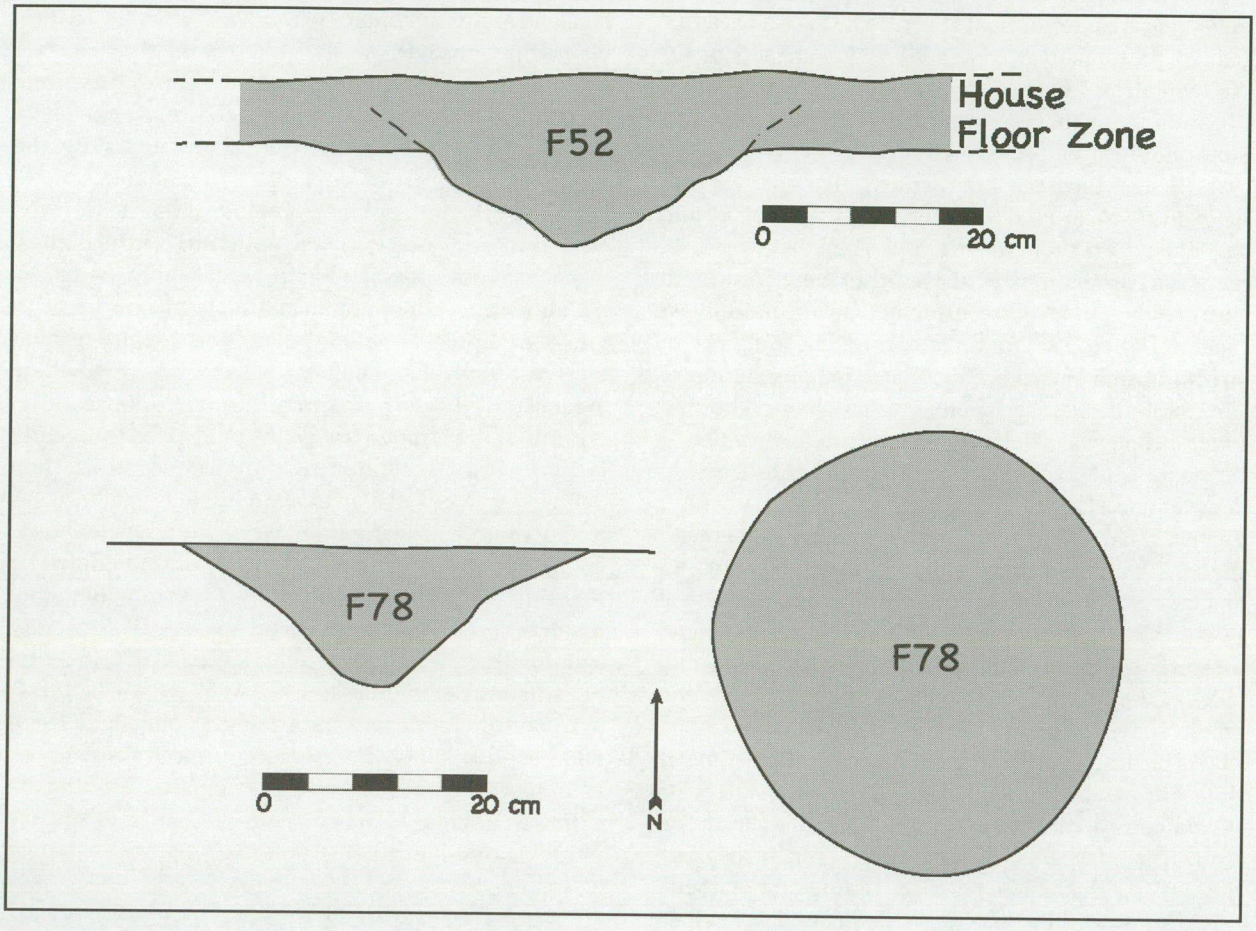


Figure 8. Conical basins (Features 52 and 78).

quadrant (excavation units N67/E26 and N68/E26, respectively) of the central living space (Figure 8). Besides this general spatial association, the features shared similar forms and probably served similar functions (Table 1). While neither feature yielded artifacts, each was noted to contain burned earth and charcoal flecks similar in quantity and consistency to previous levels excavated in that vicinity. Both were roughly circular in planview and have conical profiles. While no specific function was apparent from the excavations, it is hypothesized that the basins may have served as retainers for the globular ceramic vessels common to the Smoky Hill phase, allowing vessels to be set near the hearth area.

Features 58 and 67 (Shallow Basins)

These two features were identified early in the excavation as dark stains in the fill of House 2. Feature 58 was nearly circular, and Feature 67 was ovoid in form (Table 1). Both were located just inside the central portion of the structure's west wall and were so shallow as to be contained entirely within the house floor zone. In each case the feature consisted of dark, organic-rich fill with little besides burned earth and charcoal noted. The features' similarly shallow depth, proximity to each other, and close association with the west lodge wall might indicate a similar, though unknown, function.

Features 62, 76, and 77 (Shallow Basins)

These three are the remaining House 2 basin features. Feature 62 was identified near the southeast central support post in excavation units N65/E27 and N66/E27 as a dark soil stain on the lodge floor (Table 1). The fill was loose, and some rodent disturbance was noted, particularly in the south part of the feature. Several daub fragments were recovered from the upper feature fill, suggesting that the basin was open and only partially filled when the structure burned and collapsed. Other artifacts recovered from the feature include a large ceramic body sherd and lithic debitage. A badly burned bone awl and a crushed and burned

scapula hoe were recovered from the house floor immediately adjacent to Feature 62.

Feature 76 was located within portions of four excavation units, centered under the N68/E30 stake (Table 1). Partially identified early in the excavation, feature delineation did not occur until late in the fieldwork due to its occurrence in several excavation units. The feature appeared on the house floor as a slightly ovoid dark stain that contained abundant burned earth and charcoal flecks and occasional cultural debris. Unlike most of the basin features in House 2, Feature 76 had relatively steeply angled sides that continued to a depth of 36 cm below the base of the house floor zone. A cluster of daub was recovered from the north portion. Ceramic body sherds and lithic debitage also were collected from the fill.

Feature 77 was identified in the southwest quadrant of House 2 (Table 1). Overall feature delineation was made difficult by rodent disturbance in the vicinity and—like most of the interior features—a house floor zone that had a similar color and texture, masking the feature orifice. Unlike nearly every other feature, however, Feature 77 had an abundance of cultural material in the upper portion that assisted in identifying both the original depth of the feature and its dimensions. The feature was not well defined until sterile subsoil was encountered below the house floor. Artifacts recovered in the 10-15 cm above the floor appeared to be associated with this feature rather than the general house floor debris scatter in the western half of the lodge. Artifacts include a bison tibia digging stick tip, portions of at least one scapula hoe, a chert end scraper, ceramic fragments, and chipped stone debris. Interestingly, several flake tools, including end scrapers, were recovered from the house floor in the immediate vicinity of this feature.

Feature 53 (External Ovoid Basin)

Approximately 1 m south of House 2, a small ovoid basin was identified early in the investigation of the House 2 mound area (Table 1). The shallow feature was identified at 20 cm below datum as a slightly darkened stain of loose soil containing flecks of burned earth and charcoal. Only a bone fragment and ceramic body sherd were recovered from the feature.

Other Features

In addition to features encountered during the House 2 mound investigation, other features were investigated at 14MP407: an ovoid basin southwest of House 2, a large post and shallow basin northeast of Mound 1, and an irregular shallow basin identified herein as a borrow pit associated with Mound 1.

Feature 51 (Ovoid Basin)

Located well outside of one of the mound areas, Feature 51 was relatively apparent during the geophysical survey and was one of the anomalies cored during ground truthing prior to excavation. A small block was opened over this anomaly, effectively creating a 2 x 2-m square centered over the feature (Figure 9, Table 2). The feature proved difficult to define, as the fill was only slightly darker and less compact than the surrounding soil, though sparse amounts of charcoal and burned earth helped with definition. Almost no artifacts were found in the shallow ovoid basin. The sparse nature of the fill and light soil suggested that the feature might have been left open and filled naturally over time rather than being used as a trash receptacle or backfilled intentionally in a short interval.

Feature 55 (Post)

In an area nearer the south end of the site, the geophysical survey identified an interesting group of anomalies that formed an ovoid pattern. Limited investigation of the area identified Features 55 and 63 (Figure 10). Feature 55 consisted of a large post that was excavated through the fill of Feature 63 (Table 2). Review of the geophysical data determined that this area corresponded to a slightly larger anomaly in the group. It appears that the Feature 63 basin was visible in the data, and its larger signature in part masked the post. Considering the size of Feature 55, it is likely representative of the smaller anomalies creating the ovoid pattern and therefore represents part of a structure, possibly an arbor. It is interesting to note that there is no identifiable associated hearth anomaly in the geophysical data, suggesting seasonal or occasional use of the structure for unknown activities.

Feature 63 (Basin)

Feature 63 was identified as a shallow ovoid basin during excavation (Table 2). The anomaly indicated in this vicinity during the geophysical investigation likely represents this feature, as it is larger than the other anomalies comprising the ovoid pattern. The very northernmost portion of the feature was not excavated, though coring indicated that it did not extend more than about 10 cm beyond the limits of the unit excavation. The loose brown fill contained only sparse amounts of charcoal and burned earth. The feature predates Feature 55 by an unknown amount of time. The limited amount of cultural material recovered from this area precludes identification of any specific activities associated with this basin or the adjacent later ovoid structure.

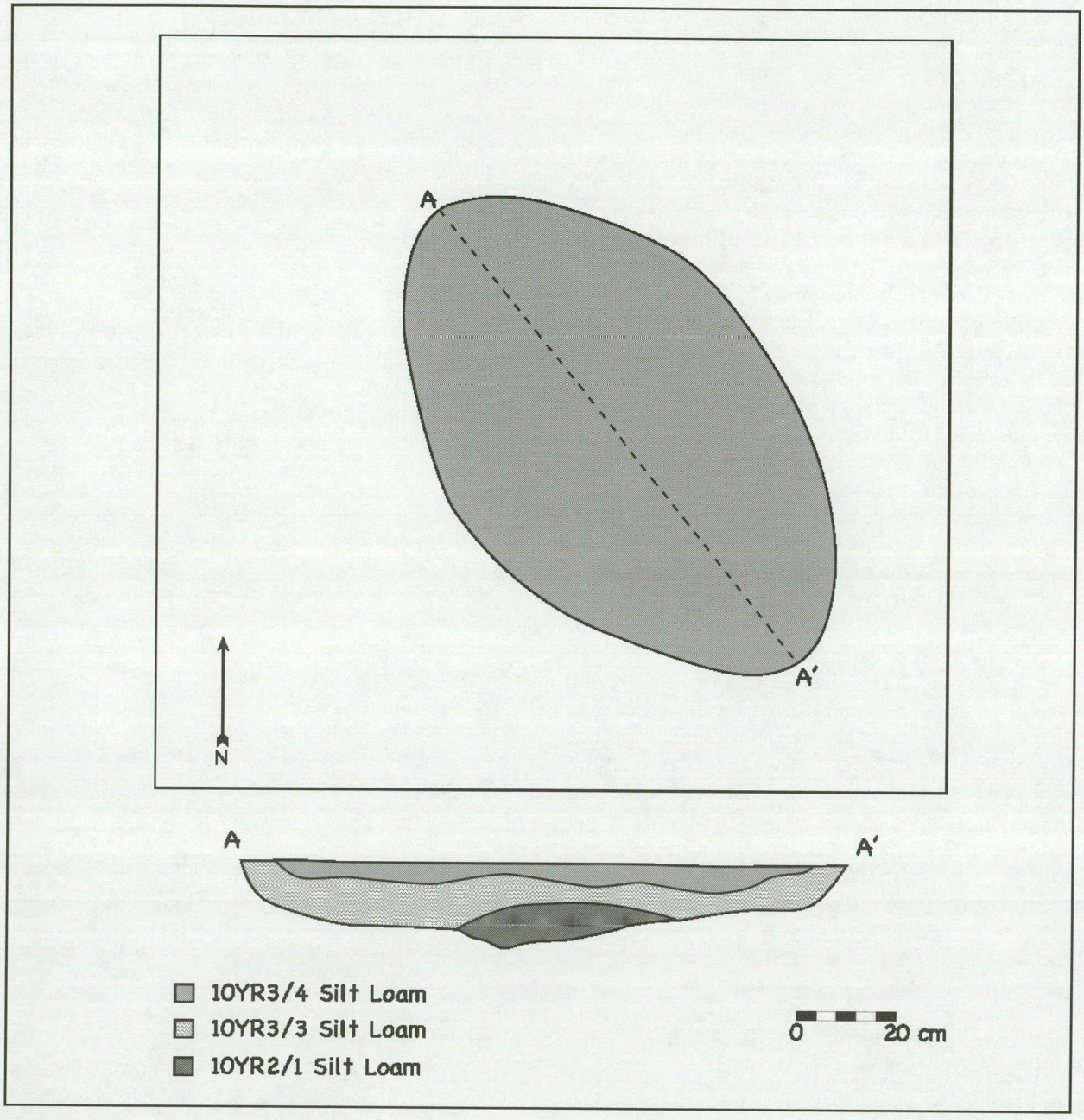


Figure 9. Ovoid basin (Feature 51).

Table 2. Features not Associated with House 2.

Feature Number	Feature Type	Location	Dimensions (cm)	Depth (cm)
51	Oval Basin	SW House 2	145 x 81	25
55	Post	NE House 1	24	38
59	Borrow Pit	NE House 1	n/a	
63	Basin	NE House 1	approx. 90 x 58	22

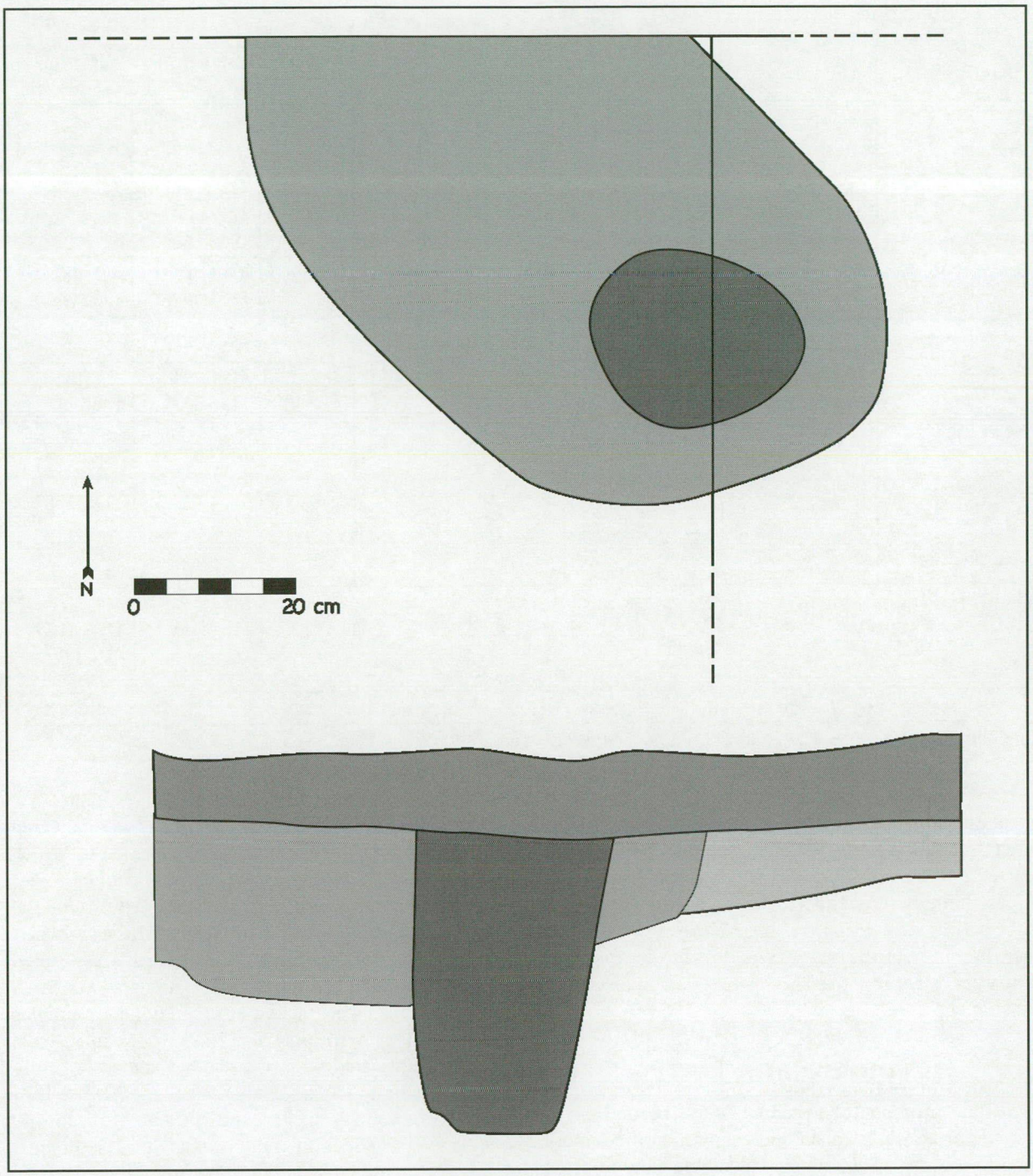


Figure 10. Plan view and cross section of large post (Feature 55).

Feature 59 (Borrow Pit)

Another geophysical anomaly investigated on the southern end of the site was Feature 59 (Table 2). This particular anomaly appeared as a large irregular feature that continued outside of the grid established for the geophysical survey. Excavation revealed the irregular margins of a basin and an undulating floor that was approximately 30 cm deep. The feature continued across the three units established to test this area and extended to the east. Very little material was collected from the loose, dark brown fill. The irregular form, large size, and proximity to the House

Table 3. Radiometric Data.

Lab Number	Provenience	Material	Dating Method	Age+	$d^{13}C$	Cal. 1 sigma range*	Cal. 2 sigma range*
ISGS-5746	Feature 74	Wood Charcoal	Standard	860±70	-25.9	AD 1051-1082 (.19) AD 1126-1135 (.06) AD 1152-1255 (.75)	AD 1033-1269 (1.00)
ISGS-A0569	Feature 74	Bean	AMS	825±25	-8.6	AD 1192-1196 (.04) AD 1207-1257 (.96)	AD 1169-1262 (1.00)
ISGS-A0570	Feature 74	Maize Kernel	AMS	780±60	-9.2	AD 1192-1196 (.02) AD 1207-1283 (.98)	AD 1050-1082 (.03) AD 1125-1136 (.01) AD 1152-1302 (.94) AD 1366-1383 (.02)
Sum of Calibrated Probabilities						AD 1175-1267 (1.00)	AD 1043-1108 (.10) AD 1118-1289 (.90)
+ Radiocarbon years before present							
* Calibration via CALIB v5.0, calibration dataset (Reimer et al. 2004)							

1 mound suggested that this feature may be a borrow area associated with that structure. Material for the earthen house construction would be acquired from areas immediately adjacent to the house. Typically the shallow depressions of these borrows would then be filled in with the waste of daily life. In this case, however, it appears that the feature was not used as a trash receptacle.

Radiocarbon Dates

The presence of several heavily burned posts, as well as a largely intact and easily identified house floor, provided an abundance of datable material from structural features with good context. Shortly after fieldwork concluded, it was decided that the three samples to be submitted would represent a variety of materials. After studying the proveniences and individual samples, three samples were chosen for submission.

One sample, taken from the mass of wood charcoal collected from Feature 74, the northwest central support post, was dated by the standard dating technique. Two specimens of burned annual plants were selected for dating via accelerator mass spectrometry (AMS), as their short growth cycle would provide a narrower standard deviation and provide tighter control on the age range of samples from the structure as a whole. A fragmented and deformed maize kernel with limited research potential as a botanical specimen and a small piece of a bean were picked from soil flotation samples from Feature 74 in unit N70, E26. These samples were closely associated with one another and were firmly associated with House 2.

The samples were submitted to the Isotope Geochemistry Section at the Illinois State Geological Survey for radiocarbon age determination. Results were calibrated using CALIB v5.0 (Stuiver and Reimer 1993). Radiocarbon ages and calibrated dates are reported in Table 3. While somewhat variable, particularly for the two dated annuals, a simple T-test demonstrates that the three dates are statistically the same at the 95 percent confidence level. Based on these three samples, House 2 at 14MP407 probably was occupied sometime in the early to mid-twelfth century to as late as the mid-thirteenth century.



Figure 11. Selected ceramic sherds.

Artifacts

Ceramics

The 14MP407 pottery collection includes at total of 33 rim sherds, some of which conjoin with others confidently to represent single vessels (Figure 11, Table 4). The rim sherd assemblage represents at least 17 vessels, with one small rim sherd fragment not included in this total. Fourteen of the vessels came from the house floor, and three were identified from the mound fill. Fourteen vessels are cordmarked to varying degrees, all but one from the house floor. Of the three identified plain ware vessels, two came from the mound fill.

Vessels represent Riley Flaring Plain (n=9) and Riley Flaring Tool Impressed (n=5). Several rims with little indication of orientation were sorted into one of these two groups, based on the presence or absence of decoration. No collared rims were found in the collection. Additional rims with in-sloping orientations were identified as examples of "coconut jars."

The typical vessel form represented at the site—based on limited reconstructions and larger sherds—is a globular jar with constricted orifice, neck of medium height, rounded to slightly angular shoulders, and rounded base. Most reconstructed vessel portions and many smaller sections indicate a common size, ranging from 4 to 6 liters, although smaller vessels of varying capacities may be present. Also identified was a small, constricted orifice bowl or jar that lacks a neck, commonly referred to as a "coconut jar." These vessels have no place in previously defined Smoky Hill phase ceramic typology, though their presence has been noted at other sites in the region (Roper 2001).

When present, vessel decoration is limited to the lip area, with oblique impressed lines being most common (n=4). One example of a punctated lip is recognized among ceramics that are readily identified with the Smoky Hill phase component. The proportion of decoration appears to be quite high when compared with other analyzed Smoky Hill ceramic assemblages along the lower Smoky Hill River (Roper 2001, 2003; Latham herein).

Eleven vessel rims yielded measures of rim height: four measuring less than 4 cm in height (2.24-3.87 cm) and seven greater than that mark (4.06-5.23 cm). Rims exhibit a variety of tempers, including sand (n=4), clay/grog (n=3), and a combination of clay/grog with a soft white mineral, possibly gypsum. This latter

material eroded easily, leaving vessel surfaces covered with small angular to sub-angular pits, measuring from less than 1 mm to more than 3 mm in diameter. Rim thicknesses range from 3.7 to 10 mm, with most measurements falling between 4.5 and 7 mm.

Several sherd lots dominate the collection of body sherds. Analysis of the body sherds was limited to sherds larger than 3 cm^2, while attempts were made to group like sherds rather than measure individual sherds within sherd lots. This was particularly useful in light of the large number of sherds from relatively few vessels. A total of 168 body sherds and sherd lots were studied. Sherd lots typically are represented by two to four sherds and occasionally by five to seven sherds. Several groups of sherds representing significant portions of vessels were analyzed collectively; these batches consist of 29, 30, and 75 sherds. Other analyzed individual specimens were noted to be nearly identical to one of these sherd groups, particularly individually piece-plotted specimens from units N70/E24-25 and N71/E27.

Four pottery complexes were encountered during the House 2 excavation, with two located on the house floor along the west wall of the structure in the vicinity of units N69/E24 and N70/E24-E25. Both complexes included oblique impressed rim sherds (one vessel left oriented, one right oriented) and numerous body sherds. While obviously representing two distinct vessels—based on the differences in decoration and subtle variation of the orientation and thickness of the rims—the overall characteristics of the sherds in each group are quite similar in color (buff to light orange), thickness (4.7-9.3 mm and 5.8-8.9 mm), and temper (clay/grog and mineral). Other sherds from the general vicinity are similar to these sherd clusters but could not confidently be assigned to either group unless a specimen happened to conjoin with a sherd from one of the clusters. Another large sherd cluster from the floor near the north wall appears similar and may be a portion of one of these vessels or perhaps a third vessel with comparable characteristics. The fourth sherd complex, recovered in unit N69/E25 on the house floor, represents a clay-tempered vessel, and many associated sherds exhibit breakage along coils. At least three vessels and dozens of individual sherds are represented among these ceramic complexes.

A sixth decorated vessel consisting of two

Table 4. Ceramic Rim Sherds.

Provenience Number	N	E	Depth (cm)	Location	Rim Form	Rim Height (cm)	Rim Angle	Lip Type	Decoration	Exterior Surface	Temper	Minimum Thickness (MM)	Maximum Thickness (MM)	Size (L)	Weight (g)
230	70	26	36	House Floor				Flat		Smooth Cord	Sand	5.2	5.8	<3	3.6
131	69	24	18-27	House Floor	Inverted	4.78		Rounded		Smooth Cord	Clay	4.4	8	7	41.6
190	70	24	20-30	House Floor	Everted			Flat	Yes	Smooth Cord	Mineral/Clay	5.2	6.9	3	8.8
199	68	29	10-20	Mound Fill	Vertical			Rounded	Yes	Plain	Fine-Medium Sand	3.3	3.9	<3	2.9
363	69	30	0-10	Mound Fill	Vertical			Rounded	Yes	Plain	Fine-Medium Sand	3.1	4.4	<3	3.4
209-1	67	25	23	House Floor	Inverted	4.23	12°	Rounded		Smooth Cord	Clay	4.8	9.5	7	58.2
504-1,2	69	25	34	House Floor	Flaring	4.06	20°	Rounded		Smooth Cord	Clay	5.6	9.7	7+	75.6
396	70	25	29	House Floor	Inverted	5.23	5°	Flat	Yes	Smooth Cord	Mineral/Clay	5.5	7.2	7+	89.5

131-18,28	69	24	20-30	House Floor	Everted	5.30	12°	Flat	Yes	Smooth Cord	Mineral/Clay	4.8	7.2	7+	50.6
448-1	70	31	33.5	House Floor	Everted			Flat	Yes	Smooth Cord	Mineral/Clay	4.6	6.2	3	9.9
387-1	70	25	29	House Floor	Everted			Flat	Yes	Smooth Cord	Mineral/Clay	4.6	6.4		11.1
350-4	69	25	0-10	Mound Fill				Rounded		Smooth Cord	Clay	4.6	6.4	<3	1.0
121-1,2	67	27	30-40	House Floor				Flat		Smooth Cord	Fine-Medium sand	4.3	7.8	4	8.7
100-1	69	26	45	House Floor	Vertical			Flat		Smooth Cord	Mineral/Clay	5.7	8.5	3	7.9
250-1	70	27	10-20	Mound Fill				Rounded		Plain	Mineral/Clay	6.2	6.6	<3	2.0
46-1	66	26	30	House Floor	Inverted			Rounded		Smooth Cord	Mineral/Clay	4.8	7.2	3	4.2
230-1,2	70	26	36	House Floor	Everted		13°	Flat		Smooth Cord	Clay	5.8	8.5	7	52.1
233-1	67	28	12	Mound Fill	Flaring	2.88		Flat		Smooth Cord	Mineral/Clay	4.3	6.1	4	7.1
286-1,2	70	26	41	Feature 74	Everted	4.81	12°	Flat		Smooth Cord	Sand	4.5	7.6	7	37.1
359-1,2	71	26	20-30	House Floor	Everted	2.92	11°	Flat		Smooth Cord	Clay	5.6	9.1	3	11.5
443-1	66	32	27	House Floor	Flaring			Flat		Smooth Cord	Mineral/Clay	5.7	6.7	3	5.4
443-2	66	32	27	House Floor	Flaring	2.24		Rounded		Smooth Cord	Mineral/Clay	4.8	5.7	3	4.9
487-1	69	25	20-30	House Floor				Flat		Smooth Cord	Clay	5.7	7.6	<3	4.0
493-1	69	25	33	House Floor	Vertical	4.69		Flat	Yes	Smooth Cord	Mineral/Clay	4.8	9.3	7+	37.4
511-1	65	25	30-40	House Floor	Everted	4.97	8°	Rounded		Smooth Cord	Mineral/Clay	5.7	10	6	32.5
515-1	66	32	30-40	House Floor				Rounded	Yes	Plain	Fine-Medium Sand	4.8	5.8	<3	24.5
326-1	67	28	50	House Floor	Flaring	3.87	19°	Rounded	Yes	Smooth Cord	Fine-Medium Sand	3.7	9.4	4	2.7

rim sherds was identified in the upper portion of the mound fill. This particular vessel was not included in the statistics of Smoky Hill ceramics, as it departs from typical Smoky Hill ceramic traits at several points: fine to medium sand temper, texture, plain surface treatment, sherd thickness of 2.5-6.7 mm, and decoration punctated to such a degree as to create a crenulated lip. The rim sherds and all analyzed body sherds with plain surfaces and thin overall sherd thicknesses came from a discrete area of the site, although individual specimens were scattered vertically within these units. Rims came from the 10-20-cm level of unit N68/E29 and the 0-10-cm level of N69/E30. Three plain ware sherds (in one instance, a sherd lot) come from the 10-20-cm level of N68/E29, the 20-30-cm level of N68/E28, and the 30-40-cm level of N70/E31, all units in the northeast quadrant of the mound excavation. Together these artifacts indicate a strong association with proveniences near the surface. While the site showed very little evidence of use aside from the Smoky Hill habitation, this group of sherds and a near-surface, early Historic period occupation are indicative of a minor component at the site, possibly related to nearby Great Bend aspect habitations, such as 14MP1, 14MP408, and 14MP459.

Chipped Stone

Lithic Cache

A cache of flakes was recovered from the extreme southwest corner of a trench that was excavated across the eastern portion of the House 2 mound by local avocationals in the early 1990s. The depression of this backfilled trench was readily visible prior to the 2004 excavation. Based on the description of the find spot and this visible remnant of that previous work, the cache likely came from the southeast corner of the lodge, somewhere in the vicinity (plus or minus 1 m) of coordinate N65.50/E31. This collection of tools and tool stone has some bearing on the results of the 2004 excavations and the interpretation of various aspects of the material assemblage.

The cache consists of 105 chert flakes and flake fragments, weighing 3,344.9 g, and a single quartzite hammerstone. The flakes were found stacked in what was likely a small pocket cache, measuring approximately 20 cm in diameter and 20 cm deep. The hammerstone was found at the base of the cache. The flakes are a distinctive tan variety of Florence chert and are quite homogenous in color, texture, and physical features (inclusions, banding near the exterior of the nodule, cortex when present, etc.), suggesting that they likely came from a single chert nodule. Despite the commonalities, only three flakes from the collection could be refitted.

This small collection is very different from the chipped stone debris recovered from the House 2 excavation in several key traits. Platforms, when present, typically exhibit a single facet/plane and evidence of a steep removal angle (often 60-80°, averaging 71°), indicating that the flakes are part of a core reduction process, versus being products of a biface reduction continuum. Cortex is often present (83.8 percent) in variable quantities; mostly secondary decortication or tertiary flakes with residual cortex are identified, with only a few primary decortication flakes noted.

During analysis of the excavated collections from the House 2 vicinity, eight unifaces were recognized that have similar traits and, therefore, are believed to originate from this cache/nodule (Table 5). Interestingly, in all cases the artifacts were recovered from a depth consistent with the floor zone of the structure. Twelve other examples (10 unifaces and 2 bifaces) are similar enough to consider that they, too, originally were part of this cache/nodule. This group came from a number of areas, including the house floor (n=8), general house mound fill (n=3), and areas adjacent to the outside of the structure (n=1). Eighty percent of these artifacts came from the lodge floor, and the collection represents more than a fifth (21.1 percent) of the total inventory of unifaces from the House 2 mound excavation. These facts indicate that the cache was not only in use at the time of lodge abandonment, but also was playing a significant role in equipping the household—from expedient use tools on simple flakes to more formal tools, such as end scrapers and projectile points. Collectively these tools were used to perform a wide variety of tasks. This point also lends support to the notion that the apparent burning of the structure might have occurred while it still served as an abode rather than after abandonment. Otherwise, why not recover/remove a valuable commodity like the cache of tool stone?

Projectile Points

Portions of 22 arrow points were recovered from various proveniences (Figure 12, Table 6), primarily in the house floor zone (n=18). Single side-notched Washita types dominate the group (n=11), with unnotched Fresno types (n=5) and side- and basal-notched Harrell types (n=2) also identified. Additionally, four fragments were confidently assigned to this artifact class, based on biface size, finish, and in some cases breakage pattern (i.e., impact fractures). One of these broken points consists of a blade broken at a set of side-notches; from the remaining portion it

Table 5. House 2 Excavated Artifacts that May Be Related to Previously Collected Lithic Cache.

Provenience Number	N	E	Depth (cm)	Location	Description	Material	Portion	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	Cortex	Heated
429-1	71	30	24	House Floor	Endscraper	Tan Florence	Complete	51.3	23.13	10.45	15.1		
44-1	67	28	20	Mound Fill	Endscraper	Tan Florence	Complete	34.92	23.73	8.76	7.6		
15-1	63	27	0-10	Exterior	Endscraper	Tan Florence	Proximal				5.5		
522-1	72	25	20-30	House Floor	Modified Flake	Tan Florence	Proximal		31.61	8.68	7.9		
87-1	66	26	20-30	House Floor	Modified Flake	Tan Florence	Medial				4.9		Yes
481-1	69	25	27	House Floor	Preform	Tan Florence	Proximal		16.23	3.83	1.7		
32-1	68	24	10-20	Mound Fill	Modified Flake	Tan Florence	Distal		16.16	2.54	0.7		
280-1	67	25	33	House Floor	Endscraper	Tan Florence	Medial				9.0		
283-1	71	27	31	House Floor	Sidescraper	Tan Florence	Proximal		22.7	6.66	5.6		
236-1	67	25	29	House Floor	Endscraper	Tan Florence	Distal		21.18	11.29	13.8		
305-1	66	23	18	House Floor	Fresno Pt.	Tan Florence	Complete	24.34	15.72	3.51	1.2		
65-2	67	24	10-20	Mound Fill	Modified Flake	Tan Florence	Medial				4.4		Yes
235-1	67	25	29	House Floor	Endscraper	Tan Florence	Distal		19.06	8.38	4.2		
401-1	70	25	25	House Floor	Endscraper	Tan Florence	Complete	24.96	19.6	4.44	2.2		
486-1	69	25	27	House Floor	Sidescraper	Tan Florence	Complete	78.96	23.67	13.89	24.0	Yes	
306-1	71	27	32	House Floor	Sidescraper	Tan Florence	Complete	35.48	15.98	4.67	2.4		
400-1	70	25	25	House Floor	Modified Flake	Tan Florence	Complete	60.57	41.78	10.64	17.1	Yes	
514-1	65	30	30-40	House Floor	Modified Flake	Tan Florence	Complete	51.25	52.85	10.03	21.1	Yes	Yes
437	72	27	31.5	House Floor	Modified Flake	Tan Florence	Complete	95.78	54.48	14.61	73.2	Yes	
48-1	68	24	25	House Floor	Sidescraper	Tan Florence	Complete	61.54	30.23	15.13	25.0	Yes	



Figure 12. Selected projectile points and knives.

Table 6. Projectile Points.

Provenience Number	N	E	Depth (cm)	Location	Description	Material	Portion	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	Heated
329-1	70	27	38	House Floor	Washita / Perforator	Florence B	Complete	46.53	14.7	4.88	2.8	Yes
420-3	70	27	30-40	House Floor	Washita	Florence	Proximal		14.83		0.3	Yes
420-1	70	27	30-40	House Floor	Washita	Florence	Complete	26.87	14.17	3.83	1.1	Yes
294-1	66	23	18	House Floor	Washita	Florence	Complete	32.52	15.18	3.14	1.4	Yes
268-1	70	29	30-40	House Floor	Washita	Florence	Proximal		12.38		0.2	Yes
40-1	68	24	18	House Floor	Washita	Florence	Proximal		15.57	3.88	1.2	Yes
55-1	67	30	39	House Floor	Washita	Florence B	Complete	13.25	13.08	2.52	0.3	Yes
315-1	66	24	20-30	House Floor	Proj.	Florence	Distal				0.8	Yes
510-1	65	25	20-30	House Floor	Harrell	Florence	Complete	27.58	12.31	3.63	0.9	Yes
359-5	71	26	20-30	House Floor	Fresno	Florence	Lateral				0.2	Yes
185-1	64	27	30-40	House Floor	Fresno	Florence C	Complete	19.58	13.63	3.35	0.7	Yes
42-2	68	24	19	House Floor	Fresno	Florence C	Proximal				0.4	Yes
464-1	70	25	20-30	House Floor	Fresno	Mississippian	Proximal				0.7	Yes
83-1	66	26	40	House Floor	Washita	Florence B	Complete	18.58	11.93	2.85	0.5	
513-1	65	30	20-30	House Floor	Washita	Smoky Hill Jasper	Proximal		13.3	2.79	0.4	
449-1	64	29	20-30	House Floor	Proj.	Florence C	Distal				0.3	
79-2	69	25	20-30	House Floor	Fresno	Florence	Proximal		14.59	2.87	0.8	
305-1	66	23	18	House Floor	Fresno	Tan Florence	Complete	24.34	15.72	3.51	1.2	
32-2	68	24	10-20	Mound Fill	Washita	Florence B	Proximal		11.97	2.97	0.6	Yes
43-1	67	30	14	Mound Fill	Harrell	Florence C	Proximal		11.72	3.25	0.4	Yes
256	66	24	0-10	Mound Fill	Washita	Alibates	Proximal		13.94	2.55	0.4	
54-1	69	27	10-20	Mound Fill	Washita	Florence B	Complete	23.54	12.43	3.35	0.8	
422-1	70	31	10-20	Mound Fill	Proj.	Florence	Distal				0.5	
187-1	67	31	10-20	Mound Fill	Proj.	Florence B	Distal				0.3	



Figure 13. Selected bifaces and unifaces.

cannot be ascertained whether this was a Washita or Harrell type.

This class of artifacts exhibits a wide variety of raw material types not noted in other classes of tools or debitage. Projectile points typically were manufactured from Flint Hills Permian chert, identified specifically with the Florence formation (n=21). Occasionally the specific variety of Florence chert can be designated, and in these instances the material is invariably Florence B (n=6) and Florence C (n=4). Other notable sources include Alibates agatized dolomite (n=1), Smoky Hill jasper (n=1), and Mississippian chert (n=1). Evidence of thermal alteration is common (62.5 percent overall), but differences are apparent between examples from the house floor and those from the mound fill. Most projectile points from the house floor are thermally altered (n=13, 72.2 percent), while few from the house mound fill show evidence of such alteration (n=2, 33.3 percent). Four specimens exhibit evidence of burning or other forms of negative thermal alteration (crazing, heat fracturing, etc.), including three from the house floor and one from the mound fill. Considering that the house was at least partially consumed by fire, this dichotomy may depict thermal alteration by a burning structure as opposed to intentional heat treatment as a step in the lithic reduction process. That being said, these differences are not typically noted among other artifact classes or between debitage collections from the mound fill and those from the house floor zone.

One interesting specimen is of a Washita point of particularly large dimensions (Figure 12). This specimen of heat-treated Florence B chert is notably longer and thicker than other artifacts in its class. It exhibits significant edge rounding and crushing, resulting in small stepped and hinged removals in the distal one-fourth to one-third of the blade. This modification is reminiscent of use-wear noted on drills and other perforators and is considered to represent an additional function performed by this tool in addition to, though not necessarily in conjunction with, its original function as a projectile point.

Bifaces/Knives

Eleven pieces of medium to large bifaces and five smaller bifaces were collected from various levels (Figure 13, Table 7). Thermal alteration, when noted at all, typically was associated with burning and/or heat fracturing and not necessarily with intentional treatment of the material. The raw material for all of

Table 7. Other Bifaces.

Provenience Number	N	E	Depth	Location	Description	Material	Portion	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	Heated
215-1	67	31	20-30	House Floor	Preform	Florence	Distal			3.25	0.9	Yes
481-1	69	25	27	House Floor	Preform	Tan Florence	Proximal		16.23	3.83	1.7	
142-1	67	31	15	Mound Fill	Preform	Florence	Complete	23.05	16.59	2.78	0.9	Yes
32-3	68	24	10-20	Mound Fill	Preform	Florence	Medial				0.9	Yes
357-1	70	31	0-10	Mound Fill	Preform	Florence C	Proximal		15.16	4.88	2.4	
377-1	68	25	34	House Floor	Mid-stage Biface	Florence B	Proximal		39.26	11.96	15.4	
332-1	70	27	36	House Floor	Mid-stage Biface	Florence B	Medial		39.15	11.35	21.8	
239-1	67	25	32	House Floor	Mid-stage Biface	Florence B	Complete	42.97	30.78	10.33	13.1	Yes
42-1	68	24	19	House Floor	Mid-stage Biface	Florence B	Medial				1.5	Yes
457-1	66	32	0-10	Mound Fill	Mid-stage Biface	Florence	Distal				8.2	Yes
56-1	63	27	18.5	Exterior	Bifacial Knife	Florence B	Distal				3.5	Yes
197-1	67	25	0-10	Mound Fill	Bifacial Knife	Florence	Medial				1.8	
206-1	63	27	21	Exterior	Bifacial Knife	Florence C	Medial				9.1	
414-2	66	25	20-30	House Floor	Bifacial Knife	Florence	Distal				2.3	Yes
248-1	68	30	0-10	Mound Fill	Bifacial Knife	Florence C	Distal				1.3	
318-1	67	32	20-30	House Floor	Alt. Bev. Knife	Florence	Medial		27.63	6.75	11.9	Yes
485-1	69	25	25	House Floor	Drill	Florence C	Proximal				3.3	Yes

these items, when noted, is Florence chert, varieties B and C.

Five bifaces were identified simply as intermediate stage bifaces, likely tool blanks. Only one complete specimen was recovered, although most are large enough to offer some indication of their form and function. The artifacts exhibit width-thickness ratios of 3:1 and have no visible evidence of modification beyond the percussion flaking that formed them. All except one piece came from the floor of the lodge and were manufactured from Florence B chert. The remaining biface, fashioned from Florence C chert, came from the mound fill.

Bifaces with evidence of retouch, primarily along lateral margins, generally consist of smaller fragments that yield little information about their original sizes and forms. In all cases the tools are B and C varieties of Florence chert. One specimen was identified as the mid-section of an alternately beveled knife. Another smaller fragment also has a beveled edge. Both beveled knives came from the house floor. Yet another fragment exhibits heavily worn lateral margins, including one segment that appears to have use-wear consistent with a spokeshave function. The rest consist of small, relatively nondescript fragments. Interestingly, two fragments came from the excavation area immediately south of the structure.

Five bifaces created on small flakes were identified as projectile point performs. Highly fragmented as a class overall, width-thickness ratios of two specimens are in the range of 5:1. Only two were associated with the house floor; the remaining three came from the overlying mound fill. All specimens were made of Florence chert, including one specimen that appears to be made from the cache stone.

Drills/Perforators

Several objects were recovered that have characteristics consistent with drilling and perforating activities. One is a small bifacial tool fragment identified as a drill, while three others are perforators made from chert flakes (Table 8). The flake tools exhibit lateral edge wear and occasional retouch and modified blunt tips consistent with a perforating function. All artifacts in this class were made from Florence chert and came from the floor of the structure.

End/Side Scrapers

The largest functional tool class consists of scrapers (Figure 13, Table 8). Steep retouch is typical of this category with stepped/crushed areas and minute hinged removals along the working edge, commonly recognized as evidence of intensive use. Seven are identified as side scrapers with their primary, often only, evidence of retouch and use located on one or occasionally both lateral margins. Five specimens came from the house floor, including one example of Mississippian chert and four tools manufactured from material very similar to the lithic cache material (Table 8). Two artifacts have cortex on their dorsal surfaces. The Mississippian chert tool is the only item bearing evidence of thermal alteration, probably intentional heat treatment. The other two specimens came from the mound fill and were manufactured from gray Florence chert.

Flake tools with evidence of retouch and use directed primarily toward the distal end of the flake are classified as end scrapers (n=23). Among six complete specimens (and occasional other specimens for which measurements could be acquired), measurements of maximum length and thickness varied widely, while width was more standardized. Thirteen end scrapers were collected from the floor of the lodge, eight from the mound fill, and two from the area outside the south wall of the structure. Seven tools were made from material similar to that in the lithic cache: five of these came from the house floor, while single examples were recovered from the mound fill and the exterior (south) of the house. No instances of thermal alteration were noted for these specimens. Fifteen end scrapers are of Florence chert, with 11 (73.3 percent) made from Florence B chert. Thermal alteration, likely intentional treatment, is common among the Florence specimens (n=11, 73.3 percent), including examples of both Florence B and Florence C chert. Four end scrapers came from the house floor and immediate vicinity of the Feature 77 basin. End and side scrapers were collected mostly from areas to the west and north of the central living area (n=18, 72.2 percent), although examples were also recovered from the south and east portions of the house.

Spokeshaves

Three flake tools, all found on the house floor, were identified with functional use as spokeshaves (Table 8). Two were made on relatively small flakes of Florence chert that were thermally altered (one obviously burned). Each exhibits a small steeply retouched notch or concavity with evidence of use in the form of small stepped areas and minute hinge removals. The third specimen (Figure 13) is of large proportions, manufactured on a Florence B flake that was the biggest piece of chipped stone collected during the excavation. In keeping with the large scale

Table 8. Unifaces.

Provenience Number	N	E	Depth	Location	Description	Material	Portion	ML	MW	MTH	WGT	Cortex	TA
38	64	27	17	Exterior	Endscraper	Florence B	Complete	54.01	22.6	12.24	14.7		Yes
15-1	63	27	0-10	Exterior	Endscraper	Tan Florence	Proximal				5.5		
45-1	66	26	29	House Floor	Endscraper	Flattop	Complete	33.42	19.3	7.87	5.7		
366-1	69	29	27	House Floor	Endscraper	Florence	Proximal				9.8		Yes
237-1	67	25	27	House Floor	Endscraper	Florence B	Complete	45.64	23.85	11.35	13.9		
211-2	71	27	30	House Floor	Endscraper	Florence B	Proximal				5.0		
81-1	67	29	49	House Floor	Endscraper	Florence B	Complete	21.59	17.29	4.45	1.5		
454-1	65	28	20-30	House Floor	Endscraper	Florence B	Lateral				0.6		Yes
317-1	67	28	30-40	House Floor	Endscraper	Florence C	Medial				0.8		Yes
122-1	64	27	20-30	House Floor	Endscraper	Florence C	Lateral				1.1		Yes
429-1	71	30	24	House Floor	Endscraper	Tan Florence	Complete	51.3	23.13	10.45	15.1		
280-1	67	25	33	House Floor	Endscraper	Tan Florence	Medial				9.0		
236-1	67	25	29	House Floor	Endscraper	Tan Florence	Distal		21.18	11.29	13.8		
235-1	67	25	29	House Floor	Endscraper	Tan Florence	Distal		19.06	8.38	4.2		
401-1	70	25	25	House Floor	Endscraper	Tan Florence	Complete	24.96	19.6	4.44	2.2		
19-1	65	27	0-10	Mound Fill	Endscraper	Florence	Medial				2.6		Yes
22-1	66	27	0-10	Mound Fill	Endscraper	Florence B	Distal		24.87	8.35	4.0		Yes
244-1	67	28	0-10	Mound Fill	Endscraper	Florence B	Medial				1.8		Yes
254-1	66	23	0-10	Mound Fill	Endscraper	Florence B	Medial				5.8		Yes
455-1	65	30	10-20	Mound Fill	Endscraper	Florence B	Lateral				0.5		Yes
275-1	66	24	13	Mound Fill	Endscraper	Florence B	Distal				1.7		Yes
34-1	68	27	0-10	Mound Fill	Endscraper	Florence B	Distal				3.2		
44-1	67	28	20	Mound Fill	Endscraper	Tan Florence	Complete	34.92	23.73	8.76	7.6		
477-1	69	25	26	House Floor	Sidescraper	Mississippian	Proximal		14.57	4.87	2.1		Yes
283-1	71	27	31	House Floor	Sidescraper	Tan Florence	Proximal		22.7	6.66	5.6		
486-1	69	25	27	House Floor	Sidescraper	Tan Florence	Complete	78.96	23.67	13.89	24.0	L	

Continues on next page.

Provenience Number	N	E	Depth	Location	Description	Material	Portion	ML	MW	MTH	WGT	Cortex	TA
306-1	71	27	32	House Floor	Sidescraper	Tan Florence	Complete	35.48	15.98	4.67	2.4		
48-1	68	24	25	House Floor	Sidescraper	Tan Florence	Complete	61.54	30.23	15.13	25.0	P	
6	66	26	0-10	Mound Fill	Sidescraper	Florence	Distal				6.5		
277-1	67	28	29	Mound Fill	Sidescraper	Florence	Complete	67.41	31.99	11.31	24.9	D	
359-4	71	26	20-30	House Floor	Spokeshave	Florence B	Complete	17.98	8.66	2.22	0.4		Yes
293-1	71	27	32	House Floor	Spokeshave	Florence	Complete	31.99	18.04	6.22	3.2	D	Yes
99-1	69	24	?	House Floor	Spokeshave	Florence B	Complete	88.41	89.3	14.92	94.7		
47	67	26	34	House Floor	Flake Perforator	Florence	Complete	25.32	15.76	6.23	1.9		Yes
414-1	66	25	20-30	House Floor	Flake Perforator	Florence B	Distal				3.4		Yes
470-1	72	27	20-30	House Floor	Flake Perforator	Florence B	Complete	42.97	16.17	3.6	1.8		
205	63	27	21	Exterior	Modified Flake	Florence B	Medial				3.1		
15-2	63	27	0-10	Exterior	Modified Flake	Florence C	Complete	26.96	22.26	3.49	1.8		Yes
379-2	70	29	89	F 75 Post	Modified Flake	Florence	Distal				2.0		Yes
379	70	29	89	F 75 Post	Modified Flake	Florence B	Proximal				2.4		Yes
298-1	70	29	63.5	F 75 Post	Modified Flake	Florence B	Proximal				3.1		
79-1	69	25	20-30	House Floor	Modified Flake	Chalcedony	Distal				0.2		
424-3	71	30	20-30	House Floor	Modified Flake	Florence	Medial				1.5		Yes
253-1	68	29	20-30	House Floor	Modified Flake	Florence	Proximal				7.3		Yes
290-1	71	25	23.5	House Floor	Modified Flake	Florence	Proximal		37.64	9.44	12.3		Yes
519-1	68	28	40-50	House Floor	Modified Flake	Florence	Lateral				6.6		Yes
103	69	24	20	House Floor	Modified Flake	Florence	Distal		29.74	9.86	17.8		Yes
360-2	71	27	30-40	House Floor	Modified Flake	Florence A	Distal				1.9		Yes
359-3	71	26	20-30	House Floor	Modified Flake	Florence B	Proximal				2.0		Yes
420-2	70	27	30-40	House Floor	Modified Flake	Florence B	Proximal				1.2		
70	64	27	31.5	House Floor	Modified Flake	Florence B	Complete	24.76	22.52	2.92	1.7		
360-3	71	27	30-40	House Floor	Modified Flake	Florence B	Distal				1.6		
365-1	64	29	18.5	House Floor	modified flake	Florence B	Lateral				5.9		
516-1	69	25	20-30	House Floor	modified flake	Florence B	Proximal				7.8		

424-2	71	30	20-30	House Floor	Modified Flake	Florence B	Lateral				0.9		Yes
318-2	67	32	20-30	House Floor	Modified Flake	Florence B	Medial				3.0		Yes
152-1	66	27	30-40	House Floor	Modified Flake	Florence B	Medial				1.3		Yes
512-3	65	28	40-50	House Floor	Modified Flake	Florence B	Medial				1.1		Yes
412-3	65	24	20-30	House Floor	Modified Flake	Florence B	Distal				1.8		Yes
122-1	64	27	20-30	House Floor	Modified Flake	Florence B	Lateral				1.1		Yes
192-1	67	31	25	House Floor	Modified Flake	Florence C	Proximal		29.43	2.76	2.9		
243-1	67	25	20-30	House Floor	Modified Flake	Florence C	Medial				2.1		
513-2	65	30	20-30	House Floor	Modified Flake	Florence C	Complete	29.76	12.62	2.92	1.1		
211-1	71	27	30	House Floor	Modified Flake	Florence C	Complete	36.04	28.67	3.91	3.7		Yes
522-1	72	25	20-30	House Floor	Modified Flake	Tan Florence	Proximal		31.61	8.68	7.9		
87-1	66	26	20-30	House Floor	Modified Flake	Tan Florence	Medial				4.9		Yes
400-1	70	25	25	House Floor	Modified Flake	Tan Florence	Complete	60.57	41.78	10.64	17.1	P	
514-1	65	30	30-40	House Floor	Modified Flake	Tan Florence	Complete	51.25	52.85	10.03	21.1	D	Yes
437	72	27	31.5	House Floor	Modified Flake	Tan Florence	Complete	95.78	54.48	14.61	73.2	P	
267-3	70	27	20-30	House Floor	Modified Flake	Florence B	Complete	24.99	18.83	4.49	1.4		Yes
54-2	69	27	10-20	Mound Fill	Modified Flake	Florence B	Proximal				1.5		
444-1	66	32	21-26	Mound Fill	Modified Flake	Florence B	Complete	35.11	33.98	4.54	4.7		Yes
232-1	66	24	2	Mound Fill	Modified Flake	Florence B	Proximal		16.17	3.55	1.9		Yes
340	64	29	0-10	Mound Fill	Modified Flake	Florence C	Distal				0.9		Yes
22-2	66	27	0-10	Mound Fill	Modified Flake	Florence C	Complete	43.43	24.96	4.26	4.2		
50-1	67	23	11	Mound Fill	Modified Flake	Florence C	Medial				5.0		
188-1	67	31		Mound Fill	Modified Flake	Florence C	Medial				2.4		
357-2	70	31	0-10	Mound Fill	Modified Flake	Florence C	Complete	24.58	17.93	4.61	1.8		Yes
452-1	65	25	10-20	Mound Fill	Modified Flake	Florence C	Medial				0.8		Yes
7-1	68	24	0-10	Mound Fill	Modified Flake	Florence C	Medial				1.3		Yes
226-1	68	26	0-10	Mound Fill	Modified Flake	Florence C	Lateral				5.0		Yes
28	67	28	10-20	Mound Fill	Modified Flake	Florence C	Distal				1.4		Yes
32-1	68	24	10-20	Mound Fill	Modified Flake	Tan Florence	Distal		16.16	2.54	0.7		
65-2	67	24	10-20	Mound Fill	Modified Flake	Tan Florence	Medial				4.4		Yes

of the tool, the steeply retouched concave working area encompasses one full side of the flake. This tool came from the house floor along the west wall of the lodge.

Modified Flakes

Modification consists of light flaking generally along lateral margins and occasional steep retouch along portions of one or both lateral edges. Much of this modification is assumed to be the result of expedient use in cutting and/or scraping activities, although similar alterations are possible inadvertently and are not necessarily the result of use. Typically these flakes are moderate in size (around 3-4 cm), although larger examples also were noted (Table 8).

The majority of these modified flakes (n=32, 66.6 percent) come from within the house, either from the floor (n=29) or the fill of the northeast central support post (n=3). Most were identified as either Florence B or Florence C chert, although single examples are Florence A and chalcedony. Interestingly, Florence B chert was commonly associated with flakes from the house floor, while Florence C chert was a common material in the overlying mound fill. Seven of the flakes (five floor, two mound fill) might be related to the lithic cache feature (Table 8).

Debitage

Chipped stone debris as a group is quite homogenous in raw material type and flake size. Taking this into account, a sampling strategy was employed for the analysis of this aspect of the 14MP407 artifact assemblage. The sources of this sample are proveniences from which other chipped stone artifacts were recovered. An additional 25 proveniences were selected at random to increase the sample size. Ultimately, 146 unit-level proveniences, yielding 1,196 individual items, were included in the sample. Some 196 additional proveniences contained chipped stone debris that was subjected to visual inspection for any unique characteristics that were not identified during the debitage sample analysis. House floor debitage (n=711) accounts for 60.6 percent of the sample, while the mound fill (n=387) makes up 33.0 percent of the assemblage. The remaining 6.4 percent (n=75) came from the exterior of the structure or proveniences within the house mound area that were not differentiated between the floor and mound fill zones.

Flake size was determined through grading: Grade 1 consists of flakes approximating 1 cm or smaller in size, Grade 2 consists of flakes 1-2 cm in maximum dimension, etc. Using this scale, 92.3 percent (n=1104) of the debitage falls within Grade 1. Including Grade 2 examples, 97.8 percent of the sample consists of flakes measuring less than 2 cm in size. Though many flakes are fragmented, overall characteristics indicate a strong correlation with intermediate to late stage biface reduction activities, as well as tool maintenance.

The collection of debitage demonstrates a nearly total reliance on near-local lithic resources. Chert associated with the Florence Limestone dominates the debitage collection and the 14MP407 chipped stone assemblage in general. For purposes of the debitage analysis, Florence varieties B and C are lumped together, whereas they were differentiated when possible for the analysis of the chipped stone tools and modified flakes. Collectively these varieties comprise 98.1 percent of the debitage sample (n=1,173). Of this group only 2.5 percent (n=29) were confidently identified as core reduction flakes, most of which appear similar to the raw material from the lithic cache. Traits that typically distinguish this reduction strategy include platforms with single facets/planes, steep removal angles, and limited numbers of flake scars on the dorsal faces. The remaining 97.5 percent commonly exhibit characteristics of a biface reduction trajectory: chiefly multi-faceted platforms and shallow removal angles. Cortex was noted on less than .1 percent (n=9) of the collection, with the majority tentatively associated with the lithic cache material. Thermal alteration was noted in 43.1 percent (n=505) of the collection, although at least some of this is associated with negative alteration, not considered to be an intentional step in the lithic reduction process. While only 7.3 percent (n=86) of the Florence chert was found to be burned, heat-fractured, or otherwise thermally altered with negative results, it is likely that at least some of the remaining material also represents unintended heating in all likelihood related to the burning of the structure, thus creating a skewed estimate of the reliance on heat treatment.

Other varieties noted rarely include Smoky Hill jasper (n=11), Ogallala quartzite (n=7), various chalcedony (n=3), Alibates agatized dolomite (n=1), and material that appears to be Knife River flint (n=1). The Smoky Hill jasper debitage is indicative of primarily late stage biface reduction. Ogallala quartzite debitage consists of flakes from cobbles, which likely represent either spalls struck from hammerstones or perhaps some limited core reduction activity.

Pecked and Ground Stone

The collection of pecked and ground stone implements consists of a number of functional tool classes



Figure 14. Selected pecked and ground stone implements.

that broadly can be divided into domestic processing and tool manufacture and maintenance categories (Figure 14, Table 9). For the most part the assemblage consists of fragments, some occasionally quite small. Locally available Dakota sandstone comprises 85.3 percent (n=29) of the tools, with the balance made up of quartzite (n=5, 14.7 percent). Only three specimens (8.8 percent) come from the mound fill. The remainder came either from the house floor (n=27, 79.4 percent) or from the fill associated with central support posts (n=4, 11.8 percent).

Besides ground stone tools two small spheroids were recovered from the house floor that are of an unknown function, though one could speculate they had a special purpose. The first appears to be a small concretion of Dakota sandstone, measuring approximately 19 mm in diameter. Evidence of intentional modification is inconclusive. Nevertheless, the object was at the least transported to the site and was part of the assemblage recovered from the house floor, indicating that it held some purpose for the former inhabitants of the site. The second object consists of a small quartzite spheroid, measuring approximately 14 mm across. It bears evidence of modification, perhaps to more perfectly shape a small quartzite pebble. Most of the surface appears to have been pecked with only a couple of small areas left with the original surface patination apparent. This item also was collected from the house floor.

Domestic Processing

Tools commonly associated with this category include manos, metates, and nutting stones. The collection of ground stone from 14MP407 includes examples of all of these.

Two large chunks, found in association with central support posts, represent metate fragments. Excavations of Feature 96 and Feature 75 posts each yielded a piece of an ovoid-shaped troughed metate. While the two fragments do not cross-fit, they are very similar in texture, shaping, and evidence of the trough and are considered to be fragments of the same metate. In both instances the fragment appeared to be wedged in between what was the post and the wall of the post excavation. Twelve other small fragments are considered to be metate pieces, based on the sizes of the fragments and the flat facets of the ground faces. These fragments consistently are of a dense variety of Dakota sandstone, material that is perhaps even partially silicified, suggesting that these may come from a single metate. All but one of these fragments

Table 9. Pecked and Ground Stone Tools.

Provenience Number	N	E	Depth (cm)	Location	Description	Material	Portion	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
405-1	70	25	21	House Floor	Grooved Abrader	Dakota Sandstone	Fragment				2.8
288-1	70	26		F 74	Grooved Abrader	Dakota Sandstone	Half	74.19	32.84	23.13	76.1
297-1	71	26	24	House Floor	Grooved Abrader	Dakota Sandstone	Complete	77.19	35.95	33.93	121.5
438	71	30	24	House Floor	Grooved Abrader	Dakota Sandstone	Fragment				35.8
377	68	25	34	House Floor	Grooved Abrader	Dakota Sandstone	Fragment				12.1
367-1	67	28	11	Mound Fill	Grooved Abrader	Dakota Sandstone	Half	60.29	30.04	22.91	61.1
310-1	71	27	31	House Floor	Grooved Abrader	Dakota Sandstone	Fragment				3.9
450-1	64	29	30-40	House Floor	Grooved Abrader	Dakota Sandstone	Fragment				20.1
304	70	29	60	F 75 post	Grooved Abrader	Dakota Sandstone	Fragment				36.1
90-1	67	29	40-50	House Floor	Grooved Abrader	Dakota Sandstone	Fragment				10.1
109-2,4	68	27	40-50	House Floor	Grooved Abrader	Dakota Sandstone	Fragment				10.9
524-1&2	67	33	30	House Floor	Grooved Abrader	Dakota Sandstone	Half	50.96	47.19	35.81	106.9
284-1	71	27	25	House Floor	Hammerstone	Quartzite	Complete				282.5
49-1	66	26	30	House Floor	Hammerstone	Quartzite	Complete				261.2
512-5	65	28	40-50	House Floor	Mano	Dakota Sandstone	Fragment				46.2
412-1&2	65	24	20-30	House Floor	Mano	Dakota Sandstone	Half		79.95	24.38	148.6
266-1	70	26	40-50	House Floor	Mano	Dakota Sandstone	Fragment				182.2
333-1	69	29	29	House Floor	Mano Spall	Quartzite	Fragment				57.9
378-1	70	29	80	F 75 post	Metate	Dakota Sandstone	Fragment				n/a
526-1	70	27		F 96 post	Metate	Dakota Sandstone	Fragment				n/a
492-1	69	25	33	House Floor	Metate	Dakota Sandstone	Fragment				63.5
514-2	65	30	30-40	House Floor	Metate	Dakota Sandstone	Fragment				150.5
325-1	71	27	33	House Floor	Metate	Dakota Sandstone	Fragment				25.7

243-4	67	25	20-30	House Floor	Metate	Dakota Sandstone	Fragment				34.8
512-4	65	28	40-50	House Floor	Metate	Dakota Sandstone	Fragment				166.6
252-1	71	26	0-10	Mound Fill	Metate	Dakota Sandstone	Fragment				125.5
384	68	25	31	House Floor	Metate	Dakota Sandstone	Fragments				445.5
12-1	61	27	10-20	Mound Fill	Misc. Groundstone	Quartzite	Fragment				19.6
145-1	67	27	45	House Floor	Nuttingstone/Tabular Groundstone	Dakota Sandstone	Half		78.99	38.53	306.7
484	69	25	28	House Floor	Quartzite Spheroid	Quartzite	Complete				3.3
441	72	27	32	House Floor	Sandstone Spheroid-Concretion?	Dakota Sandstone	Complete				4.6
238-1	67	25	27	House Floor	Tabular Groundstone	Dakota Sandstone	Fragment				37.9
404-1	70	25	29	House Floor	Tabular Groundstone	Dakota Sandstone	Fragment		95.56	56.18	181.8
169-1	70	24	24	House Floor	Tabular Groundstone	Dakota Sandstone	Fragment				46.6

came from the house floor, mostly in the northwest quadrant of the structure.

Manos, the accompanying equipment for processing activities involving metates, were conspicuously few in number from the excavation. Only five pieces from three or four individual tools were recovered. One of these represents approximately half of an ovoid-shaped mano of Dakota sandstone. Other fragments include what may be a piece of that mano, another Dakota sandstone fragment, and a spall from a quartzite mano. All of these items came from the house floor, scattered throughout excavated floor area—north, northeast, southeast, and southwest of the central living area.

A single piece of tabular ground stone exhibits part of a single pit in the center of one face, indicating a function as a stone for processing nuts. The circular pit measures 28.5 mm in diameter by 4.5 mm deep. The piece itself was shaped into a rectangular form about the size of a modern fired building brick. The sides are pecked from the shaping process; both faces are ground smooth and are very flat from side to side. While it is possible that the tool also functioned as a mano, the appearance of the grinding is not particularly representative of wear patterns typically associated with that function. Several other fragments of tabular ground stone with similarly ground features were found on the floor of the lodge. No particular functional classification is identified with these pieces. The nutting stone represents one of the few tools that came from the house floor within the central living area of the structure.

Tool Manufacture and Maintenance

Tools grouped in this category include abraders and hammerstones. Abraders are themselves a variable tool class, seeing potential use in a number of tool manufacture and maintenance scenarios, including as shaft abraders for creating and/or maintaining arrow shafts, as flintknapping edge/platform maintenance tools, and for creating and maintaining a varied inventory of bone tools.

Two quartzite cobbles have ends exhibiting battered and pecked modification. One cobble is triangular, with one point in particular bearing the most evidence of use. The other specimen is rectangular and exhibits pecking and some grinding on both ends. Often these tools are associated with flintknapping activities, serving as hard hammer percussors; however, alternate functions could include faunal processing and even processing nut mast, where the cobble would serve a similar function as a percussion instrument. It is important to remember that a third

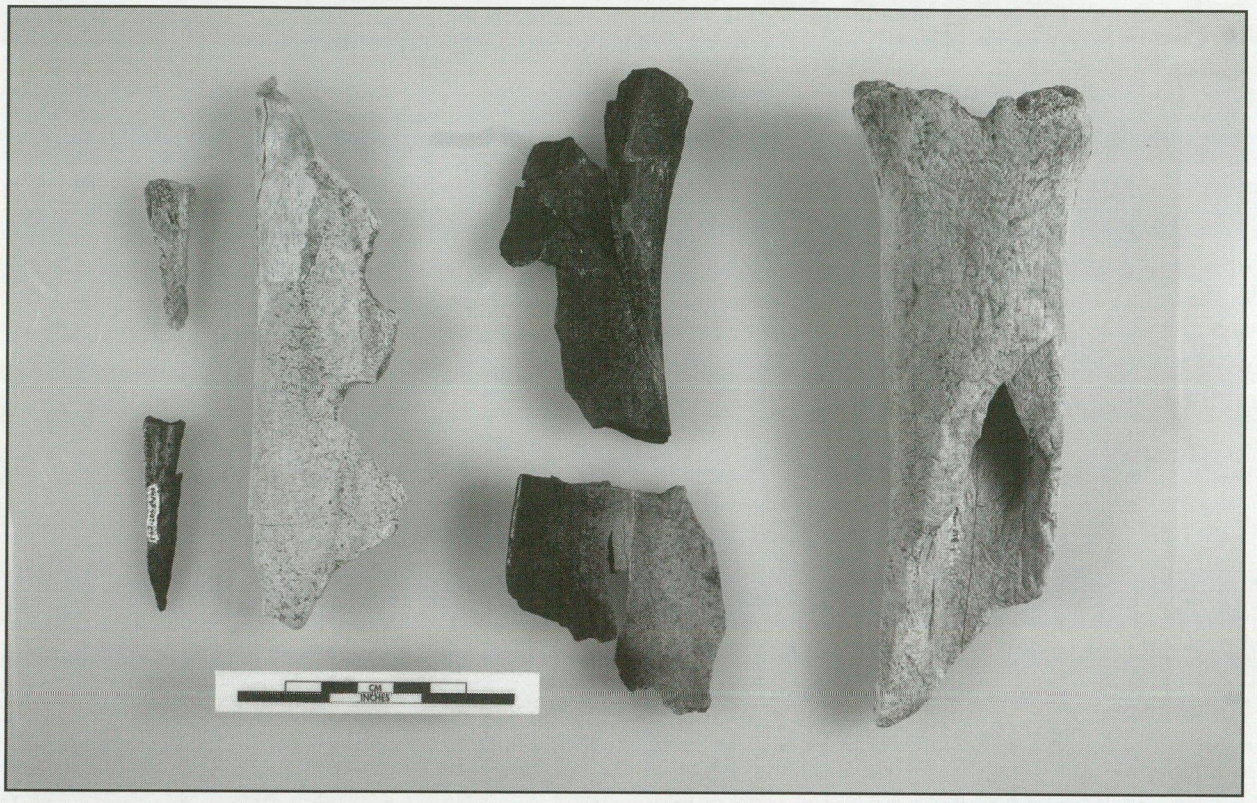


Figure 15. Selected bone tools.

hammerstone from the house was found in the previously excavated lithic cache feature.

Abraders comprise the largest class of ground stone implements identified from the site. Most are small fragments that exhibit portions of grooves; however, four specimens give some indication of form (size and shape) and function. One of these is a complete, loaf-shaped specimen with grooves in four faces. These modifications are quite variable: one groove is U-shaped, measuring 10 mm across and 4 mm deep; another is V-shaped, measuring about 9 mm across and 4 mm deep. A third face exhibits two V-shaped grooves, with channels measuring about 8 mm across with depths of 2-4 mm. The final V-shaped channel is 11 mm wide and nearly 6 mm deep with some evidence of rounding along the upper portions of the channel similar to that on U-shaped grooves. Whether the V-shaped grooves here represent functional use (i.e., flintknapping or bone tool manufacture/maintenance) or prepared channels for use as a shaft abrader, which typically creates U-shaped grooves, is not known, although the modifications to the fourth channel suggest that the latter may be the case.

Other fragments exhibit U-shaped grooves, measuring 6-14 mm in diameter and 2-4 mm deep. Forms typically are loaf-shaped, though at least two examples with roughly plano-convex or semi-circular cross sections are present. Multiple grooves are occasionally observed, though typically a dominant, deep channel on one side and faint grooves on one or more additional sides characterize these multi-grooved abraders.

Bone

Bone tools, as with bone in general at the site, are rare in the collection (Figure 15, Table 10). Fewer still are identifiable tools, although examples of typical functional classes are present, including bone awls, scapula hoes, and tibia digging stick tips. The horizontal location of this small assemblage correlates strongly with the southwest quadrant of the structure, while the vertical proveniences all indicate an association with the house floor or, in some cases, possibly the Feature 77 basin.

Portions of at least two bison scapula hoes were recovered. One consists of a crushed, burned fragment, found lying on the house floor adjacent to the Feature 62 basin. A second specimen was found in excavation unit N67/E25, which also contained the poorly defined remains of a basin. Evident artifact clustering in levels

Table 10. Bone Tools.

Provenience Number	N	E	Depth (cm)	Location	Description	Portion	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
278-1	67	25	34	F77, House Floor	Tibia Digging Stick Tip	Complete	185.55	64.43	45.84	179.3
141	66	27	36-38	House Floor	Scapula Hoe	Fragments				46.3
381, 414	66	25	20-30	House Floor	Scapula Hoe	Fragments				21.6
408-1	66	25	34	House Floor	Tibia Digging Stick Tip	Fragment				10.5
84-2,101-1	66	27	35-35.5	House Floor	Bone Awl	Fragments	59.3	14.85	3.81	4.3
315-2	66	24	20-30	House Floor	Awl Blank	Fragment				2.8
243-3	67	25	20-30	F77, House Floor	Scapula Hoe	Fragment				49.6
258-1	67	25	30-40	F77, House Floor	Awl Blank	Fragment				5.9

immediately above the eventually defined feature suggests that most were associated with the feature rather than the general house floor. This second scapula is one of those artifacts. It exhibits no evidence of burning. Near the center of its blade are two small ovoid perforations, one measuring 19 mm across and the other more irregular but approximately 25-30 mm across. The purpose of these holes is unknown, but they may relate to securing and hafting the tool. The portions are large enough to indicate some of the manufacturing steps. Reduction of scapulae to create the desired tool form included removal of the glenoid (the socket into which the head of the humerus fits) by snapping off the process at the scapula neck while still green. The spinous process was also removed, possibly by grooving and snapping the thin bone. The broken edge on the face of the scapula was ground smooth on the one specimen retaining this portion of the bone. Additional modification included trimming the ridge along the posterior border and shortening the overall length of the tool by trimming the blade along the vertebral border by grooving and snapping the blade.

One complete and two fragments of bison tibia digging stick tips came from House 2. The complete specimen and the largest fragment came from the vicinity of Feature 77; neither appeared to have been burned. The complete tool was found lying at an approximately 45° angle along what would become the western margin of the basin, suggesting that it was lying along the sloping wall of the feature. The tool has a roughly circular socket in the distal end, which is not fused, indicating that the tibia was from an immature bison. The working margin is sharply angled, with the resulting point formed along the densest, thickest portion of the existing shaft. The third tibia tool fragment is a small, badly burned piece of a tip. All specimens exhibit noticeable polish, usually to a high degree, and striations of varying lengths and depths running parallel to the long axes of the tools.

Reduction of the bison tibia included removal of the proximal (next to the femur) end somewhere near that articular (joint) end. A variety of methods bring about this result, including cutting or simply breaking near the proximal end of the shaft. The standardized form of the angular break along the shaft suggests cutting, or at least grooving, may have been a common practice in order to assure a useful blank from which to create the tool. The retained distal (next to the foot) end typically exhibits extensive grinding along the shaft break to clean up the break and create the tool form and working margin. The distal articular face was drilled out to accept a handle. This socket, which is often uniform in size, measures 30 mm in diameter on the complete specimen from 14MP407.

One awl was recovered from the house floor. The specimen was found immediately adjacent to Feature 62, beside the badly burned scapula tool. The item is also severely burned and broken, consisting of several conjoined fragments. At least two additional pieces appear to be from the same tool. While only a portion of the tool remains, it is apparent that it was

manufactured from the shaft of a deer metapodial. Two additional items consist of modified portions of deer metapodials. Both exhibit evidence of grooving and snapping, typical of the process used to create awls.

Fauna/Flora

Faunal remains were surprisingly sparse from the excavation, and small portions generally represent the limited identifiable elements. Bone tools make up the bulk of the identifiable bison and deer elements. The size of the collection precludes a meaningful discussion of the role of various species in the daily subsistence activities of the site. Animals represented include bison, deer, medium-sized mammals, small mammals (rodents), fish, snake, turtle (probably ornate box turtle), and a bird (possibly duck). In spite of its limited nature, the collection points to reliance on a diversity of faunal species, typical of Smoky Hill phase subsistence patterns and the Central Plains tradition in general (Bozell 1991; Brown 1981).

Floral remains were found throughout the House 2 excavation but were limited to the lodge floor and associated features. Table 11 lists examples of charred botanicals noted in the artifact catalogue from the site. Those specimens from soil flotation samples typically refer to the heavy fraction of the samples, as these portions were sorted during lab processing of the site materials. Soil flotation light fractions were not subject to laboratory sorting.

Maize kernels dominate the identified remains from the heavy fraction and hand collection during excavation. A cluster of maize kernels and remnants of cobs were found on the house floor in the northern part of the structure (units N70/E26 and N70/E27). The cob fragments were noted in the field, and attempts were made to collect the fragile remnants by removing a block of the surrounding matrix. In spite of attempts to preserve these specimens, very little remains of the cob aside from a scatter of charcoal encased in soil.

Several examples of beans also were identified. These specimens typically are fragmented, though at least one relatively complete example was found. Interestingly, most bean specimens were from feature contexts: one each came from Feature 74 and Feature 75 central support posts, and a third came from the eastern portion of the central hearth.

Other charred seeds were not identified to type during cataloguing, although at least some

Table 11. Floral Remains.

Excavation Unit		Depth/ Feature	Material	Collection Method
N36	E14	20-30	Maize	Flotation
N63	E27	F53	Unidentified Seed	Flotation
N63	E28	20-30	Unidentified Seed	Flotation
N64	E27	20-30	Unidentified Seed	Hand
N64	E27	F60	Unidentified Seed	Flotation
N65	E26	20-30	Unidentified Seed	Hand
N65	E30	20-30	Unidentified Seed	Flotation
N66	E24	30-40	Maize	Flotation
N66	E25	20-30	Unidentified Seed	Flotation
N66	E25	30-40	Unidentified Seed	Flotation
N66	E26	20-30	Maize	Flotation
N66	E27	30-40	Maize	Flotation
N66	E27	F62	Maize	Flotation
N67	E25	20-30	Unidentified Seed	Flotation
N67	E26	40-50	Maize	Flotation
N67	E31	25	Bean	Hand
N67	E31	20-30	Unidentified Seed	Flotation
N67	E32	40-50	Unidentified Seed	Flotation
N68	E27	30-40	Maize	Flotation
N68	E27	F56	Unidentified Seed	Flotation
N68	E28	F55/88	Bean	Flotation
N69	E24	F65	Maize	Flotation
N70	E24	F67	Maize	Flotation
N70	E26	36	Maize	Hand
N70	E26	20-30	Maize	Flotation
N70	E26	40+	Maize	Flotation
N70	E26	F74	Maize, Bean	Flotation
N70	E27	30-40	Maize	Flotation
N70	E27	F84	Maize	Flotation
N70	E29	F75	Bean	Flotation
N71	E25	F79	Unidentified Seed	Flotation
N71	E26	27	Cob Frag	Hand
N71	E26	20-30	Unidentified Seed	Flotation
N71	E27	33	Cob Frag	Hand
N71	E27	33	Cob Frag	Hand
N71	E27	30	Cob Frag	Hand
N71	E27	20-30	Maize	Hand
N71	E27	30-sterile	Unidentified Seed	Flotation
N71	E27	25-30	Walnut Shell	Flotation
N72	E27	28	Maize	Hand
N72	E27	28	Maize	Hand

appear upon inspection to represent small fragments of maize kernels or beans. Others, however, may be portions or complete examples of other small seeds, probably collected wild plant remains. The identified collection also includes a walnut shell fragment.

Discussion and Conclusions

The 2004 KATP field school investigated one of the few remaining relatively intact Smoky Hill phase habitation sites on the Central Plains. The goals of this investigation were two-fold: 1) identify and test features outside of houses to better understand the organization and location of outdoor activities, and 2) excavate within a structure to collect abundant soil flotation samples from internal features and the house floor for paleoethnobotanical analysis and for recovery of diagnostic artifacts to help place the site within the larger context of Smoky Hill phase settlements.

Geophysical survey of the site provided data concerning the nature of the visible house mound features in the pasture, as well as offering considerable insight into the presence and locations of likely features in adjacent areas. Limited ground truthing and test excavations during the KATP field school defined a number of these anomalies as deep storage pits, basins, irregular borrow areas, and a circular post structure, tentatively identified as an arbor.

What was learned about the internal organization of the site? Areas outside of structures generally have been excluded from previous investigations at Smoky Hill phase sites; hence, a potentially large part of the daily activities of the site's inhabitants was not studied. Approximately 25 m^2 along and outside the perimeter of structures were tested during the 2004 KATP field school. Main block excavations focused on the area south of the central mound where evidence of limited use was found. A small basin containing bone and lithic debitage was excavated adjacent to the south wall, with surrounding units outside the house yielding a sparse scatter of habitation debris, including lithic debitage, flake tools, and scattered ceramics. A second area of investigation was a cluster of discrete anomalies that suggested a circular pattern of possible posts and an adjacent irregularly shaped feature. Portions of an irregular shallow borrow, situated a short distance northeast of Mound 1, were excavated, but little material was present in this feature. A scatter of units focused on the cluster of possible posts and one was confidently identified within the confines of a shallow basin. Artifacts were limited across this area, however, with only occasional chert debitage, isolated ceramics, and burned earth and charcoal present in the shallow excavations. From these limited findings, it is difficult to enter into a lengthy discussion on the use of space outside Smoky Hill phase houses. This limited excavation and the results of the geophysical survey suggest that external storage pits were scattered around the habitations, as were shallow basins used for a number of activities, including temporary storage and processing of materials. No evidence of extensive sheet middens of trash was identified during work outside of structures; rather, cultural material was relatively sparse in open areas. If the areas and features investigated during the KATP are any indication, even external features failed to be used regularly for trash disposal.

Standardized flotation sampling was an important aspect of the fieldwork, though the outcome of this aspect remains to be determined pending formal analysis of the collection. The recovery of plant remains via flotation should help provide much needed insight into this portion of the local diet and offer some indication of the reliance on horticulture and wild plants. Much of the past work on the Smoky Hill phase occurred prior to the time that flotation was a commonly used procedure in excavations. With this in mind, systematic flotation samples were collected from all units excavated more than 20 cm below the ground surface. Samples were collected from inside the house fill and floor zones, as well as some samples from outside the structure. Cultural features, including post molds and any pits or basins encountered, were subject to flotation of at least one-half of the fill. Occasionally additional flotation samples judgmentally were taken from features and portions of the house floor. Hand collection of visually recognized remains was also carried out when possible. This yielded a small but significant collection of charred botanical remains, consisting primarily of fragments of beans and maize kernels. Together this information promises a better understanding of subsistence practices carried on at this site and may allow inferences for this activity elsewhere in the Smoky Hill phase.

A wide variety of artifact classes were recovered through the excavations at 14MP407. While hardly unique in appearance when compared with the assemblages from other Smoky Hill phase habitation sites in the region, the artifacts do offer some insight into a number of topics specific to the habitation of site 14MP407.

Lithic artifacts include limited quantities of flake debris, particularly larger flakes. Most of the debitage is small, representing the later stages of lithic reduction to create tools, as well as the resharpening

of tools. Chert from the Flint Hills (Florence B and C varieties) is by far the most common raw material in the chipped stone assemblage and comprises almost all of the recovered debitage. Smoky Hill jasper and Alibates agatized dolomite are present in isolated to very limited quantities. One unexpected find was an end scraper made of Flattop chalcedony (White River group silicates), the closest source of which is in northeast Colorado. It is clear that raw material was generally coming to the site in reduced forms as mid- to late-stage bifaces and finished tools. A flake cache from House 2 indicates at least some material was coming in unfinished forms, though it is uncertain whether the cache represents a collection of suitable flakes from a reduction episode elsewhere on site or from some other location and was subsequently placed together in House 2. Artifacts recovered from the House 2 excavation indicate that the cache was being actively used at the time of abandonment/destruction of House 2.

The ceramic assemblage consists primarily of cordmarked sand/grit- and grog-tempered ceramics. At least two forms of vessels are present in the collection: a neckless jar or bowl with a narrow opening (coconut jar) and the more common globular jar. Vessels are Riley Flaring types, and no collared rims were recovered from the site. Decoration in the form of oblique tool impressions on lips was relatively common (n=5 of 14 vessels). The proportion of decoration is high compared with Smoky Hill phase ceramic assemblages from sites in the Saline/McPherson County area (Roper 2001, 2003, 2006b; Latham herein).

Data on subsistence are general in nature due to the paucity of recovered faunal remains and the lack of a formal analysis of processed flotation samples. In general the faunal collection is indicative of a generalized procurement strategy that is typically noted in discussions of Smoky Hill phase subsistence. Bison, deer, various small to medium-sized mammals, fish, snake, box turtle, and bird are all present in the assemblage. Floral remains include charred bean and maize kernels that were hand collected with relative frequency in portions of House 2, particularly in feature contexts. Other charred seeds, presumably representing a number of wild collected specimens were noted during processing and cataloging. Future analysis of the collection promises additional insight into the reliance on botanical resources in the area.

The 2004 KATP successfully carried out a plan to study areas external to identified house structures, identifying numerous features, although artifacts in these outdoor features and areas were relatively sparse. The standardized flotation sampling produced a collection worthy of additional research with a strong potential for insightful commentary on Middle Ceramic period subsistence in the Smoky Hill River valley. The artifact assemblage, while not dynamic, certainly offers an excellent comparative collection from a previously unresearched area of the Smoky Hill phase geography, and future studies will undoubtedly revisit the collection for that reason. Site 14MP407 yielded considerable information regarding the prehistoric lifeways of a Central Plains population, and the site continues to hold much promise for helping to better understand the past inhabitants of this site and the place of the Smoky Hill phase in the regional cultural sequence.

Acknowledgments. As with fieldwork, analysis, and reporting of any magnitude, many individuals have a hand in the ultimate success of the work. This is my chance to acknowledge those contributions. As always, however, any shortcomings in the fieldwork or reporting are solely the responsibility of the author.

The Kansas Anthropological Association has an unquestioned commitment to the preservation and interpretation of Kansas' heritage as found in the remains of a lengthy cultural occupation of the Central Plains. It has been my pleasure to have such a longstanding association with the dedicated individuals of that organization, and whatever success I am as an archeologist today is owed chiefly to my time spent learning through them.

In regard to site 14MP407, I am indebted to a number of avocationals who gave of their time and knowledge of the site, notably the late Richard Stauffer, the late Jim Stauffer, and Jim's son Brian. Brian graciously loaned a portion of his family's collection from 14MP407 for study prior to the 2004 KATP field school. Richard also had a collection from the site and offered insight into the nature of the component in the wheat field west of the 2004 fieldwork location. Harold Reed originally recorded the site, one of many in the area he recorded and collected from, thereby preserving valuable information and bringing an important site to the attention of the professional community.

The fieldwork could not have been carried out without the professional oversight provided by staff of the KSHS Cultural Resources Division during the KATP field school; Anita Frank, Robert Hoard, Christine Garst, Martin Stein, Randy Thies, Tim Weston, and Virginia Wulfkuhle all provided assistance during the field and lab work. Virginia also deserves special thanks as the ever-patient editor who awaited this late submission.

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A Geophysical Investigation of 14MP407, a Smoky Hill Phase Archeological Site in McPherson County, Kansas

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The Kansas Anthropologist 27:127-135

A geophysical investigation of 14MP407 was conducted in the spring of 2004. A multi-method approach was utilized that included both magnetic field gradient and electrical resistance survey. The investigation sought to map buried archeological features prior to the 2004 Kansas Archeology Training Program field school. The geophysical survey successfully mapped several Central Plains tradition house features and numerous additional features near these houses. These maps were used to target one house and two additional features for excavation during the field school. Several additional anomalies or anomalous patterns were identified near houses but were not tested due to time and budget constraints. These anomalies appear to represent features external to the houses, ancillary structures, specialized activity areas, or footpaths; unfortunately, the image resolution was insufficient to make more a definitive interpretation. The results of the investigation confirm the effectiveness of magnetic and resistance survey methods for mapping Central Plains tradition isolated farmstead or hamlets. Suggested survey design modifications are offered that would increase the visibility of small low contrast features at similar sites.

In the spring of 2004, Archaeo-Physics, LLC was contracted by the Kansas State Historical Society (KSHS) to conduct a geophysical investigation at 14MP407, a Smoky Hill phase archeological site in McPherson County, Kansas. The Smoky Hill phase is a geographic variation of the Central Plains tradition of Native American peoples living in extended farmsteads, hamlets, and villages during the Middle Ceramic period (A.D. 1000-1500). The settlement pattern for Central Plains tradition peoples consisted of isolated rectangular earthlodges, strung along stream drainages and separated from each other by several hundred meters to more than a kilometer. Often several lodges formed small hamlets, separated from other lodges or hamlets by similar distances. More rarely, a dozen or more lodges formed small villages.

The investigation consisted of electrical resistance and magnetic field gradient surveys over 8,100 m^2 of the site. Fieldwork was conducted from April 8 to 10, 2004. The objective was to locate and map buried archeological features prior to the Kansas Archeology Training Program (KATP) field school, which was to begin in June 2004. Because features external to houses are underrepresented in the Central Plains tradition archeological record, it was hoped that the geophysical investigation might detect not only Smoky Hill phase houses, but also features between or near houses (e.g., storage pits, middens, hearths, external structures).

This article presents the results of the geophysical investigation and relates those results to the KATP excavations conducted in 2004. A detailed description of the 2004 KATP excavations is covered elsewhere in this volume (see Bevitt herein).

Field Methods

The geophysical investigation began by establishing a 30 x 30-m grid system over the site. KSHS personnel accomplished the location and placement of



Figure 1. Location of the geophysical survey grids at 14MP407. The western grid was surveyed by magnetic field gradient methods only.

the geophysical survey grid prior to the geophysical investigation using an electronic total station (Figure 1), which combines an optical instrument used in surveying that combines an electronic transit, electronic distance measuring (EDM) device, and software running on an external computer. Two geophysical areas of investigation were established. The larger area (6,300 m^2) was in the eastern portion of the site, which was in pasture at the time of the survey. A smaller survey area (1,800 m^2) was in the western portion of the site in a cultivated wheat field. The grids were aligned to magnetic north. Wooden stakes marked the corners of each 30 x 30-m grid.

Magnetic field gradient surveys passively measure changes in the local magnetic field over the survey area, while electrical resistance surveys actively measure the ease or difficulty with which an electric current flows through soil. Electrical resistance is termed an active method because a small electrical current is applied to the soil, and the resulting voltage field is measured. For readers interested in learning more details concerning geophysical survey methods in archeology, works by Clark (1996) and Gaffney and Gater (2003) are highly recommended.

Resistance and magnetic data collection was conducted in a similar fashion. Each 30 x 30-m grid was surveyed by taking readings at regular intervals along regularly spaced transects. Successive transects were surveyed in a zigzag pattern until the grid was completed. Spatial control was maintained using a system of 30-m ropes marked at every meter. The spacing of the data transects was .5 m for the magnetic field gradient survey and 1.0 m for the electrical resistance survey. Eight samples per linear meter were collected during the magnetic field gradient survey, resulting in an overall data sample density of 16 samples per square meter. Two samples per linear meter were collected during the electrical resistance survey, resulting in an overall data sample density of two samples per square meter.

The magnetic field gradient survey was performed using a Geoscan Research FM256 fluxgate gradiom-

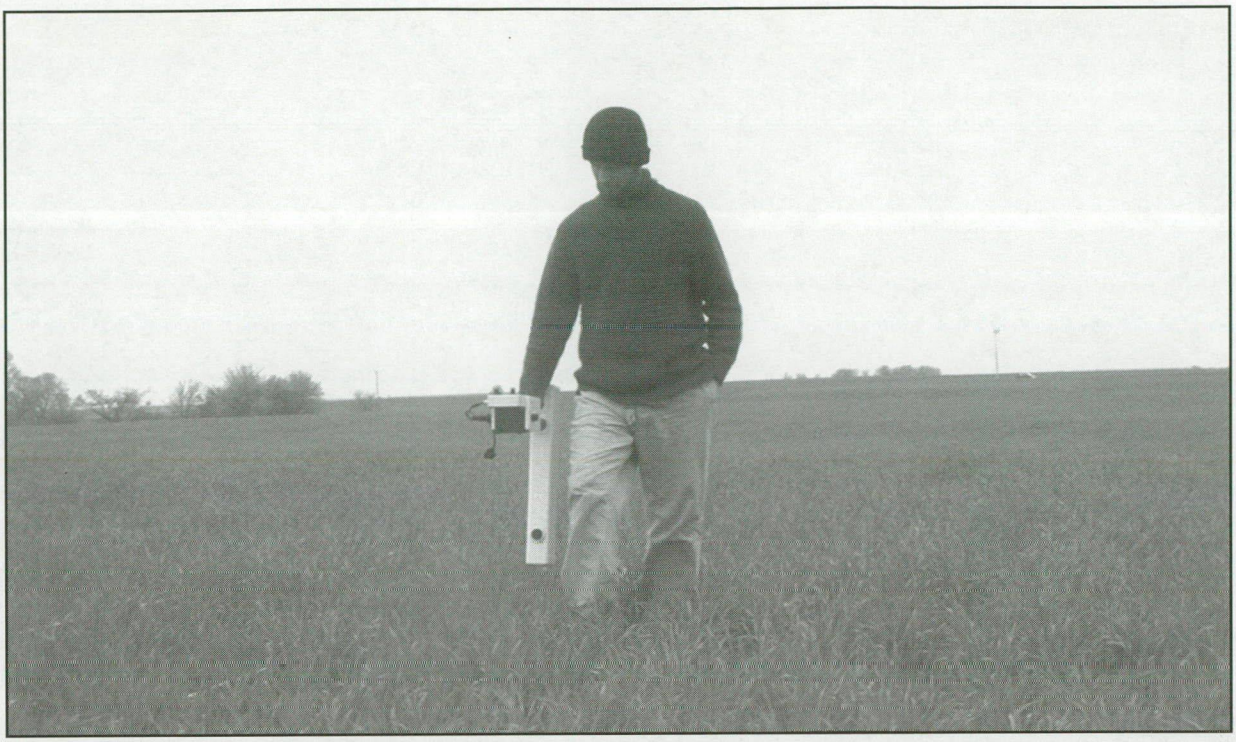


Figure 2. Magnetic data collection at 14MP407 using the FM36 fluxgate gradiometer.

eter (Figure 2) operated in its highest sensitivity range (.1-nanoTesla [nT]). The FM256 has two fluxgate sensors, vertically separated by .5 m. Recorded data represents the difference, or gradient, between the two sensors.

The electrical resistance survey was conducted using a Geoscan Research RM15 resistance meter, operated in twin electrode configuration (Figure 3). Of the many possible four-electrode arrays commonly utilized in electrical resistance surveys, the twin electrode configuration offers perhaps the best overall compromise among sensitivity, simplicity of signal response, and depth of penetration. Resistance data were collected using a mobile probe spacing of .5 m and a remote probe spacing of 1.0 m. The nominal depth of investigation using this electrode configuration is approximately .5 m.

After the field survey was completed, all data were downloaded to a portable field computer, and individual 30 x 30-m survey blocks of data were assembled into a composite. These data were processed appropriately to correct for operator-induced defects and to highlight certain aspects of the data. Grayscale images were then produced from the processed data. These images were analyzed, and areas containing significant deviations from the normal background readings were identified. These "anomalies" were then tested using a ½-inch in



Figure 3. Resistance data collection at 14MP407 using the RM15 soil resistance meter.



Figure 4. Magnetic field gradient survey results overlaid on a USGS aerial photo of the site area.

diameter hand-powered Oakfield soil core or a 3-inch in diameter mechanically powered Giddings soil core during the initial stages of fieldwork prior to the KATP field school. Coring confirmed that most of the anomalies identified during data analysis were created by buried archeological features.

Geophysical Survey Results

The results of geophysical surveys of archeological sites usually are presented graphically. This is done because anomalies of cultural origin are generally recognized by their patterning, rather than by their numeric values alone. When rendered as images, cultural and natural patterns can be recognized and the physical phenomena causing the detected anomalies can be visualized. This section presents the geophysical images from 14MP407 and briefly explains the source of geophysical anomalies at this site, as determined by testing during the 2004 KATP field school.

Imagery created from the magnetic field gradient data is presented in Figure 4, while Figure 5 depicts imagery created from the electrical resistance survey data. The most obvious patterning in both Figures 4 and 5 are long linear anomalies running nearly the entire length of the eastern survey area. Modern two-track roads or other recent disturbance appears to be the source of these patterns, and they are not thought to be archeologically significant.

Less obvious, but still readily visible, are three regions of anomalous signal in the eastern survey area. These anomalies represent the locations of three Smoky Hill phase houses. The houses appear as areas of relatively high electrical resistance (Figure 5). The magnetic signal caused by the houses is somewhat more complex. House 1 and House 2 in Figure 4 contain relatively intense (strong) magnetic signals. Examination of the magnetic imagery in Figure 4 shows that this signal is both positive (black) and negative (white) in direction. In an archeological context, magnetic signals with these characteristics often are interpreted as created by burned features. This appears to be the case here, as testing by soil coring (House 1) and excavation (House 2) indicate that both contain evidence of burning, while testing of House 3 (soil coring) did not reveal evidence of burning.

The lack of charcoal, burned daub, or other common indicators of burning in House 3 soil cores suggests that this feature may represent a small burial



Figure 5. Electrical resistance survey results overlaid on a USGS aerial photo of the site area.

mound rather than a house. Burial mounds are often associated with isolated Central Plains tradition isolated farmsteads or hamlets (O'Brien 1984: 57-60); however, given the inconclusive information that testing of this anomaly yielded, it seems prudent to say that its interpretation is uncertain at this time.

A possible fourth house was identified in the magnetic survey results from the western survey area (Figure 4). This house was not tested during the 2004 KATP field school, so its interpretation remains speculative. Although not confirmed by direct invasive testing, strong indirect evidence supporting this interpretation is provided by a sketch map depicting a positive crop mark at this location and the surface collection of burned daub from this field in the past (C. Tod Bevitt, personal communication). Project volunteer and Courson Archaeological Research archeologist Scott Brosowske mapped the positive crop mark during magnetic field gradient data collection in the western survey area (copy of map in possession of the author). The crop mark measured approximately 10 m east to west and 3 m north to south. In addition, several smaller (~1 m in diameter) positive magnetic anomalies were identified in the western survey area. The size and geometry of these smaller anomalies suggest that they may represent storage pits or hearths associated with this house. Several of these smaller anomalies appear to be elongated or "smeared" in the direction of crop plowing, implying that the tops of buried features in the western survey area may be disturbed by plowing.

A more detailed view of imagery from the eastern survey area is offered in Figure 6. Houses 1, 2, and 3 are labeled, as are several additional features confirmed by excavation and/or coring. Two positive magnetic anomalies approximately 1 m in diameter were identified south of House 1. Both had strong correlations in the electrical resistance survey results and were cored and confirmed as archeological features but were not excavated.

Two geophysical anomalies were identified between House 1 and House 2. The first of these was expressed as a positive magnetic anomaly, approximately 1 m in diameter, with a strong correlation in the resistance survey results. This anomaly was tested by excavation and is labeled as Feature 59 in Figure 6. Feature 59 was tentatively identified as a possible borrow pit (an excavated area where material has been dug for use in another location), associated with construction of House 1. The borrow pit fill was filled

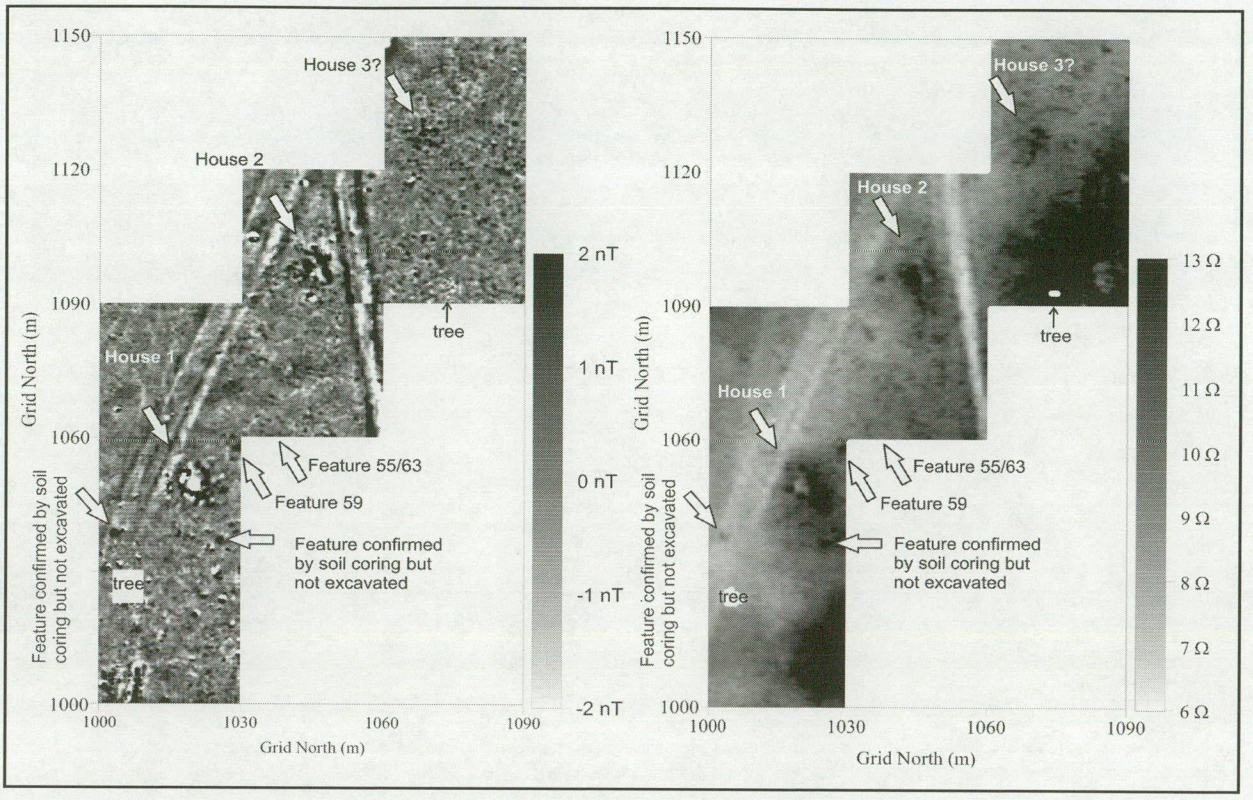


Figure 6. A closer view of the geophysical survey results from 14MP407.

with magnetically enhanced soils, although these soils did not contain high concentrations of artifacts.

Just to the northeast of Feature 59, a cluster of small (< 1 m in diameter) positive magnetic anomalies forms a circular pattern. This circular pattern has a weak correlation in the electrical resistance results. These anomalies are labeled Feature 55/63 in Figure 6. Feature 55 was tentatively identified as a shallow basin feature, and Feature 63 is an unburned post mold within Feature 55. It seems that the "post mold patterning" visible in the magnetic survey imagery is due to magnetically enhanced soils within the unburned post molds. Soil samples collected from Feature 63 were subjected to a laboratory-based soil magnetism analysis. This analysis revealed that Feature 63 contained magnetic minerals with ultra-fine grain sizes, which suggests that the magnetic enhancement within Feature 63 was caused by bacterial magnetism (Maki 2005). It should be mentioned that magnetic mineral grain size criteria can suggest that bacterial magnetism is responsible for magnetic mineral enhancement within archeological features; however, this test is not diagnostic. Diagnostic evidence of bacterial magnetism is best provided by direct visual observation using transmission electron microscopy (TEM) methods. Unfortunately, TEM studies have yet to be conducted on these samples due to lack of funding.

Three large (> 10 m) weakly positive magnetic anomalies are visible between House 1 and House 2. These anomalies are not labeled, but are readily visible in Figure 6. The geometry of these anomalies is somewhat poorly defined, and this—combined with the weakly positive signal response—suggests that they may be caused by a concentration of magnetically enhanced soils. Although these anomalies were not tested during the 2004 KATP field school, it seems likely they may represent trash-filled sheet middens.

A final view of the geophysical imagery is provided in Figure 7. These images reveal fine detail in the vicinity of House 2. Numbered arrows indicate several anomalies (or anomalous patterns) that were not tested during the 2004 KATP field school. Although the anomalies tend to be weak, ephemeral, or otherwise difficult to interpret, they are worth discussing in detail because they appear to represent cultural features associated with, but external to, House 2. These geophysical anomalies may define specialized activity areas associated with the lodges. Such areas have been recognized at other Central Plains tradition sites in the region (Roper 2006:120-121).

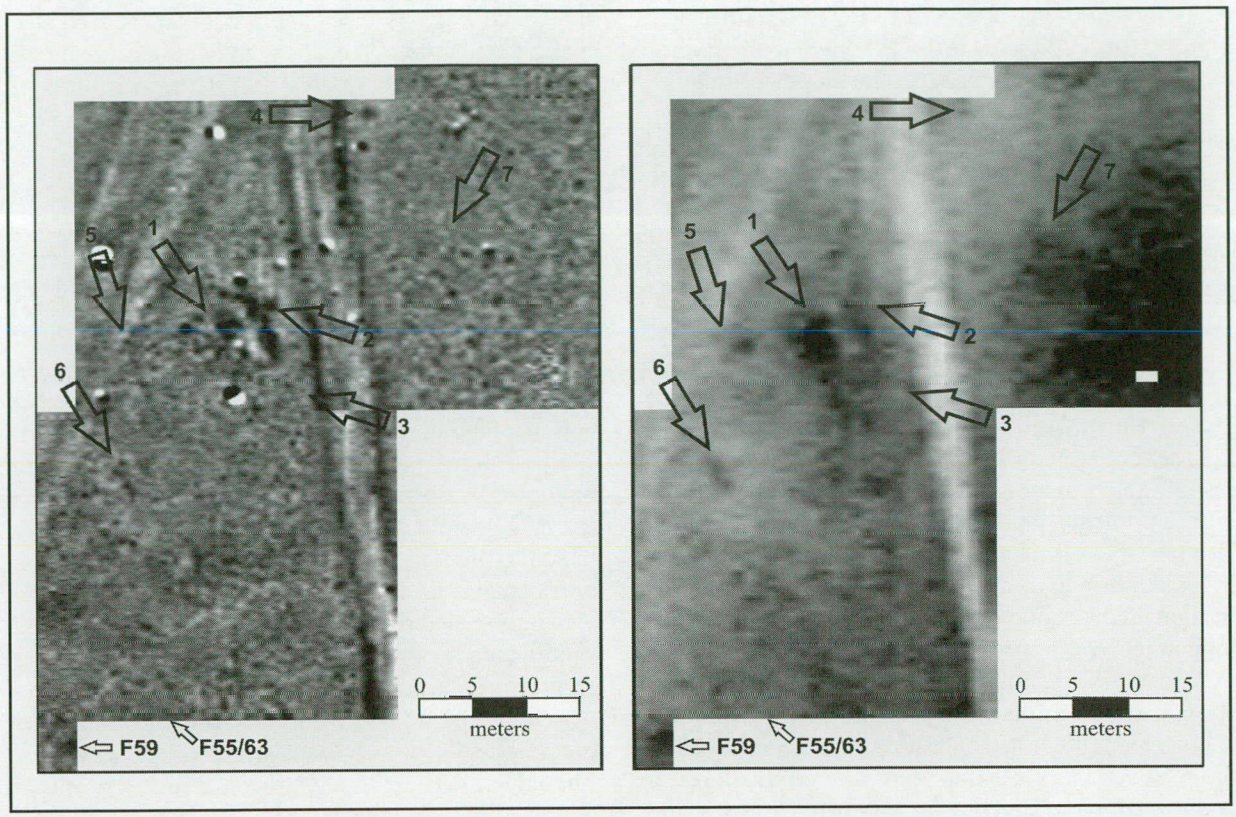


Figure 7. A detailed view of House 2 and surrounding areas. Very subtle patterning may represent features external to the house, ancillary structures, specialized activity areas, or footpaths.

A description and discussion of the numbered anomalies follows:

1. The largest and most intense resistance anomaly associated with House 2 appears to represent the thickest concentration of collapse roof debris.

2. Several small (< 1 m in diameter) positive magnetic anomalies form a linear alignment. The anomalies appear to "bleed together" due to their close proximity to each other. Excavation results from House 2 revealed that the northwest quadrant of the house had evidence of catastrophic burning, including burned daub and several severely burned post molds (C. Tod Bevitt, personal communication). It also appears that the house collapsed to the southeast, leaving the northwest perimeter lightly covered and the southeast perimeter with more soil overburden. This linear alignment of magnetic anomalies may represent burned post molds along the northern perimeter of the house. The intense resistance anomaly (#1 above) and complex and intense magnetic signal to the south and east of #2 probably represent the extent of burned and collapsed roof debris.

3. Several small (< 1 m in diameter) positive magnetic anomalies form a linear pattern. These may represent post molds (possibly unburned) on the south edge of the house, perhaps outside the perimeter of the house itself (i.e., external to the house.)

4. A circular positive magnetic anomaly (~1 m in diameter) has a relatively weak but distinct correlation in the resistance imagery. Although this anomaly was not tested, its size and geometry suggest a storage pit or hearth feature.

5. Weak linear and rectilinear anomalies are visible in both the magnetic and resistance survey results here. These appear to represent features external to House 2, perhaps small temporary structures, fences, footpaths, or garden boundaries. A circular resistance anomaly approximately 1 m in diameter is immediately adjacent to the southeast. This may represent a storage pit or hearth.

6. A short (~5 m) linear anomaly appears in both the magnetic and resistance imagery at this location. Possible post mold patterning is visible to the south and west of here in the magnetic survey imagery.

7. A long (> 30 m) linear high resistance anomaly is visible here. Although very poorly defined, this

anomaly appears to extend from House 1 in the south to near House 3 in the north. If related to the prehistoric occupation of the site, this linear patterning may represent a footpath. Alternative explanations might include a nineteenth- or twentieth-century wagon trail or a bison or deer trail.

Summary

In the eastern survey area the geophysical investigation mapped two confirmed houses and one additional anomaly that may represent a third house or perhaps a small family burial mound. One of these houses (House 2) was excavated during the 2004 KATP field school. The two confirmed houses were burned, resulting in a more intense magnetic signal response with significant positive and negative components. The possible third house (or burial mound) created a less intense magnetic signal that was mostly positive in sign, which is often the case with unburned archeological features.

In the western survey area one possible house was identified in the magnetic survey results. This anomaly was not tested by excavation or coring during the 2004 KATP field school, but its interpretation as a house is supported by a positive crop mark, measuring 10 x 3 m, and burned daub in the surrounding wheat field. Several smaller magnetic anomalies (~1 m in diameter) also were identified in the western area. The geometry and size of these anomalies suggest that they may represent storage pits or hearths. Several of these smaller anomalies exhibited "smearing" along the direction of plow scars, which suggests that they have been at least partially disturbed by modern agricultural activity.

The three main anomalies in the eastern survey area are separated by 40 to 60 m, and the possible house in the western area is approximately 200 m away from the closest confirmed house to the east. If contemporary with one another, it would appear that 14MP407 might be considered a small hamlet of Central Plains tradition farmsteads.

Several anomalies external to the houses were identified in the geophysical survey results. Four of these anomalies were tested and confirmed as archeological features. Features 59 and 55/63 were partially excavated during 2004 KATP field school. Two additional external features were confirmed by soil coring but not excavated.

Several anomalies and anomalous patterns near houses, both in the eastern and western survey areas, were not tested due to time and budget constraints. Many of these may be characterized as subtle, weak, or indistinct, which is to be expected if they were created by smaller and/or low contrast archeological features. These untested anomalies may represent outdoor specialized activity areas, ancillary structures, fences, footpaths, storage pits, hearths, or any number of other features at Central Plains tradition farmsteads.

Recommendations for Future Research

The 2004 geophysical survey of 14MP407 confirmed the effectiveness of magnetic field gradient and electrical resistance survey methods in locating and mapping houses and external features at Central Plains tradition farmsteads. Effectiveness would undoubtedly be significantly improved by increasing the data sample density during data collection. For example, decreasing the transect interval to .25 m during magnetic field gradient data collection and to .5 m during electrical resistance data collection would significantly improve the resolution of the resulting imagery. Of course improving the image resolution by increasing the data sample density also increases the time and effort required to complete the survey. The advantages of this approach must be balanced with the time and budget constraints inherent in most archeological research.

Additional geophysical survey methods and/or variations on the methods applied here might yield additional and more detailed information. For example, active electromagnetic methods for measuring the magnetic susceptibility of soils would provide a comprehensive understanding of the distribution of culturally enhanced (high magnetic susceptibility) soils. This would be a nice complement to the magnetic gradiometer data and may provide better definition of some features (e.g., sheet middens, garden boundaries, soil borrows.) Additionally, recent research suggests that a variation of the electrode configuration used during the electrical resistance, known as the square array, may provide improved definition of shallow low contrast targets. Future surveyors may want to include multiplexed twin-probe and square array measurements at each resistance data station.

Although ground penetrating radar (GPR) is a very effective high-resolution geophysical survey method at many archeological sites, its application is not recommended at 14MP407 due to highly conductive (low resistance) soils. High conductivity soils can seriously limit the depth of penetration of GPR signal, often rendering the method ineffective.

In summary, future geophysical investigators at Central Plains tradition farmsteads may want to

consider incorporating higher data sample densities, additional survey methods, and multiplexed square and twin-probe array electrical resistance surveys into the research design. Such an approach, combined with rigorous data quality control in the field and appropriate post-survey data processing, should yield extremely detailed imagery depicting the organization of Central Plains tradition farmsteads.

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Notes

Book Reviews

La Harpe's Post: A Tale of French-Wichita Contact on the Eastern Plains

La Harpe's Post: A Tale of French-Wichita Contact on the Eastern Plains. GEORGE H. ODELL (with contributions by Marie E. Brown, John C. Dixon, Lee and Mary Elizabeth Good, Eric J. Menzel, Isabella Muntz, Lee Anna Schniebs, Kenneth L. Shingleton Jr., Joe B. Thompson, Frieda Vereecken-Odell, and Bonnie C. Yates). University of Alabama Press, Tuscaloosa, 2002. xx + 369 pp., including 79 illustrations, appendixes, notes, references cited, contributors, index. $29.95 (paper). ISBN 0-8173-1162-9. *Reviewed by* Jim D. Feagins.

La Harpe's Post: A Tale of French-Wichita Contact on the Eastern Plains really contains two stories: one about history and another about archeology. Most of the volume is concerned with the manner and degree in which the two stories relate to each other.

In September of 1719, Jean-Baptiste Bénard, Sieur de la Harpe with 9 men and 22 horses made their way northward from a trading post on the Red River. This peaceful mission wound its way into uncharted territory in what is now the state of Oklahoma. La Harpe's diary describes a journey that ended in a village (or a village within an area) that contained 6,000 inhabitants, principally the Tawakoni. They are one of several loose groups, including the Wichita proper, that years later coalesced into what we know as the Wichita tribe. Carrying many trade items, La Harpe came to establish friendly alliances with these people, in the hope of much future trade and political cooperation. Odell has attempted to reconstruct La Harpe's route.

During his 10-day visit, many gifts were exchanged. An estimated 1,500 livres of European trade goods were distributed by La Harpe. The Tawakoni gave him 30 bison robes, rock salt, loaves of tobacco, verdigris, and pieces of ultra-marine. In addition, he received a young Apache slave, missing a finger on each hand that had been eaten. The chief apologized for having only one slave to give, saying that 17 others had been consumed at a public feast a month earlier. Before La Harpe left, he carved the coat of arms of the king of France on a post and erected it in the center of the village.

Before his return from the Tawakoni village, he secured the services of a Naouydiche guide and his wife. However, a party of Lipan Apache bison hunters soon killed these guides. Ravenously hungry and quite exhausted, the Frenchmen finally reached their post on the Red River.

Odell describes the Wichita and other Caddoan-speakers (Caddo and Pawnee) and the non-Caddoan-speakers (Osage and Plains Apache), who were all neighbors to the Wichita. Also, the political climate in Europe is discussed, including the interaction of France and Spain with various tribes in the New World. This background is important for understanding La Harpe's visit to the Wichita during this time period.

The second story is more modern in nature. It concerns a cultural resource management (CRM) survey and subsequent excavation of an archeological site on a low bluff overlooking the Arkansas River valley just south of Tulsa, Oklahoma. The Lasley Vore site (34TU65) was discovered in 1987 on land owned by the Kimberly-Clark Paper Company. The archeological excavation of 34TU65 by the University of Tulsa was an attempt to mitigate the site's destruction by the then-proposed paper plant construction. The presence of features and native-made and European-made artifacts indicated that a significant protohistoric or early historic village site existed during the early 1700s at the location. Was this the actual Tawakoni village that La Harpe visited in 1719, or was it a nearby village from this same time period? Either way some of this trade material must have been associated with the Frenchman's visit to this part of the eastern plains.

The 81 features from the Lasley Vore site are categorized into 12 types—most commonly basin-shaped, curved-bottom storage pits. These features are generally described in the text but in more detail in an appendix.

The faunal remains, bone tools, pottery, and stone tools (including their functions and the origins of the materials from which they were made) are described generally in the text, while the basic data on these and other materials are well presented in appendices. Deer and bison bones represent the largest percentage of edible meat at the site. Bison scapula hoes are relatively common. The chipped-stone materials were mainly from Ozark sources; however, a significant amount came from the Flint Hills of Oklahoma/Kansas. Lesser amounts came from southeast Oklahoma, Arkansas, and more distant sources. Pottery is divided

into seven major classes: Cowley Plain, Deer Creek Simple Stamped, Deer Creek Brushed, Womack Engraved, and three undesignated classes. The stone tool and debris types are as follows: adze, bifaces, burins, chopping tools, combination tool, cores, denticulates, drills, gravers, gunflints, notched pieces, projectile points (Fresno, Maud, and Nodena types), retouched pieces, scrapers, unifaces, wedges, abraders, hammerstones, manos, metates, worked pieces, ground stone, cortication flakes, and noncortication flakes.

The European artifacts are divided into glass and metal categories and include 14 glass bead types, 14 kinds of gun parts, 5 types of metal tools/weapons, and 12 types of metal utensils and miscellaneous artifacts. Again, these artifacts are generally described in the text, with most of the detailed data presented in various appendices.

Through statistical analysis of clusters of features and their contents, Odell argues that the aggregation of features is not random but rather reflects social and/or economic divisions. He also hypothesizes "...that the artifacts contained in the features are representative of activities that occurred in their immediate vicinity" (p. 103). Statistically he suggests that certain specific activities occurred adjacent to different feature clusters.

The site is interpreted as a single-occupation Wichita settlement or a place to which the Wichita returned periodically. Good quality stone and the metal tools were conserved and reused when possible. The Lasley Vore site's ceramic and stone tool assemblages are similar to those found on Great Bend aspect sites in Kansas and similar sites in Oklahoma, which are thought to be predecessors of the historic Wichita. After La Harpe's time, the Wichita moved southward, possibly to create some distance between them and their warlike, better armed, neighbors to the east—the Osage. Also, but probably of lesser importance, they may have been enticed southward to be closer to French traders.

Most of the volume's archeological data itself is contained in 11 large appendices that collectively comprise about half the volume. The appendices cover floodplain geomorphology, feature data, faunal remains, ceramic techniques, lithic analysis, glass beads, metal artifacts, radiocarbon dates, statistical analysis, pottery clays, and small-sized debitage analysis. The appendices also set forth the heart of the archeological database that not only presents the proof behind various statements made in the text, but also will continue to provide useful comparative information for years to come.

Being a careful archeologist, George Odell makes no claim that the Lasley Vore site is the actual Tawakoni village visited by La Harpe, although undoubtedly he would like to be able to do so. However, he does tie the indigenous village site to the Wichita and to the time period during which La Harpe journeyed to the area.

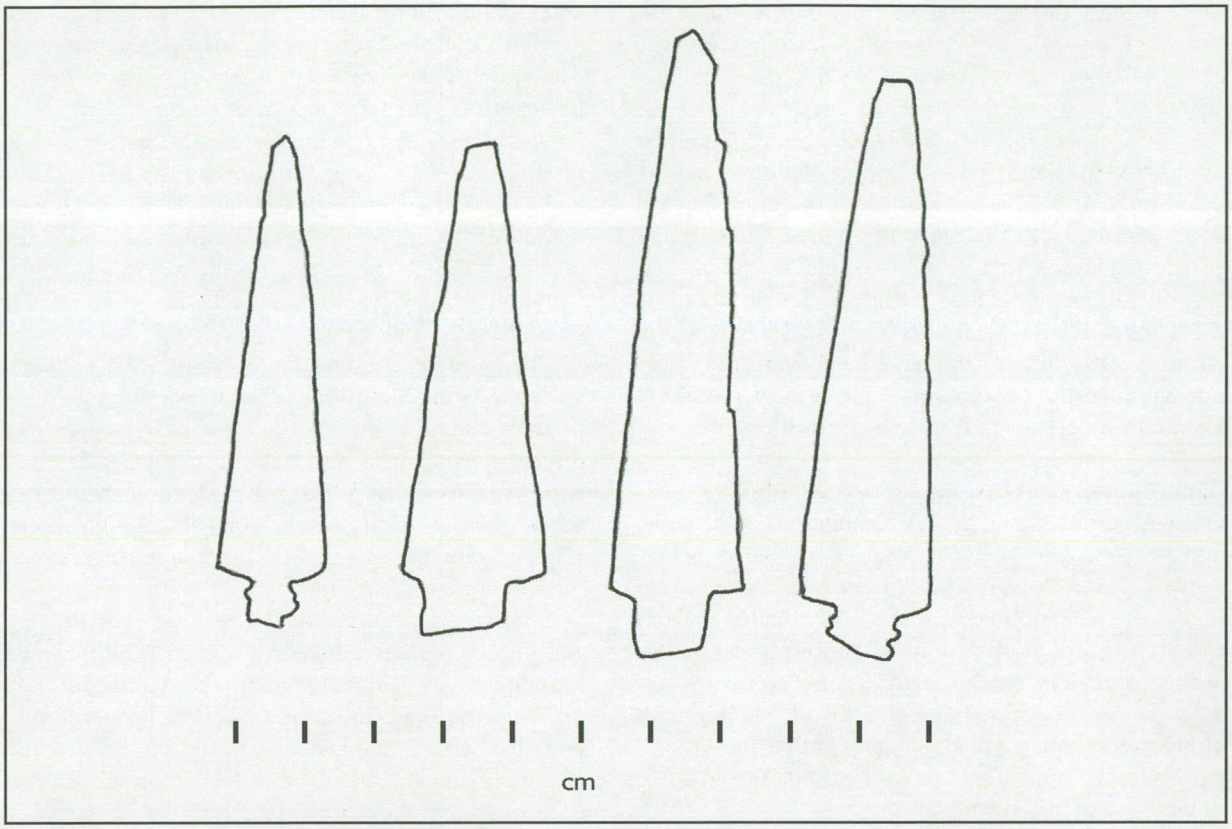
La Harpe's Post: A Tale of French-Wichita Contact on the Eastern Plains presents the results of CRM work on an important early historic site to archeologists, historians, and the general public. This is an example of CRM work that is not confined to gray literature stuck in an archive. All parties are to be greatly commended. The book can be obtained from your local bookstore or directly from the University of Alabama Press, online at http://www.uapress.us.edu or by phone at 773-702-7000.

Finding Sand Creek: History, Archeology, and the 1864 Massacre Site

Finding Sand Creek: History, Archeology, and the 1864 Massacre Site. JEROME A. GREENE and DOUGLAS D. SCOTT. University of Oklahoma Press, Norman, 2004 (paper edition 2006). xxvi + 241 pp., 30 figures, 13 maps, 3 tables, 5 appendices, notes, bibliography, index. $14.95 (paper). ISBN 0-8061-3801-7. *Reviewed by* Jim D. Feagins.

Rippling prairie grasses upon the rolling High Plains terrain compose a peaceful scene along the borders of Sand Creek—a gentle, meandering stream usually containing considerably more sand than water. This pastoral landscape in northern Kiowa County, Colorado, lies approximately 24 miles west of the Kansas border or 42 miles west of Tribune, Kansas.

The view today belies the carnage and horror that occurred along this stretch of Sand Creek, starting on a shameful day—November 29, 1864. On that date more than 700 soldiers, primarily 100 day-enlistees from the Third and First Colorado Regiments under the overall command of Colonel John Chivington, attacked a peaceful village of Southern Cheyenne and the adjacent camp of a few Arapaho along the creek. This camp consisted of perhaps 100 or so lodges with possibly more than 500 inhabitants; the majority were women, children, and aged men. Most of the able-bodied men were away on the hunt for bison. The few Arapaho lodges were led by Left Hand, and the Cheyenne leader was Black Kettle, both known as peace leaders. Chief Black Kettle had brought his village to



Iron arrow points from the Sand Creek site.

Sand Creek where they remained with the permission of Major Scott J. Anthony, then at Fort Lyon. (Today, Lamar, Colorado, is at the location of Fort Lyon, about 34 miles from the massacre location.)

A major revolt by the Sioux in Minnesota, coupled with the fear of Confederate troops influencing southern and central Plains tribes, left Colorado citizens extremely paranoid. Territorial Governor John Evans wanted to eliminate all Indians from the plains. The general mood of the populace was to kill the Indians and remove that threat from their doorstep. This set the stage for Chivington, a politically ambitious Indian hater, to act.

In spite of his knowledge of Black Kettle's peaceful intentions, Chivington attacked at dawn, catching the village by surprise. Right away the large pony herd was captured. In spite of Black Kettle's quick action of putting up an American flag and a white flag, he was killed. With small arms fire and howitzer shells bursting among them, the villagers, grabbing what weapons they could, scattered. Many of the women and children, driven several miles to the northwest along the streambed, were eventually hunted down and killed at a place where they had dug pits in the sand in a desperate attempt to avoid the bullets. The Coloradoans chased down and killed many of the scattering village inhabitants in the open terrain; thus, the massacre site occupies portions of several sections of land. After approximately seven hours the carnage was over. At least 150 Cheyenne and Arapaho lay dead. Chivington lost 9 men and had 38 wounded. The soldiers camped nearby until December 1, looting and destroying all the Indian supplies, burning the village, and scalping and in other ways mutating many of the bodies. Chivington returned to Denver as a hero—at least for a time.

After this atrocity, the western parts of the Central Plains were aflame with incensed Indians, making large portions of western Kansas and eastern Colorado unsafe for travelers or settlers. There was one positive side to this event: as American citizens learned of this incident, many were outraged, and this blatant act of violence did eventually contribute to an Indian policy reform movement.

As we know, peace eventually came. Within a decade or so, ranch cattle grazed on the land, and after almost 150 years, the exact location of Black Kettle's village became folklore. The historic accounts and

maps usually did not agree, nor did native oral traditions agree—collectively placing the massacre site along a 20-mile plus stretch of Sand Creek. Exactly where did this horrible, senseless deed take place?

On October 6, 1998, the United States Congress authorized the Sand Creek Massacre National Historic Site Study Act. This act mandated that the National Park Service (NPS) identify the location and extent of the massacre area and determine its suitability, feasibility, and potential costs for development as a National Historic Site. Thus, the stage was set for a serious study of the massacre location. While not without some controversy, the project proved to be most successful. Employing multidisciplinary methods, the likely locations of the action along Sand Creek were examined, using published and archival resources (including ethnographic/Cheyenne and Arapaho participant accounts), oral accounts by modern tribal descendants, interviews with current landowners, examinations of old collections from the area, a geomorphic investigation, and modern archeological research. Prior to the archeological work, a geomorphic study of the soil development along the stream correctly indicated that the ground surface at the time of the massacre would be but a few inches below the present land surface.

Because of the large extent of the survey area and the extensive vegetation cover, a controlled metal detector survey was initiated using a Global Positioning System (GPS) to plot artifacts. This approach worked very well. Also, three other remote sensing methods (i.e., two methods using electromagnetism and a magnetometer) were used by the NPS in selected small areas within the eventually identified village location. Several small anomalies, which may be deeply buried metal objects, were encountered by the remote sensing scans. In spite of previous years of uncontrolled relic collecting, more than 400 battle-related artifacts were recovered during the NPS survey. These artifacts were especially common within the village site, where Chivington's soldiers destroyed the Indians' property. The archeological evidence clearly indicated the location of a Native American village attacked by U.S. soldiers using Civil War-period armament.

Members of the Cheyenne and Arapaho tribes observed and/or participated in all the NPS fieldwork. Tribal elders served as important consultants to the project. However, this village identification was somewhat controversial in that several slightly different locations for the village had been passed down by oral tradition to some tribal elders. A few said that they heard the voices of their ancestors at the location that they believed to be the village. At a point on the creek called South Bend, local citizens in 1950 had erected a stone marker, commemorating the massacre. This was also the area that the Cheyenne Arrow Keeper had consecrated with a formal ceremony in 1978. However, in spite of an intensive effort, archeological research recovered very little in that traditional area and failed to identify it as Black Kettle's village. Undoubtedly the South Bend area is not the village portion of the site; however, it could be the area where Chivington's troops unburdened themselves of excess gear just before the attack.

This tragic, inexcusable event of 1864 is bound to evoke strong emotions from all people regardless of their ancestry, but this is especially true for the direct descendants of the Native Americans involved with the massacre. While all evidence is not equal, the boundaries of the Sand Creek Massacre National Historic Site are large enough to encompass several interpretations of the site.

The most accurate of the historic records concerning the massacre location was an 1868 map and journal left by Lieutenant Samuel W. Bonsall. In 1870 he returned, this time escorting General William T. Sherman and his party to the site. It was still relatively "fresh," and they collected a large number of artifacts and some human remains during that visit. Bonsall's records agree closely with the overwhelming archeological information.

Finding Sand Creek: History, Archeology, and the 1864 Massacre Site summarizes the massacre; explains the multicultural, multidisciplinary methods used to locate the site; and presents the results of this research. Some artifacts are described in the third chapter, "Identifying the Sand Creek Massacre Site," but most descriptions are presented in the 40 pages of Appendix A. The artifact measurements are given in the English system rather than in metric, as is commonly done. Different scales of measurement sometimes hinder comparisons with similar materials from other sites. The following was recovered during the investigation: cartridge cases and lead bullets of various calibers, cannon-related case-shot fragments, percussion caps and cap tins, trade gun parts, iron arrowheads, military shoulder-scale fragment, general-service buttons, New York State Militia button, canteen stopper ring, picket pin, suspender grip, trouser buttons, boot nails, photograph preserver (picture frame) fragment, trade-silver fragment, hawk bells, shear or scissor fragment, thimble, tinklers, tin cups, tin pans, tin plates, tin bowls, tin coffee pot, tin buckets, tin grater, coffee grinder, cast-iron kettles and pots, cast-iron skillet, iron basting spoon, iron table spoon, iron table fork, iron table knife, meat skewer,

tin cans, sardine can, potted-meat can, condensed-milk can, trunk lock, kerosene lamp part, gas-jet lighting device, axes, awls, files, hammer, flesher/scrapers, wedge, spur fragment, saddle plate, bridle parts, tack buckles, horseshoes, horseshoe nails, wagon hardware, nails, brass tack, strap iron, and barrel hoops. Almost all of these artifacts were deliberately destroyed by the soldiers, as indicated in the historical records and confirmed with the archeology. In a publication such as this, written for several different audiences, the authors and publisher made a valiant effort to present many details of the materials recovered. Personally this reviewer was disappointed that all of the listed artifacts were not described or illustrated.

Four additional appendices found in the volume are very useful. They present archival information relating to the types of artifacts one could expect in a Plains Indian encampment during that time period and the types of known weaponry used by the Colorado volunteer cavalry.

The bibliography is divided into seven different categories: manuscripts, government publications, books and pamphlets, articles, periodicals, maps and plats, and miscellaneous. To find a reference on something in the text, one has to go to the endnotes and then sort out which bibliography section includes the reference. This is a cumbersome process. The arrangement of the bibliography may simply be a matter of preference between an archeologist and a historian; however, since this reviewer is an archeologist, this type of arrangement always seems rather archaic.

Some maps and aerial photographs were too small to readily see the details without magnification. Unfortunately, the small format (5 ¼ x 8 ½ inches) of the paper edition did not allow for larger illustrations.

The authors—Greene, the historian, and Scott, the archeologist—are to be commended for this well written volume, which is of considerable interest to the general public as well as those in the fields of history, anthropology, and related areas of research. In spite of this reviewer's few—and perhaps at times rather picky—criticisms, this book is extremely interesting and well done. It is certainly worthy of space on one's bookshelf and most assuredly will be referenced from time to time by many researchers.

Finding Sand Creek: History, Archeology, and the 1864 Massacre Site is available through your local bookstore or directly from the University of Oklahoma Press, online at www.oupress.com or by phone at 800-627-7377. Readers interested in the current development of the 2,400-acre Sand Creek Massacre National Historic Site can check the web at http://www.nps.gov/sand/.

Civil War Women

Civil War Women. BARBARA BRACKMAN. C&T Publishing Lafayette, California, 2000. 128 pp., appendix, bibliography, endnotes, index. $25.95 (paper). ISBN 1-57120-104-1. *Reviewed by* Beverly Zupka, M.D.

Civil War Women is a book written with a triple purpose: inspiring modern quilters with projects honoring women of the Civil War era, providing interesting activities for Civil War re-enactors, and telling the stories of historical women in mostly non-traditional roles.

The structure of the book is a combination of craft book and historical text. Brackman is a nationally known quilter, and the book's construction is very much like a quilt. It relies on pattern, balance, contrast, and attention to detail. The roles of nine different women are explored: abolitionists, freed slaves, newspaper writers, refugees, nurses, spies, plantation owners, government clerks, and soldiers' wives. Each role is matched to a quilt project and an activity for re-enactors.

Brackman fills this pattern very skillfully. Not only does she write well, but she focuses almost exclusively on primary source material without ever becoming tedious. The book also contains many photographs, engravings, and quotations that make each page visually appealing.

The author maintains balance and contrast between sections (Northern abolitionists and Southern spies) and within each section (slave and free quilters). There is dancing at her quilting parties, but there are also tired backs and pricked fingers. Brackman includes stories of the rich and of the poor, as well as vignettes of beauty and of horror, of duty and dishonesty. Despite this balance, Brackman's sympathies are clearly with abolitionism and feminism. Adamant pro-slavery positions are given zero space in her book. This is not unexpected, but there is also no space given to ardent supporters of traditional women's roles—a little surprising in a book about quilting. However, the stories are rich and interesting. For example, I was surprised to learn of the intense hostility surrounding the federal government's decision to hire female hospital nurses. I had assumed that male physicians had always seen emptying bedpans as women's work!

Each section includes a quilt project inspired by the historical women. This focuses on the meaning of the particular quilt pattern, whether it be Northern eagles or the Southern Democrat rose. The quilt

inspired by slave women is a wonderful quilt with an even better name, "Tobacco Worm." Instructions and templates are given for the construction of each quilt project.

One disappointment is that there are not more photographs of the original quilts described in the text. I would love to see what the original "Tobacco Worm" quilt looked like. The focus on modern quilts means that anyone wanting to reproduce period quilts must look elsewhere. This will be a particular problem for re-enactors—a group that the book targets directly.

Nevertheless, the other activities suggested for re-enactors are interesting, creative, historically accurate, and fun. Brackman's attention to detail makes these activities pop to life. My favorite is smuggling contraband in a hoop skirt. Brackman not only tells tales of actual smugglers (a woman carrying cavalry boots and canned meat under her petticoat), but also gives tips on attaching articles to the hoops and using conversation to size up potential customers. Other activities include staging a bazaar, giving a stump speech, making a tobacco bag or sweetheart flag, interviewing soldiers, and writing letters home.

This book is a delightful introduction to the lives of women of the Civil War era. The projects and the excellent annotated bibliography encourage modern readers to connect further with these women by reading, by sewing, and by re-enacting moments of their lives. Brackman's reliance on primary source material makes this book a good resource for anyone interested in Civil War history.

Storied Stone: Indian Rock Art of the Black Hills Country

Storied Stone: Indian Rock Art of the Black Hills Country. LINEA SUNDSTROM. University of Oklahoma Press, Norman, 2004. x + 238 pp., 205 figures, 3 tables, notes, references, index. $44.95 (cloth, ISBN 0-8061-3562-X). $24.95 (paper, ISBN 0-8061-3596-4). *Reviewed by* Jim D. Feagins.

Storied Stone: Indian Rock Art of the Black Hills Country is written in an interesting, easy-to-read manner. The geographical scope of this volume includes not only the Black Hills of South Dakota and Wyoming, but also the North Cave Hills adjacent to the northern edge of the Black Hills proper.

Born and raised in the Black Hills and after spending more than two decades studying the rock art of the region, Sundstrom is well qualified to write this volume. While there are many publications on rock art, she uses a slightly different approach in that she incorporates an unusual amount of ethnographic information to compare with the rock art. At times it can be misleading to place too much emphasis on ethnographic accounts when comparing archeological materials, including rock art; this is especially true with sites that date back thousands of years. On the other hand, there are considerable advantages, especially with historic and late prehistoric rock art. Ethnographic comparisons can provide considerable insight concerning certain rock motifs, if they are presented with care. Sundstrom is not afraid to speculate. This reviewer has no problem with that, if it is clear to readers just where facts leave off and speculation begins. Generally, that is obvious. In a few instances where more than one interpretation is possible, Sundstrom tends to slightly over-interpret some rock art. Of course, in the vast majority of cases, several viewpoints are presented with appropriate support.

Sundstrom makes convincing connections between certain rock art and similar styles and/or motifs from protohistoric and historic sources, such as with ledger art and hide painting. For example, it appears that a sound link exists between certain shield petroglyphs and Cheyenne shields that were recorded historically. The motifs/designs placed on the shields, part of the spiritual medicine or power, are usually the result of personal vision quests by the owners, or their use could be purchased from others who had successful vision quests. These phosphene images are perceived by the brain as visual images—originating from trances, visions, or altered states of consciousness; nevertheless, they represent powerful events. Shield rock art may provide a strong geographic connection to a ceremony, a vision quest, or a warring event.

The volume also contains innovative information on petroglyphs depicting Lakota Elk Dancers and Mandan-Hidatsa eagle trapping rituals. It is always refreshing to determine tribal affiliations with well-grounded support. For many American Indians these and other rock art sites are not just "...quaint but fading reminders of the past," but rather "... living, powerful, holy places" (p. 46). Often they are places where spiritual help can still be sought.

The book contains the usual introduction to rock art and its history, its relationship to historic and modern Native Americans, and the environment of the area. Some chapters are arranged according to rock art chronology, and some are according to style or rock art subject matter. Criticism of the volume is quite minor,

with the most important being that some photographic images are rather dark, show poor contrast, and are not as sharp as they should be.

This reviewer has informally examined numerous rock art sites and readily admits a weakness for reading rock art books—having reviewed several (Feagins 1987, 1988, 1989, 1991, 1992, 1993, 1999, 2002, 2003). With this broad basis for comparison, this volume's major strength is that it stretches the ethnographic comparisons and interpretations of rock art in a most useful manner. Sundstrom is clearly well versed in Native American ethnohistory, ethnographic objects, petroglyphs, and pictographs. Her knowledge of Lakota, Mandan, Hidatsa, Crow, Cheyenne, Kiowa, and Ponca ethnography enhances her rock art studies.

The general public, as well as archeologists and ethnologists, will find this delightful volume educational, entertaining, and easy to read. *Storied Stone: Indian Rock Art of the Black Hills Country* may be obtained through your local bookstore or directly from the University of Oklahoma Press, online at oupress.com or by phone at 800-627-7377.

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Notes

About the Authors

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Tod joined R. Christopher Goodwin & Associates, Inc. as a project manager in January 2006, directing operations in the Plains region. He received his B.A. from the University of Kansas in 1994 and his M.A. from Wichita State University in 1999. Tod's graduate research focused on three Plains Village period (AD 1000-1500) habitation sites in southern Kansas excavated jointly by the Kansas State Historical Society and the Kansas Anthropological Association over a number of years. A regular contributor of articles and talks oriented toward his peers and the general public, Tod's publications most recently have included contributions to *Kansas Preservation*, *The Kansas Anthropologist*, and a chapter on the Plains Village period in southern Kansas in the edited volume *Kansas Archaeology*. His research interests include the study of prehistoric ceramics, lithic caches and caching behavior, trade/exchange, and environmental reconstruction.

Jim D. Feagins

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Mark A. Latham

[redacted]

During the 1970s and 1980s Mark spent many days every year plowing, chisel plowing, disking, cultivating, compacting, and land leveling throughout Reno, Harvey, and McPherson Counties. His papers in this journal are a true coming together of his two most prominent careers. He witnessed the development of no-till planting and a distinct reduction in agricultural tillage, which ultimately led to his change in careers. He is a cultural resources principal investigator for Burns and McDonnell, Kansas City, Missouri.
Mark is a native Kansan and a member of the KAA. He has conducted cultural resource investigations in 25 states since receiving his M.A. in anthropology from Wichita State University. He resides in Lindsborg with his wife Kiersten and daughter Callan.

David Maki

[redacted]

David co-founded the geophysical consulting firm Archaeo-Physics, LLC in 1997, after completing his degree in civil engineering at the University of Minnesota and a four-year stint in the U.S. Marine Corps. He feels privileged to scratch out a living doing something he enjoys and has thoroughly appreciated working with the many fascinating characters who comprise the global archeological community. His research interests include applying technology to archeological problems with a special emphasis on the emerging field of environmental magnetism.

Donna C. Roper

[redacted]

Donna probably needs no introduction, having contributed to more volumes than not of *The Kansas Anthropologist* in the third millennium. Having completed her study of 14SA1 at Salina—now published as *The Whiteford Site, or Indian Burial Pit: A Smoky Hill Phase Cemetery in Saline County* (Kansas State Historical Society, Anthropological Series No. 18, 2006)—she has moved on to a multitude of other studies, some of which build on that study, and some of which put it in broader context on the Central Plains. These include the description and analysis of Harold Reed's superbly organized and documented collections from sites in central Kansas. She notes that little of what she has been able to do with the Smoky Hill phase would be possible without the contributions of avocational archeologists.

Thomas A. Witty, Jr.

[redacted]

Tom Witty was the state archeologist of Kansas from 1960 to 1994. "Back to Kansas," a retrospective of his career is included in the Special Issue #200 of *Plains Anthropologist* as a contribution to *Plains Archaeology's Past: A Collection of Personal Narratives*, edited by Marlin F. Hawley and Virginia A. Wulfkuhle.

Beverly Zupka

[redacted]

Beverly Zupka is a medical doctor and a volunteer in the archeology laboratory at the Kansas State Historical Society. The book she reviewed for this issue of *The Kansas Anthropologist* inspired her to take up quilting as a hobby.

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INFORMATION FOR AUTHORS

Manuscripts are actively solicited for *The Kansas Anthropologist*. Articles should have a relationship to Kansas anthropology (archeology, ethnography, ethnohistory, cultural/social anthropology, physical anthropology, etc.). All manuscripts must be the original, unpublished work of the authors.

The varied readership of the journal should be kept in mind when preparing papers. **Jargon should be avoided.** The style authority is *American Antiquity* (see Volume 57, Number 4, 1992). Professionals are expected to submit their manuscripts in this form; others who are not familiar with the *American Antiquity* style guide will receive editorial assistance.

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Submit manuscripts to the address below. The editorial staff is here to help you. If you have any questions, please contact:

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