Volume 36
2015

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Journal of the Kansas Anthropological Association

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KANSAS ANTHROPOLOGICAL ASSOCIATION

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This publication is financed in part with federal funds from the National Park Service, a division of the United States Department of the Interior, and administered by the Kansas Historical Society. The contents and opinions do not necessarily reflect the views or policies of the U.S. Department of the Interior or the Kansas Historical Society. U.S. Department of the Interior regulations strictly prohibit unlawful discrimination in departmental federally assisted programs on the basis of race, color, national origin, age, or handicap. Any person who believes that he or she has been discriminated against in any program, activitiy, or facility operated by a recipient of federal assistance should write to Director, Equal Opportunity Program, U.S. Department of the Interior, National Park Service, 1849 G Street, Northwest, Washington, D.C. 20240.

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Notes

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FLUTED POINTS FROM NORTHERN KANSAS

Jack L. Hofman
Barbara M. Crable
University of Kansas

Two fluted points and a fluted preform have recently been found and documented in Republic County in northern Kansas. These artifacts, including a Clovis and a Folsom point, add to the evidence for early Paleoindian sites in the upland areas of the county, which is characterized by salt marshes and salt springs. Previously eight Clovis points and one Folsom have been reported from Republic County, and other discoveries have been reported for the region (Hofman 2013). This paper summarizes information about three new finds, including site settings and material types.

Considering the Plains region as a whole, Folsom sites and isolated Folsom points are more common than are Clovis sites and points (Andrews et al. 2008; Asher 2015; Hofman 1996; Williams 2015). However, in Kansas Clovis finds are more numerous than Folsom (Asher 2015; Blackmar 2001; Blackmar and Hofman 2006). This phenomenon does not seem to be the result of recording bias. While a clear explanation has not been forthcoming, the pattern might relate to a more generalized subsistence among Clovis groups as compared to the specialized bison-focused economy of Folsom people (Asher 2015; Collins 2007). Climate and ecological changes also may be contributing factors. Possibly current sample sizes are too small to reflect the "real" pattern, although they are comparable to some surrounding states.

This paper supplies additional information about recently documented fluted points and will help build the data base of early Paleoindian evidence for Kansas and the central Plains region. Artifact measurements are provided in Table 1, along with information about other fluted points from Republic County. The Figure 1 map shows the relative locations of the recent and past fluted point finds for the area.

14RP59

Site 14RP59 is located on the upland divide between Rose Creek and Mill Creek between Narka and Munden, Kansas. It is about 13 km west of 14RP10, which is situated on this same divide but close to a spring-fed tributary of Rose Creek. Site 14RP10 yielded a Clovis, made of Permian chert, a Folsom, and an unfluted Paleoindian projectile point. Another Clovis point, made from Smoky Hill jasper, was discovered on Mill Creek some 11 km southeast of 14RP59. Today no features at the 14RP59 find spot suggest why this specific place would have been of interest to Clovis people. The isolated Clovis point might have been lost, perhaps during a hunting episode. The specimen was collected in 2016, following the clearing of trees and buildings from a historic farmstead, 75–100 m away from the house and yard in a tree row. The property, which is on east and northeast slopes of the upland divide that drains into a tributary of Rose Creek, is currently under cultivation. No other chipped stone material was found in the vicinity.

The point is made from a translucent yellow-brown White River Group chalcedony (silicate), probably from the Flattop source area (Asher 2015; Greiser 1983; Hoard et al. 1992, 1993; Holen 2001), which is west of Sterling, Colorado, about 475 km west of Republic County. The artifact is complete and undamaged (Figure 2, top). It has a deeply concave base and is fluted on both faces, with one flute scar ending in a hinge termination and the other flute interrupted by flaking. Flake scars on the blade are expanding and meet near the midline. The lower lateral edges and base are heavily ground. The blade

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Table 1. Fluted Points from Republic County, Kansas. Measurements are in centimeters.

Point type	Site number	Site name	Portion	Material	Length	Width	Base width	Thickness	Fluted thickness*	Kansas Clovis number
Clovis	14RP8	Fisher	CO	SHJ	7.25	2.85	2.92	0.89	0.49	32
Clovis	14RP10	Graham	NC	PRB	3.73	2.19	2.196	0.62	0.46	113
Folsom	14RP10	Graham	BA	FW	(1.79)	1.80	1.785	0.38	0.26	NA
Clovis	14RP11	Larson	CO	WRGS	8.30	3.04	2.69	0.83	0.53	44
Clovis	14RP12	Blue Marble	BA	WRGS	(2.85)	(2.61)	—	0.75	—	114
Clovis	14RP59	Strnad	CO	WRGS	5.66	2.01	1.97	0.65	0.48	136
Folsom	14RP60	Munden	BA	PRB	(2.71)	2.54	2.54	0.55	0.38	NA
Clovis	14RP61	Strnad Cherry	BA	SHJ	(4.76)	(2.6)	—	1.01	0.47	137
Clovis	14RP327	Bredthauer	CO	SHJ	4.35	2.07	1.909	0.64	0.55	110
Clovis	14RP327	Bredthauer	BA	SHJ	(4.03)	3.36	2.925	0.83	0.63	111
Clovis	14RP327	Bredthauer	BA	SHJ	(3.27)	2.32	2.05	0.57	0.45	112

Key to Portion codes: CO = complete; NC = nearly complete; BA = base broken across blade

Key to Lithic Material types: SHJ = Smoky Hill jasper; PRB = Florence (Permian) B; FW = silicified wood; WRGS = White River Group Silicates (Flattop chalcedony)

*Fluted thickness is measured 1 cm above the center of the base.

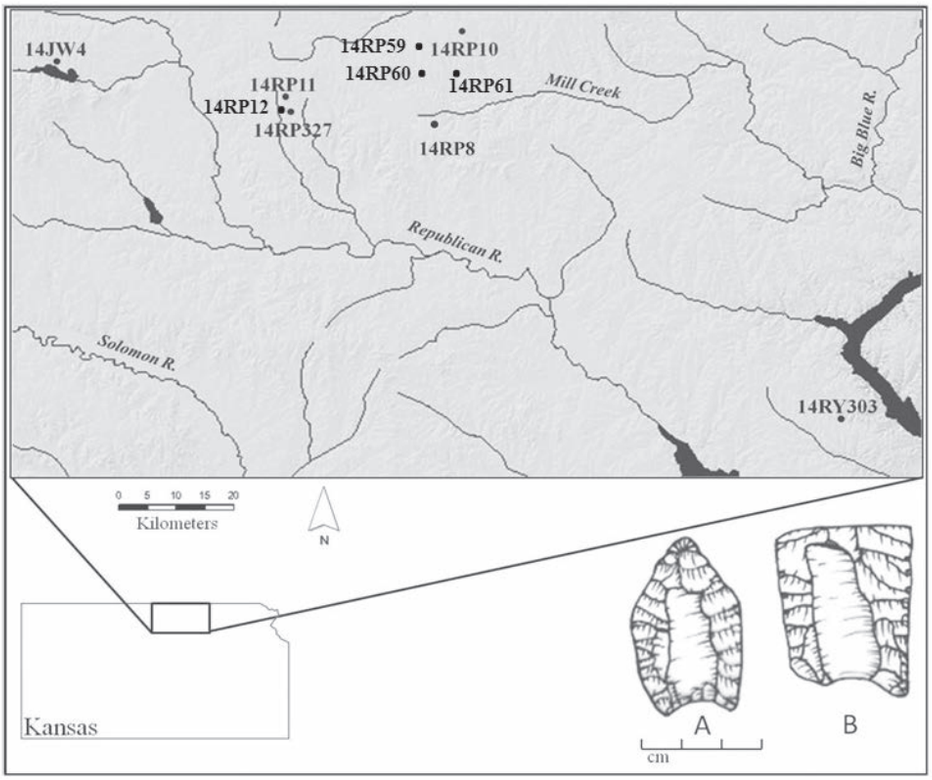

Figure 1. Map of the Republic County area with early Paleoindian site locations (modified from Hofman 2013). A and B are Smoky Hill jasper Clovis points from 14RP327. The Eckles Clovis site is 14JW4, and the Diskau Clovis site is 14RY303.

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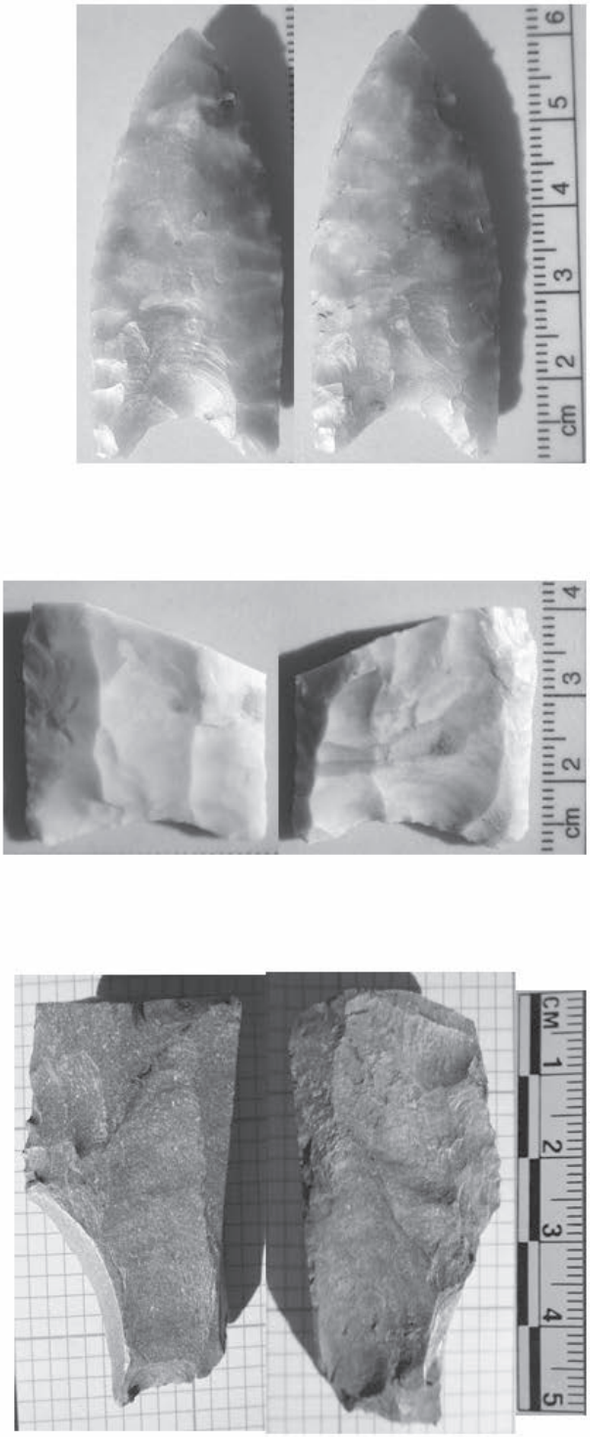

Figure 2. Fluted projectile points from Republic County sites 14RP59, 14RP60, and 14RP61.

appears to have been reworked at least once, and the original point is believed to have been longer. The tip is sharp and undamaged.

Other Flattop chalcedony Clovis points are documented from 14RP11 and 14RP12. The Clovis assemblage from the Eckles site to the west in Jewell County also is manufactured from Flattop chalcedony (Holen 2010).

14RP60

Site 14RP60 is located in the uplands north of Munden in the upper reaches of a shallow draw that drains northwest into a tributary of Rose Creek. A playa lies about 200 m to the east. The find spot was disturbed in the process of filling and re-leveling a narrow gully, and renewed erosion exposed reduced and oxidized sediments about 30–40 cm below the ground surface. The buried horizon indicates standing water and a fluctuating water table for an extended period in the past. This might have been a playa basin, the margin of which was breached by headward erosion of the draw to the northwest. The find spot in a cultivated field did not yield other chipped stone artifacts or bone.

The 14RP60 Folsom point (Figure 2, center) is made from a very high quality vitreous mottled white and gray Permian chert (Florence B). Only the basal portion remains, but the compound snap fracture is recent (historic age, based on differential weathering of the broken surface compared to the other surfaces) and probably resulted either from cultivation or earth-moving activity. The specimen is fluted on both faces, with flutes extending the full length of the basal fragment. The original lengths of the point and the flutes are unknown. A single flute is present on one face, and multiple flute removals are visible on the opposite side. Lateral edge grinding is evident, and basal grinding is very light. Marginal flaking is horizontal, roughly parallel, and interrupted by the flute scars. One lateral edge may have been reworked, suggesting that some prior damage might have been repaired. Apparently less than half the length of the original point is represented.

This is only the second Folsom point documented for Republic County. The other, also a basal piece but manufactured from silicified wood, was recovered at the Graham site (14RP10), located about 12

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km to the east near a spring-fed tributary of Rose Creek.

14RP61

Site 14RP61 is situated about 11 km east of Munden on the scarp or slope of a high terrace (T2) along the west side of Cherry Creek, a tributary of Mill Creek. The site was discovered in a cultivated field after clearing and burning trees and filling a gully that had eroded the terrace face. A large contracting-stemmed dart point (13 cm in length) and two large bifacial preforms (one almost 9 cm and the second 9.5 cm in length) were collected within a few meters of each other in an eroded gully on the terrace face. All three are manufactured from gray Florence B Permian chert and are assumed to be of late Archaic or Woodland age. A limited amount of deer-sized bone, some of which is burned and has green fractures, was found at the site and is assumed to be associated with the late Archaic or Woodland-age artifacts. The site has not yielded fire-cracked rocks or flakes, so it does not appear to be a typical camp or domestic occupation. Historic burning of trees may account, at least in part, for the charcoal at the site.

The Clovis preform fragment was found near the base of the terrace scarp about 20 m east of the area where the stemmed point and bifaces occurred. The piece is manufactured from Smoky Hill jasper (Stein 2005). A large basal portion was apparently broken during the late stage of thinning and shaping (Figure 2, bottom). The preform is completely bifacially flaked and exhibits multiple flute removals from the base on both faces. It is relatively flat in both long section and cross section. It split during the fluting, the corner snapped off, and it also broke across the blade. The surviving part represents half of the basal element, but the basal corner is also missing. Original length, width, and extent of the flutes are unknown. The remaining lateral edge is straight, and no grinding is evident on the base or blade margin. An iron stain on one face apparently resulted from contact with cultivation equipment, but this does not appear to have contributed to the breakage, as all fracture surfaces are patinated and weathered.

Other Clovis points made from Smoky Hill jasper are documented from Republic County at sites 14RP8 and 14RP327. Site 14RP8 is located on Mill Creek about 8.5 km southwest of 14RP61. Site 14RP327, situated about 24 km to the southwest, had three Clovis points, all made from Smoky Hill jasper. Several of the Clovis points from the Diskau site in Riley County, about 75 km to the southeast, also are made from Smoky Hill jasper (Schmits 1987).

SUMMARY COMMENTS

Current evidence from the upland areas of Republic County indicates repeated activities of Clovis and Folsom people. These sites stand in contrast to the majority of fluted point finds in northeastern Kansas, which are from major stream valleys, usually on gravel bars (Asher 2015, Wetherill 1995). Exceptions to this pattern are the Eckles and Diskau Clovis sites that are located on uplands along the Republican and Blue river systems. In the Republic County vicinity the upland divide between the Republican and Blue drainages is fringed by springs and seeps that flow into Rose, Mill, Riley, and Salt creeks. This locality was an important and recurrently used pathway for movements of animals and people, and the mineral-rich springs would have been an important attraction to animals, such as mammoth, mastodons, horses, camels, and bison. Discoveries of late Pleistocene megafauna are relatively common in the region, but as yet no direct associations with fluted points have been identified in Republic County.

Clovis artifacts from the county attest to a variety of activities. Several points are isolated complete or impact-damaged specimens, which probably were lost during hunting episodes. These include the Clovis points from 14RP59 and 14RP8, but whether these points were associated with successful kills is unknown. Two sites, 14RP10 and 14RP327, probably represent camps or short-term bivouac and retooling sites where damaged projectile points were repaired or replaced. They are marked by Clovis point bases or heavily reworked “expended” points and are located close to good springs. Site 14RP12 probably was an overlook and retooling station. This site is situated on a high ridge, overlooking the Riley and Salt creek drainages, and

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yielded a Clovis preform that failed during fluting. Small bifacial retouch flakes of diverse materials are common at this site and reflect final shaping or reworking of projectile points and other tools. Later Paleoindian and Archaic evidence is present on the site as well, suggesting repeated and similar use of the site area over many millennia. The failed preform at 14RP61 probably also represents manufacturing and perhaps retooling activities, but in a very different and protected setting lower in the Cherry Creek valley. Site 14RP11 is located on the slope near an upland spring that feeds Riley and Salt creeks. The site produced a complete Clovis point, apparently in association with two bifaces that were subsequently lost and not documented. This find could have been a Clovis-age cache. Collectively, these discoveries reveal an interesting range of Clovis-period activity in the Republic County area and provide tantalizing clues about Clovis people, who relied upon the salt springs and diverse resources in this region.

ACKNOWLEDGMENTS

The authors extend our special thanks to David, Carla, Talia, Sophia, Adalyn, and Zebulon Strnad. Also, Virginia Wulfkuhle first documented the 14RP59 point and initiated our contact with the Strnad family.

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NOTES FROM AN EXPERIMENT WITH PRIMITIVE POTTERY FIRING WITH OPPORTUNISTIC THERMAL TREATMENT OF CHERT

Jim D. Feagins
St. Joseph Museum

Peggy Feagins
Belton, Missouri

This article describes the pyrometer recording of an outdoor pottery firing experiment using primitive methods. The experiment with thermal treatment of Winterset chert was an opportunistic adjunct to the pottery firing.

This humble article is based on notes written 40 years ago with no intention of ever submitting them for publication. This was a time when Peggy Feagins was relatively new in her career as a professional potter, and her husband Jim was well into teaching science full time but also had started doing cultural resources management archeology on the side as part of the adjunct staff for the Kansas City Museum. Peggy's work was generally wheel-thrown and slab-built pottery, fired in an electrical kiln. However, the primary goal of this project was to get a feel for the processes, trials, and tribulations of firing pottery outdoors over an open fire. The heat treatment of chert was secondary to that effort—simply taking advantage of the opportunity to add another experiment to the mix.

A lot of archeological experimentation was being conducted in the 1970s and later in an attempt to help answer certain archeological research questions. One major research focus was prehistoric technology. Two examples of special interest in the Feagins household were the various nuances of prehistoric pottery manufacture and the differential use of heat-treated chert from certain geological formations for the manufacture of chipped-stone tools.

Prior to this firing Peggy intermittently over several years had carried out a half dozen outdoor pottery firings, experimenting with a number of variables: locally dug clays, temper types, vessel shapes, arrangements of pots to enhance their protection during firing, use of firing pits or no pits, and fuel types. The fuels ranged from different species of wood to dry cow dung patties. During this time Peggy taught an adult education course for the Kansas City Parks Department, titled "Pottery from the Ground Up." The department furnished dry dung from the Kansas City Zoo for the firing. Because the dung had been trampled by animals, mixed slightly with their straw bedding, and was quite friable when dry, it could not be attributed specifically to elephants or zebras or a whole range of animals in between. The private firing was conducted in the Feagins' garden in Grandview, Missouri, employing a pyrometer to quantify the firing temperature. Thus, it is considered to be more useful to others who might contemplate doing such experiments or to those who simply want to learn a little more about primitive pottery manufacture or the heat treatment of chert.

THE POTTERY FIRING

This firing experiment started very late in the afternoon of April 27, 1978. During the warm sunny days in this part of the central plains, there is usually a diurnal wind pattern, with wind increasing during the heat of the day and dying down again toward evening. For this reason potters using primitive methods prefer to start firing very early in the morning or late in the day. On this particular day

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the breeze was not ideal, as it changed direction and increased for a time during the most critical part of the firing (Table 1). Obviously, modern potters favor using a kiln, where such variables can be controlled, but prehistoric potters on the prairies and elsewhere did not have that luxury.

A broad, shallow pit, measuring 3 by 4 feet in area and 6 inches in depth, had been dug previously.

Table 1. Firing temperatures for pottery and Winterset chert sample.

4/27/1978 time: PM	Running time in minutes	Temperature—Celsius °	Temperature—Fahrenheit °	Comments
4:53	0.0	20.0	64	Fire ignited; gentle breeze
4:59	6.0	48.9	120	Gentle breeze
5:02	9.0	93.3	200	
5:03.5	10.5	493.3	920	Very gentle breeze
5:04.5	11.5	524.0	975	
5:06	13.0	546.1	1,015	
5:08	15.0	671.1	1,240	Gentle breeze
5:10	17.0	737.8	1,360	
5:12.5	19.5	765.5	1,410	Breeze continued from east
5:14	21.0	810.0	1,490	
5:17	24.0	876.7	1,610	Slight breeze increase
5:18.5	25.5	951.7	1,745	Wind picked up
5:20	27.0	943.3	1,730	Slightly stronger wind
5:21.5	28.5	868.3	1,595	Wind direction now variable
5:23	30.0	911.1	1,680	Variable stronger wind continued
5:25.5	32.5	937.8	1,720	Fire starting to diminish
5:29	36.0	860.0	1,580	Wind mainly from north
5:33	40.0	815.0	1,500	
5:36.5	43.0	871.1	1,600	
5:41	48.0	765.6	1,410	
5:46	53.0	771.1	1,420	
5:49.5	56.5	665.6	1,250	North wind continued
5:57	64.0	643.3	1,190	
6:01	68.0	621.1	1,150	
6:05	72.0	626.7	1,160	
6:07	74.0	604.4	1,120	
6:10.5	77.5	604.4	1,120	Wind slightly diminishing
6:21	88.0	571.1	1,060	
6:26	93.0	565.5	1,050	
6:31	98.0	554.4	990	
6:41	108.0	476.7	890	
6:44.5	111.5	486.7	910	
6:52	119.0	460.0	860	
6:58	125.0	454.4	850	
7:05	132.0	437.8	820	
7:52	179.0	304.4	580	
8:01	188.0	282.2	540	
8:05	192.0	248.9	480	Coals raked away
8:59	246.0	146.1	295	Recording stopped; cooling

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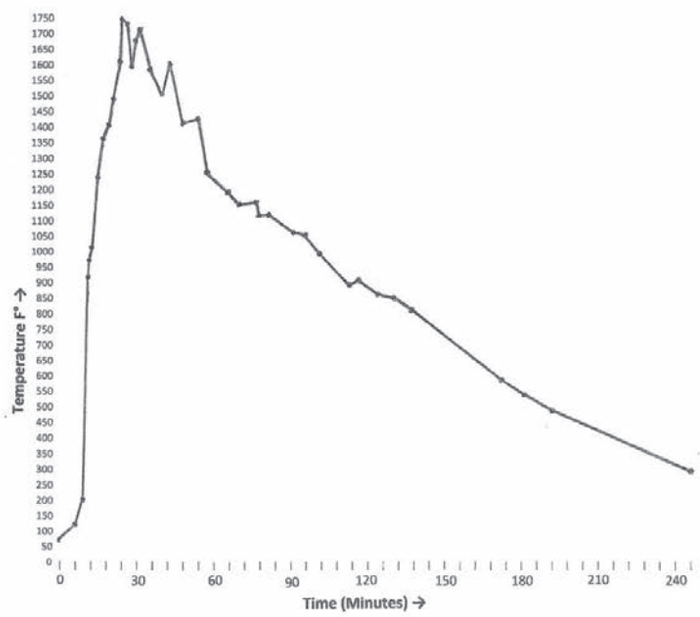

Figure 1. Graph of firing temperatures through time.

Figure 2. Taking a pyrometer reading during firing from behind a protective asbestos sheet.

In order to warm the soil and especially to remove moisture from the ground, a small fire was burned in the pit for several hours before the actual pottery firing. The pots themselves were not preheated beside the firepit, as had been done in previous experiments. Instead, they were preheated in the oven at 150° F for three or four hours. In addition to warming the vessels, the extended heating drove out residual moisture.

When the pit was sufficiently dry and the pots were ready, the coals were spread out in the pit, and the cutout end of a metal barrel was laid flat over the scattered coals. Thus, the pottery did not rest directly on any of the coals. Only four pots were fired at this time. Three were placed under metal buckets, while one was left exposed directly to the wood and flames. This idea resulted from an experience in Flagstaff, Arizona, one summer when Jim attended graduate school. Jim and Peggy watched Garnet Pavatea, a Tewa-Hopi, fire her pottery with dung. She partially protected her pots with a piece of metal and some large broken pottery fragments.

To fuel this firing Peggy decided to use dry Osage orange (*Maclura pomifera)*, commonly called "hedge," which probably had been cut four to eight months earlier. This wood is considered a

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little risky, as it is a hard, hot-burning wood that tends to spark from small pieces of popping sap. Nevertheless, Peggy wanted a hotter temperature with the hope of creating a harder pottery ware.

Small 2- to 3-inch-diameter logs of Osage orange were placed around and over the pottery, other softer woods stacked on top, and a brush pile of very small, dry sticks piled over all. When lit, the brush burned furiously, but most of the heat went up. Eventually it ignited the Osage orange wood below, gradually heating the pottery a little less suddenly than if the kindling had been at the bottom. The rate of temperature increase is seen in Table 1 and Figure 1. Note that the recorded time intervals varied after a while.

The firing temperatures were obtained by using a portable pyrometer (series 245, model # PM-20700), manufactured by the Thermolyne Corporation of Dubuque, Iowa. The instrument has the capacity to record a range of temperatures from 32° to 2,200° F. This highest temperature is approximately 1,200° C, which is more than adequate for recording primitive firings.

The pyrometer instrumentation was attached by means of a long electrical wire to a thermocouple, which was placed well within the firing pit (Figure 2). An effort was made to protect the thermocouple wiring by placing it in a very shallow trench near the fire until it reached the pit, where it had been inserted inside small clay drainage tiles. The distal end of the thermocouple protruded outside the tile and outside of the buckets; thus, it best recorded the temperature variations affecting the one unprotected vessel. This seemed to work well. However, after the fire had cooled overnight, it was discovered that about 35 cm of insulation on the wiring within the clay tiles had melted. While this did not affect the accuracy of the readings, it required wire repair before recording future firings.

The three pots, protected by the inverted metal buckets, fired nicely with no cracks and a minimum of firing clouds. In contrast, the unprotected pot had cracks and, as expected, extreme firing clouds. The firing clouds were not a problem and simply added character to the vessels. The cracks on that vessel were a different matter, as they rendered the pot unusable for cooking or for storing liquids. It still could be used for more limited service, storing dry foodstuffs, such as nuts, seeds, etc.

EXPERIMENT WITH HEAT TREATING CHERT

For the heat treatment of chert experiment, three pieces of Winterset chert were collected from a partly soil-covered outcrop near Maybrook Creek in southern Jackson County, Missouri. Winterset chert is a common chert type that was heavily utilized by prehistoric people in and surrounding the Kansas City area from at least Archaic times through Late Prehistoric periods. Winterset is the most commonly used chert in the area south of the Missouri River, especially in Jackson County, Missouri (Feagins 2006:16) and eastern Johnson County, Kansas, and it is often found on archeological sites in adjoining counties. The upper portion of the Winterset member of the Dennis formation (Pennsylvanian age) is chert bearing (Searight and Howe 1961:101). To the author's knowledge, this chert is not known for being deliberately heat treated in the prehistoric past; however, there could be exceptions. Certain other cherts commonly were heat altered to increase ease in flintknapping for the manufacture of chipped-stone tools (Ray 2007; Whittaker 1994:72–74). Some cherts are not improved by heat treatment, and some are even adversely affected. One could not help but wonder what heating would do for Winterset chert. The initial hypothesis was that heat treatment would not improve the flintknapping qualities of Winterset chert.

In this experiment two pieces of chert were buried vertically in the center of a large sand-filled juice can, which rested beside the exposed pot. The third piece was placed horizontally on top of the sand at the brim of the metal can, where it was directly exposed to the flames during the pottery firing.

The two pieces of chert that were buried in the sand shattered into very small fragments. While it was hoped that the sand would insulate them from a drastic thermal shock, such was not the case. The extensive shatter included a few small potlids, which are characteristic of adverse thermal alteration, i.e., thermal-shock. The colors of these pieces seemed to be the same or almost the same as before the firing.

Surprisingly, the third piece of chert, which was exposed directly to the flames, fared better than the two that had been buried in the sand. The unprotected piece did not shatter. The only changes in

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appearance were mild carbon deposits on the upper surface from slight smoking and a light pinkish coloration at one end. The color change was very slight and perhaps could have gone unnoticed. On the opposite side, the side resting directly on the sand, a slight shiny luster was visible at one small location. No experimentation was done to test the knapability of this piece of chert before or after the heat treatment.

It was hoped that this experiment might give clues as to why Winterset was used without thermal modifications by prehistoric inhabitants. The prevalent theories about heat treatment or lack of it in the late 1970s and still today were only partially supported by this limited and crude experiment. In fact, as anticipated, the heat did have an adverse effect on the Winterset chert buried in the sand. However, the piece directly exposed to the fury of the flames fared better. This was not expected. Clearly more experiments with better controls need to be conducted and followed with flintknapping tests on the results. The Feagins' hypothesis remains that Winterset chert as a tool-stone source was not improved by heat treatment. It is hoped that someone else will take up the challenge of additional thermal testing of this tool-stone source and will share the results with the archeological community.

SUMMARY

The focus of this firing was on the pottery. Clearly the increasing wind and its variability, especially approaching and during the period of maximum firing, affected the temperature readings (Table 1 and Figure 1). As the wind died down at the end of each gust, the temperature rose. Even though moisture had been removed from the firepit and within the pots themselves prior to the firing, the temperature increase was rapid enough to cause thermal shock, cracking the vessel that was outside the overturned metal buckets and in direct contact with the flames. As had been determined in previous pottery firing experiments by the Feagins and others, the most rapid change in temperature occurred as the heat increased, not as the heat decreased. Any breakage was most likely to occur before the flames began to die down into a lingering bed of coals. This is common knowledge, but this experiment quantified temperature readings at different times during the firing. As Table 1 shows, the interval of greatest risk for thermal shock lasted approximately 45 minutes from about 15 minutes until about an hour into the firing. The three vessels protected under the buckets came out unscathed, likely due to being sheltered from the "cooling" effects of the wind and from hot spots where burning logs touched the pots. The temperatures were sufficient to vitrify the clay into usable pottery.

Firing of pottery and chert are both subject to some similar hazards. These efforts simply add, however belatedly, a little more information on primitive pottery firing and heat treatment of Winterset chert to the archeological, ceramic, and lithic literature.

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SQUASH KNIVES: AN EXPERIMENTAL ARCHEOLOGY PROJECT

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Washburn University

This experiment compared the effectiveness and efficiency of bone squash knives and chipped stone tools. In time trials newly fashioned tools, based on designs found in some archeological contexts, were used to cut two varieties of squash.

This project was conducted because there was much debate on whether the artifact commonly referred to as a squash knife was actually a knife or a spatula or possibly a tool that served another purpose. Pitting the bone knives against chipped stone knives gave a baseline to determine if squash knives were more or less efficient cutting tools. The experiment was conducted in May 2017 at the Kansas Historical Society Archeology Lab and was funded by a grant from the Kansas Anthropological Association's John Reynolds Memorial Research Fund.

DEFINITION, RESEARCH QUESTIONS, AND HYPOTHESIS

A squash knife is defined as a bone tool, shaped from a bison scapula, used by American Indians to cut squash into strips, which were then dried to preserve for winter food (University of Iowa 2017).

Research questions were

1. Was the squash knife used for cutting squash?
2. Was the squash knife better than or just as efficient as stone cutting tools?
3. Does the knife-handled version of the squash knife work as well as the ax-head version?

The hypothesis was that bone squash knives would not cut vegetables as efficiently and cleanly as lithic tools.

MATERIALS AND METHODS

Materials consisted of two green bison scapulae, two chipped stone bifaces, four acorn squash, and four butternut squash.

The experimental squash knives could have been fashioned using replica stone tools, but, due to time constraints, they were made with modern tools. For example, chipped stone bifaces were replaced by metal knives to score and groove the scapulae, and a modern grinding stone was substituted for sandstone abraders to bevel and sharpen the edges.

Two bison scapulae were obtained from a local source and prepared in the following manner.

1. The scapulae were soaked in a 5-gallon bucket of water for about three and a half days to hydrate the bone and make it easier to work.
2. Two different squash knives were made (Figure 1): one in the shape of a knife blade with handle

Figure 1. Ax-head (left) and handled (right) versions of replicated squash knives.

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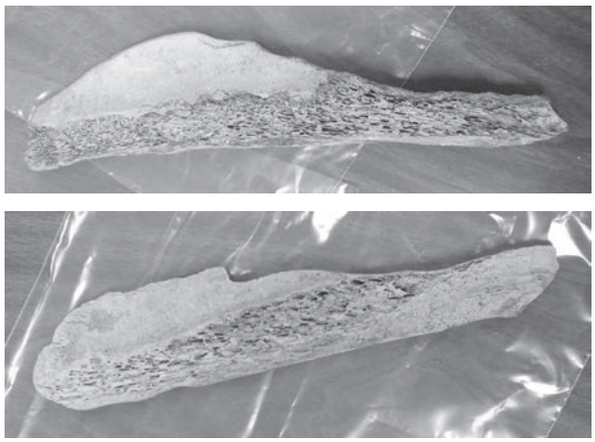

Figure 2. Artifacts from 14RC5 and 14RC8 referenced for replicating handled squash knife.

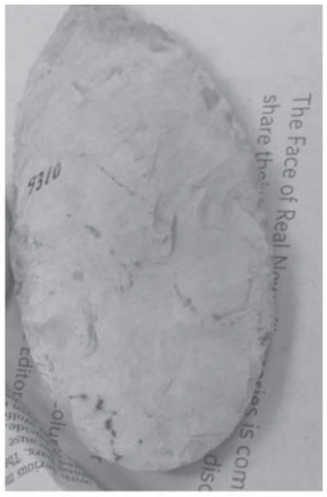

Figure 3. Chipped stone tool A.

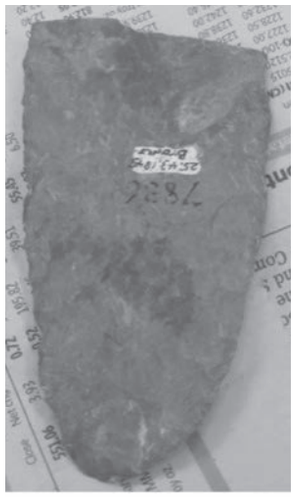

Figure 4. Chipped stone tool B.

Figure 5. The author cutting butternut squash with the handled version of the squash knife in the timed portion of the experiment.

and the other in ax-head form. The handled version was designed by referencing artifacts from 14RC8 (Tobias site) and 14RC5 (Malone site), curated in the Kansas Historical Society (KSHS) collections (Figure 2). The ax-head version was created by consulting *Buffalo Bird Woman's Garden: Agriculture of the Hidatsa Indians* (Wilson 1987:106).

3. The two distinct squash knife shapes were outlined on separate scapulae with pencil.
4. A modern metal knife was used to lightly score and then deeply groove the squash knife outlines.
5. The scored squash knives were placed on an anvil and separated from the parent scapulae by striking them with a modern hammer.
6. Modern metal files and pieces of sandstone were used to sharpen the squash knives to single-edged bevels.

Material for the two lithic tools needed for the experiment were obtained from the KSHS deaccessioned collections. They were sharpened by pressure flaking with a deer antler. One (chipped stone tool A; Figure 3) was fashioned from white Permian chert that produced a handle large enough to be useful. The other (chipped stone tool B; Figure 4) was made on a section of Florence chert that did not create a handle. The Permian chert biface was less dangerous to use, so the Florence chert tool

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was used only for the 30-second test and not the full squash test.

THE EXPERIMENT AND RESULTS

This experiment consisted of two parts. The first involved cutting acorn and butternut squash into 1/4-inch-thick slices (from side to side, not from stem to blossom end), as described in Wilson 1987:71, to see how far and easily the strips could be cut in a 30-second time period (Figure 5). The level of efficiency of the bone and lithic knives was assessed by the quality of the cuts and amount of force required to make the cuts.

The second part of the experiment used the same bone and lithic tools to completely slice whole acorn and butternut squash, recording how long the process took. Tables 1 and 2 and Figures 6–8 present the results of both procedures.

Table 1. 30-second Time Test.

Tool	Number acorn squash slices	Number butternut squash slices	Comments
Ax-head squash knife	3	2	Clean easy cuts; more control with thinner blade
Handled squash knife	3	3	Harder to cut than with ax-head version; cuts still clean
Chipped stone tool A	1	1.5	Very hard to cut with; very rough and pulverizing cuts
Chipped stone tool B	.5	.5	Harder to cut with because of short blade; cuts not clean

Table 2. Cutting up Whole Squash.

Tool	Acorn squash time (minutes)	Number acorn squash slices	Butternut squash time (minutes)	Number butternut squash slices	Average time per slice (seconds)	Comments
Ax-head squash knife	3:09	12	4:42	16	17.63	Easy to use; clean, thin (1/4-inch thick) slices
Handled squash knife	3:02	11	6:05	15	24.33	More force required to complete each cut; thin (1/4-inch) slices still possible
Chipped stone tool A.	4:31	6	7:52	10	47.20	Huge amount of force required to complete each cut–comparable to sawing through plastic; 3/4-inch-thick cut was thinnest achieved

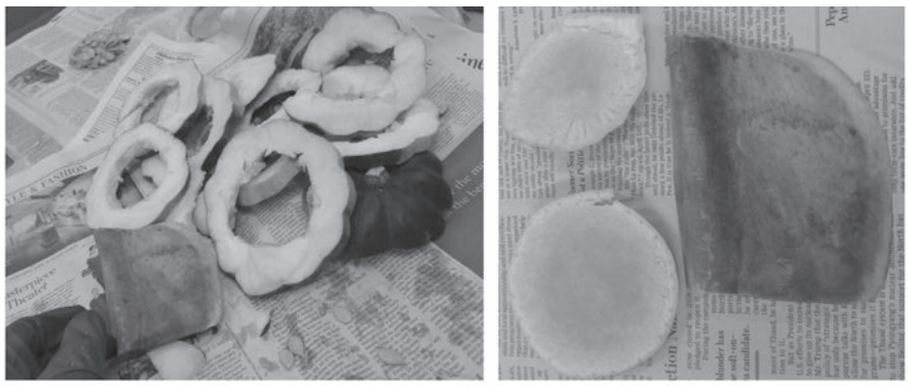

Figure 6. Thin and clean cuts made by the ax-head squash knife. This type of blade had a tendency to cut the slices in a spiral formation.

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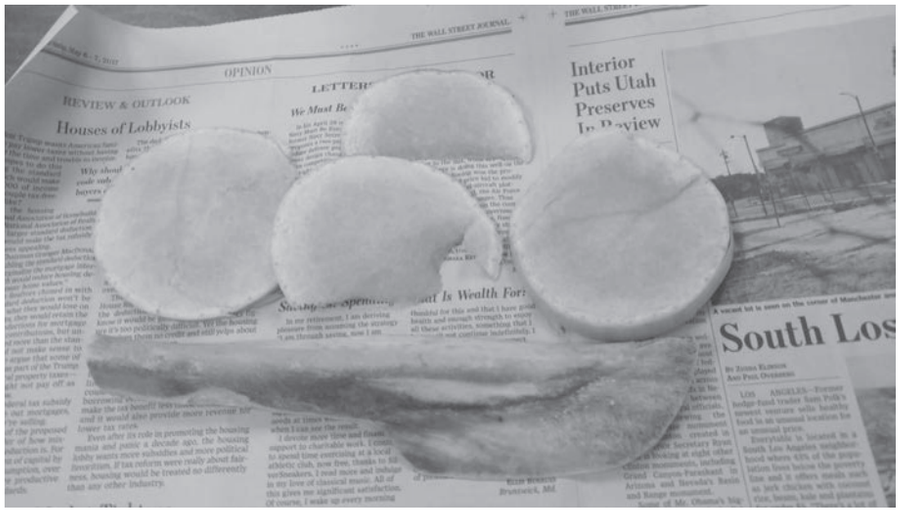

Figure 7. Relatively clean cuts that the handled squash knife made. The thickness of the blade made cutting perfect slices rather difficult.

Figure 8. Sloppy cuts made by stone bifaces, demonstrating how thick the cuts had to be in order not to smash the squash. The squash split due to the thickness and ineffective cutting surfaces of the bifaces.

CONCLUSION

Comparing the results achieved with the bone and chipped stone tools, the hypothesis that the chipped stone tools would be better cutting tools than the bone knives proved false. Surprisingly, the bone squash knives worked very well for cutting squashes to a degree comparable to a modern metal chef's knife.

The ax-head version was much easier to work with than the handled knife version because of two factors. The first was the wide thin blade that allowed the squash to be sliced with little resistance and without the squash bending and splitting. The second factor was the angle at which the blade was employed. When using the ax-head version, the pressure was directed to the palm of the hand, allowing more pressure to be applied to the squash with considerable ease. In contrast, the knife handle version needed a large amount of torque, generated from the rotation of the wrist, causing the user to tire more frequently.

In sum, this experimental project determined that so-called squash knives found in archeological contexts may well have been used by Native Americans for cutting vegetables. The ax-head version of the tool proved to be the most efficient for slicing squash. Stone tools were less effective and efficient at this task

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ACKNOWLEDGMENTS

The author acknowledges the support of a John Reynolds Memorial Research Fund grant from the Kansas Anthropological Association. He thanks Kansas Historical Society archeologists Chris Garst and Robert Hoard and intern Meghan Grizzle for their help with this project.

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SURFACE SURVEYS WEST AND SOUTH OF THE TOBIAS SITE (14RC8)

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This report documents surface surveys conducted on cultivated fields immediately west and south of the Tobias site (14RC8), a Protohistoric Wichita village site in Rice County, Kansas. Plotted locations of lithic and other artifact finds provide a clearer picture of the settlement area and are the basis for adjustment of site boundaries. Extrapolation of the plotted artifact zone beyond the cultivated ground was the impetus for several additional investigations on adjacent pastureland.

For a few weeks in autumn 2011, I was in Kansas, familiarizing myself with some acreage in Rice County that had been in family ownership for almost three decades. While family trips to Kansas occasionally included quick excursions to "check on the land," the farm had never enjoyed more than obscure status to me. After all, we lived in Minnesota and simply did not get to Kansas, let alone to Rice County, very often.

Imagine my delight when I stumbled across a piece of worked stone while walking over one of the cultivated fields. That and several other finds set in motion an archeological surface reconnaissance in which artifacts were collected and their positions recorded. This project began in earnest in March 2012 and is ongoing.

BACKGROUND

As it happens, my family's property is contiguous with the Tobias site, the iconic state-owned preserve that was the location of a Wichita Indian settlement in the Protohistoric period (A.D. 1450–1700). This Great Bend aspect, Little River focus site (Blakeslee and Hawley 2006; Wedel 1959) occupies 32 ha (80 acres) on a broad ridge at the northeast corner of a section. The remainder of the section to the west and south is owned by my grandmother.

The Tobias site has been the subject of amateur and professional investigation since the early 1900s. Smithsonian archeologist Waldo Wedel (1959:214), when discussing the site environs, stated, "The cultivated fields lying to the south . . . when freshly plowed yield chipped stone, potsherds, bone fragments, and other detritus after every rain. This suggests that the actual area of habitation may once have been appreciably larger." He was less certain, without being totally dismissive, about a ridge to the west, being in pasture at the north end, which he described as "another grassy knoll without visible archeological remains" (Wedel 1959:211).

The distance that the Tobias site extended beyond the ridge to the south and west is a central issue of this project. I started my research by contacting the Kansas Historical Society (KSHS) for information regarding the land close to 14RC8. State Archeologist Robert Hoard provided an overhead graphic, showing the settlement area, as it was understood at the time (Figure 1, dashed line). Beyond the state-owned property, but largely excluding the north pasture, the village extended .4 km west and nearly .8 km south. However, despite a long history of interest in the Tobias site, knowledge of the settlement area beyond the Kansas preserve has remained tenuous. Aside from some anecdotal information gathered over the years from local farmers and relic hunters, this recent boundary is primarily the result of an archeological reconnaissance carried out by the KSHS Archeology Office along the proposed route of an LPG pipeline across the north end of the section, including across 14RC8 (Wulfkuhle and Witty 1992). The investigators expanded their survey to better understand the site's extent west and south of the ridgetop. The

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study, which included pedestrian survey, shovel tests, and the collection of period artifacts, went quite a long way and established the west and south village boundaries noted in Figure 1.

PROJECT AREA

The property sits a mere .16 km off the right bank of the Little Arkansas River, a spring-fed creek that originates a few kilometers to the northwest and flows lazily to the southeast, where it eventually joins the Arkansas River at Wichita, Kansas. The terrain here corresponds nicely to Rice County's blend of low hills, ridges, and shallow valleys. The bedrock is gritty, iron-rich sandstone, and except for a few modest outcrops, it is covered by typical central Kansas prairie soils.

The north and west-central areas are in pasture,

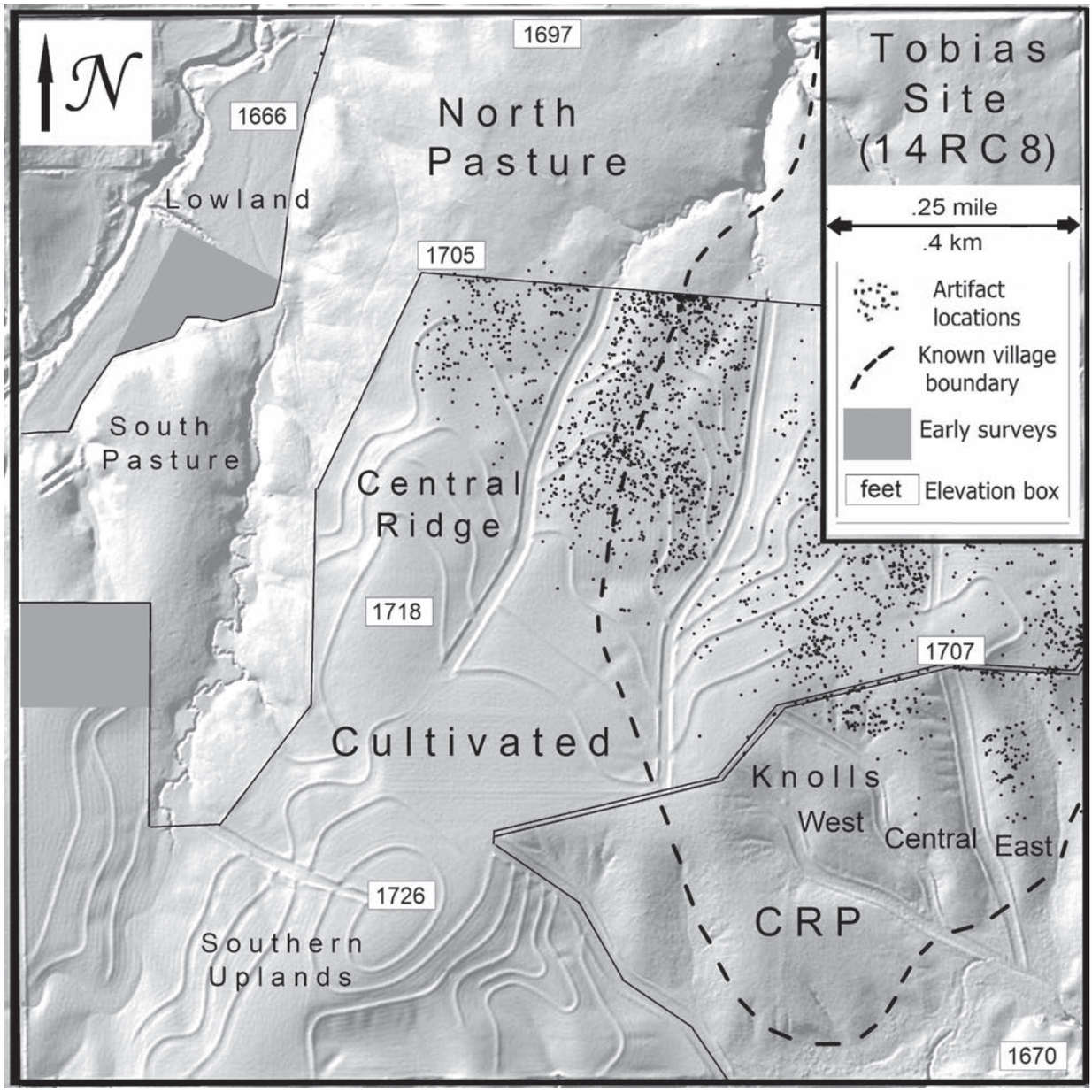

Figure 1. Project area in relation to the Tobias site. Black dots are artifact locations. The dashed line depicts the village boundary as understood prior to the surveys reported here. Illustration and all photos are by the author.

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none of which has ever been tilled. Cultivated fields, separated by grassy waterways, dominate the central and southern regions and extend narrowly to the east.

The extreme northwest portion is a wooded lowland, cut by a minor northeast-running stream, whose reliability as a water source in the distant past is speculative, and includes some small cultivated plots. The southeast corner was formerly cultivated until it was converted to Conservation Reserve Program (CRP) acreage in the 1980s. Several south-facing knolls descend into a lowland there.

About .4 km west of the Tobias site ridge, which runs north and south, is a second "central" elevation that starts as pasture in the center north of the property and runs to the south-southwest. It ascends gradually for 1.2 km, then blends with southern uplands.

Between the two ridges is a wide cultivated tract with grassy waterways at its margins. This field descends from the southern uplands to the north-northeast, where it meets the north pasture fence. Beyond is a shallow lowland, bounded by two gullies that eventually merge into a single trench that ends at a culvert.

METHODS

Project surveys have been conducted primarily in the spring (March-April) and in the fall (October-November), as the weather in central Kansas is tolerable then and the cultivated fields are often in good survey condition, which means that ground visibility is fair to excellent and sufficient weathering has taken place since the last visit. A few surveys have been conducted in the May-to-July time frame. The majority have targeted parcels currently or formerly under cultivation, while a number of informal searches of the pastureland have occurred as well.

Transects are typically 4–5 paces or 12–15 feet apart. Crop rows are followed when available, although at times even when rows are discernible, laying a course with flags eliminates the frustration that often results when there is a high degree of row cross-stitching on small or irregularly shaped pieces. New artifacts are collected on the spot. A digital photograph is taken of each object, and a GPS entry in UTM coordinates with a short description (e.g., pale prox flake) is noted. Then the search resumes.

At day's end photos and GPS data are downloaded to a laptop computer. Each collected artifact is matched in sequence to its image and GPS entry. The item then goes into its own plastic bag along with a 3 by 5 card bearing the artifact ID number, description, collection date, and UTM coordinates. Eventually all artifacts are digitally photographed a half dozen or so times to record scale and features, and the images are stored in the project database.

Two early and thorough surveys in the western far reaches (Figure 1) yielded no cultural material. These two surveys served as informal controls against which later surveys and materials encountered could be judged. That is, as one nears the Tobias site ridge, non-native materials (e.g., Smoky Hill jasper) begin to show up on the surface.

SURVEY RESULTS

Since March 2012, a total of 2,147 artifacts have been collected. The assemblage across all surveyed areas consists mostly of debitage but also includes a scattering of pottery sherds, knives and knife fragments, side and end scrapers, complete and partial points, and in some places, hammerstones. Some objects collected early on are not cultural or are at best questionable (e.g., "boiling stones" and bone fragments). These have been relegated to a separate "questionable" category and are not included in the totals.

As Figure 1 shows, the artifact zone extends north to where the cultivated areas meet the north pasture fence. On the westernmost field artifacts (n = 234) are scattered from the pasture fence south for roughly 250 m and exist in highest concentration toward the center of the ridge where it is quite flat (Figure 2). From there, the artifact boundary runs southeast into the CRP section. The central cultivated field (Figure 3) has a fairly consistent distribution of artifact locations (n = 1,066) that ends about 450 m to the south.

Contiguous with the Tobias site's west fence is another cultivated strip (Figure 4) that descends to the west. Two complete surveys there yielded a number of artifacts (n = 57), the majority concentrated within 30 m of the fence and a little south

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Figure 2. View to the north from atop the central ridge. Arrow notes location of the fence that borders the north pasture.

Figure 3. View to the north of the center cultivated field that descends gradually to the north-northeast. Arrow indicates the southern extent of the artifact zone.

where the terrain begins to level and merge with higher ground.

Beyond the 14RC8 south fence, the topography has transitioned into a level upland that stretches to the CRP section (Figure 5). Except where the terrain slopes lower at the west margin and where to the east some modern-day contouring reshaped an acreage that borders the CRP section, artifacts (n = 575) are uniformly distributed. Because of less favorable survey conditions, it is an under-served region by this project, receiving the equivalent of only two complete survey passes, whereas portions of the north-central cultivated parcels have received as many as four.

After a prescribed burn of the CRP section in 2015, top to bottom surveys of the center and east knolls were conducted. Each knoll descends very gradually to the south. The center knoll artifacts (n = 105) were largely restricted to within 100 m of the top. At the east knoll, including some marginal ground at the edge of the property, artifacts (n = 102) occurred at the top but then went missing for about 80 m down the slope. Some modern-day contouring might have obscured the record. In any case, the artifact trail rematerialized on a moderately level spot before disappearing after 150 m.

DISCUSSION

ASSEMBLAGE

The lithic material has not been systematically sorted into specific material types, but it appears consistent with the 14RC8 site assemblage (Robert

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Figure 4. View to the north of the field that borders the Tobias site, which is at right.

Figure 5. View to the west-northwest of the level uplands south of the Tobias site. Arrow points to the Tobias site's southwest corner post.

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Hoard, personal communication 2015; see also Zehnder [1998] for a discussion of Tobias site lithic material types). The dominant lithic component is Smoky Hill jasper and related materials, followed by cherts from the Kansas Flint Hills, and a smattering of Alibates agatized dolomite from the panhandle of Texas. Ogallala gravels also are present.

The number of surface finds associated with this project is not overwhelming given the large tracts surveyed. Nevertheless, all of the areas still in cultivation within the artifact zone continue to give up artifacts on a consistent basis. Only three complete side-notched points have been found since the start of the project. Local collecting over many decades might to some extent account for this low number, although this is difficult to gauge. My own experience with surface artifact density at other sites in the vicinity leads me to view the project area under consideration here as a sort of Tobias site suburb.

Thirty-seven pottery sherds account for a mere 1.7% of the total assemblage. This is understandable given the many decades of agricultural activity. Latham (2006) noted that fewer sherds survive under such conditions, and those that do are typically small. This certainly describes the sherds collected here, as only one exceeds 2 cm in length.

TOBIAS SITE BOUNDARY

The findings of this project provide the basis for a redrawing of the Tobias site settlement boundary west of 14RC8 to include portions of both the central ridge and the north pasture (Robert Hoard, personal communication 2015). The southern limit has remained relatively unchanged.

The north pasture (Wedel's "grassy knoll") has seen some activity since the start of this project. I invited Donald Blakeslee of Wichita State University (WSU) to visit the property, and in July 2012 he, some students, and I made a single clockwise pass over the east half of the north pasture. At the north end Blakeslee discovered a stone flake brought to the surface by rodent activity. No other artifacts or any features were found during that brief tour. In March 2012 I had collected a thin sliver of worked stone in the north pasture but at a more southerly location.

These finds and some additional artifacts, found later at disparate locations in the north pasture, suggested that the Tobias site village might have extended into the north pasture. Artifacts collected in 2013 from the cultivated fields south of the north pasture fence added to this view. Together they provided the impetus for several professional archeological investigations starting in 2015.

In January of that year I learned that the National Park Service (NPS) annual Archaeological Prospection Workshop was to be held at 14RC8 and related regional sites. I inquired about including some surveys on the north pasture. Blakeslee was supervising the effort, and he subsequently agreed to include a few test plots there. As a result of the NPS event, which included geophysical work by Archaeo-Physics LLC of Minneapolis, Minnesota, features were found. Two additional investigations ensued. As these are the purview of other parties and as of this writing the analyses are ongoing, I will not describe them in detail here. Prehistoric and protohistoric activity across much of the north pasture is yet to be understood.

Similarly, portions of the CRP section remain to be surveyed by this project, specifically the "west knoll" and another just beyond it. Both are included within the old and the revised Tobias site boundaries. Each is moderately level in places, warranting a closer look after the next controlled burn.

ACKNOWLEDGMENTS

I wish to thank Bob Hoard at the KSHS and Don Blakeslee of WSU for their early and continued interest in my project. In March 2015 Bob Hoard and Kansas Anthropological Association officer Chris Hord set aside the better part of a day to review much of my collection. Discussions with them left me confident that I was on the right track. In addition to his efforts on the north pasture, Don Blakeslee has been a patient recipient of unsolicited "updates" from me and has answered many questions along the way.

In September 2011 I dropped in on the KSHS Archeology Office without any warning whatsoever and was privileged to spend over an hour talking all things Tobias site with Virginia Wulfkuhle.

Thanks to Kirk Peverley, our farmer in Rice County, for providing historical and land use details regarding the property discussed here. Context is king.

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Finally, thank you to my grandmother and late grandfather, lifelong Kansans, without whom this project and the enjoyment it has brought me would not have been possible.

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CENTRAL KANSAS PETROGLYPHS

A DECADE OF KAA FIELD RESEARCH

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This paper covers investigations of petroglyph sites in central Kansas. Fieldwork methods are reviewed, as well as the commonalities of the recorded sites. While field surveys are ongoing, research continues on sites recorded across the central United States to add to the larger body of knowledge. In addition, general thoughts and impressions about petroglyphs are offered.

As an avocational archeologist, I have been involved with many aspects of field archeology. Yet it is rock art—a minor sideline for most—which truly fascinates me. Why does rock art captivate me so? The images often show a mastery of form and execution that belies their outward simplicity. Also, they hint at a mysterious past. Most importantly, however, they connect us directly to the beliefs and cultures of Native American peoples, who first discovered and populated this continent.

While bones tell what animals human beings hunted, lithic tools indicate how they killed their prey, and potsherds show how they cooked the meat, these artifacts tell us almost nothing about how people worshiped, the way they perceived their environment, the ceremonies they conducted, or their feelings about their place in the world. Rock art can reveal all these things, for it is one of the rare archeological phenomena where form, structure, and location derive almost solely from the mind of the creator. The result is an almost limitless array of images throughout the landscape that represent an infinite variety of ideas, experiences, and perceptions. By recognizing the relationships among images, we can begin to see patterns of depiction. These patterns, viewed in the context of the cultures that produced them and the landscapes in which they are found, help illuminate the meaning and significance of rock art.

Rock art sites chronicle long histories, hunting ceremonies, and religions of the region's diverse native peoples. They reveal relationships with the spirit world and record interaction with traditional enemies and with Europeans and European Americans. Unfortunately, ignorance of this rich cultural record has led to thoughtless vandalism and the defacement of many sites. At some sites petroglyphs have been stolen or destroyed. This paper is intended to help interested persons learn about and appreciate the origins, diversity, significance, and beauty of central Kansas rock art.

INVESTIGATION METHODS

The Kansas Anthropological Association rock art recording team was organized in the winter of 2008. Core members of the team are Al Petz, Melonie Sullivan, Chris Hoard, Melanie Naden, and me. The group's first survey was conducted at 14RC10, a site originally documented by Martin Stein in 1975. Site revision work continued at 14RC1 and 14RC425. An informant with property in McPherson and Ellsworth counties allowed the team to survey both north and south of Kanopolis Reservoir, resulting in identification of seven new sites. A former resident made us aware of a Dakota sandstone cave in Ottawa County. To date 13 petroglyph sites have been recorded or revised, and several more sites remain to be documented in Cowley County. Landowner permission was always obtained prior to investigation.

The team plans with three fieldwork considerations:

- For the most part the petroglyphs occur on or around Dakota sandstone outcrops. Sandstone

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is soft and easily incised. This same trait makes rock art created on this "canvass" quite vulnerable to erosion in the harsh Kansas environment.
- One or more natural springs are typically present.
- Visibility is a variable that cannot be overlooked, as it influences recording outcomes.

LOCATION

Locations of central Kansas rock art usually conform to a few common characteristics. Prior to jumping out of the truck, research on the survey area environment can identify promising geologic formations and natural springs. Questions to ask include: Where are the water sources? Do they emanate from stone outcrops? Does the local flora reflect a constant water source, e.g., cottonwood trees or cattails? Although ponds or lakes are occasionally present, sometimes the result of a natural spring is simply a clear robust stream.

Rock art surveys depend heavily on optimal visibility. Heavily wooded areas are best surveyed when trees are bare of foliage. A cloudy day with no shadows typically yields the best visibility and conditions for photography. Some of the KAA team's best work has been done in rain and sleet.

The objective is to accurately document and record these fragile sites. Mapping, measuring, and photography skills are essential. Recorders should ask, Will another researcher be able to find this rock art site 10 years from now using this data?

EQUIPMENT

As with any archeological survey, success depends upon having proper equipment. Rock art esearchers must be prepared to climb rocks, ford streams, and crawl on their bellies like reptiles. Mud is a common obstacle, so mud boots and extra socks should be packed. We also haul 2 by 6-inch wood planks to traverse very wet areas.

It is not uncommon to come upon a grotto or cave. The KAA team packs in a variety of LED lamps, as well as infrared torches. A stout climbing rope can come in handy when accessing a site from above. Personal safety is paramount.

Precise measuring is extremely important, but the procedure is complicated because most rock art measurements must be taken vertically or at an angle. Basic tools include a stadia rod, wide metric steel tape, 100-meter reel tape, directional arrow, and metric photographer's scale.

I prefer a Canon 6D for field photography. It takes a beating and keeps on doing the job. Any quality DSLR (digital single lens reflex) will suffice, however. The ability to interchange lenses is critical. An overall wide angle or panorama shot is needed for a large site. On a rock face something versatile like a 1.4/85-mm lens works. Inside a grotto or cave, stepping down to a 50-mm or 24-mm lens is required. My recommendations for lighting are as follows. For outdoor images experiment with soft fill at varying angles. A slave flash is convenient. In close quarters with very low or absent ambient light, an assistant can hold a light source at various angles and distances from the subject.

Typically I shoot up to 1,000 images at a site, and I recommend the same for anyone recording a rock art site. Lights and shadows play tricks on the eye, and the camera often reveals what the eyes cannot see. There are no hard and fast rules for rock art photography; one must experiment to find what works.

ETHICAL ISSUES

Never conduct a survey without landowner permission. The County Register of Deeds or a neighbor can provide contact information. A cooperative landowner can be a great resource; an angry landowner can ruin the day.

If the site can be traced to a specific tribe, attempt to contact the tribal council and request a site visit and blessing. Much can be learned by a visit from a tribal elder. At times the symbolism of the rock art is lost on people of European heritage.

The representational images that the team has recorded fall primarily into three categories: human, animal, and material culture.

HUMAN FIGURES

Central Kansas humans are simple schematic figures with little emphasis on naturalism. They are generally characterized by outlined rectilinear body forms, at times elaborated with details, such as fingers, breast plates or ribs, and headdresses

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Figure 1. Breast plate or rib detail from the Peverley site (14RC1), Rice County.

(Figure l). Almost all these humans are drawn as static frontal figures with upraised arms bent at the elbow. Humans are the most common and distinctive designs found. The majority of human figures are of three types: shield-bearing warriors, V-neck humans, and rectangular-body humans.

The shield-bearing warrior is the most striking of human figures. At its simplest this design is comprised of concentric circles for the shield (Figure 2), held in front of the torso, a simple shaft for a weapon, two vertical lines for legs, and a keystone-shaped head.

The V-neck human is the most common and distinctive feature in central Kansas petroglyphs, easily identified by the V defining the shoulder area (Figure 3). The basic design is two vertical lines

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Figure 2. Shield detail from the Spriggs site (14RC10), Rice County.

for torso and legs, V-shaped shoulders, stick neck, and circular head. Most have horizontal waist, feet, arms, and hands, and some have facial features. Their typical stance is frontal, with the arms held out to each side and bent upwards at the elbows. Most V-neck humans are oriented upright, but some are shown on their sides. In some cases torsos are greatly elongated relative to legs and arms.

Figure 3. V-shape human figure from an unnamed site (14EW17), Ellsworth County.

ANIMAL FIGURES

Like human forms, animals are schematic and highly conventionalized. Generally they are simply outlined curvilinear bodies with some anatomical details. They usually are shown as static images, almost always in profile. Animals represented in sites investigated by the KAA team are horses, mules, and birds

Boat form animals are characterized by a distinctive body shape, which varies from an oval or crescent to an elongated or ovate form (Figure 4).

Mature style animals are highly schematic and characterized by a flowing, streamlined body shape in which a few simple strokes elegantly capture the form of the animal with little recourse to naturalism or details. Horses are the most common subject (Penny1992). In classic examples a single sinuous line forms the upper head, neck, back, and rear legs

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Figure 4. Boat-shape body animal from the Peverley site (14RC1), Rice County.

(Figure 5). A second line forms the lower head, throat, and front leg, and a third gently arching line forms the belly. Snouts are often left open, and legs are generally a single straight line. Usually only two legs are shown, with little or no modeling of limbs. Other anatomic features are restricted to schematic ears, hooves, and tails, rendered with simple lines. As this form is used primarily for horses, it is thought to be a post-contact development.

Although absolute dating has been attempted on northwestern Plains petroglyph sites, determining the age of Central Plains petroglyphs still relies primarily on analysis of subject matter. For example, guns and horses date some rock art to the Historic period, while shield-bearing warriors link central Kansas rock art to the pre-contact era.

Shield-bearing warrior designs show large body shields that were widely used by pedestrian warriors of many Plains groups throughout much of the Late Prehistoric period. The only known archeological examples were found in south-central Utah and radiocarbon dated to about A.D. 1500 (Loendorf and Conner 1993). These specimens are approximately 3 feet in diameter with painted geometric designs, similar to some rock art shield-bearing warriors. After the reintroduction of the horse, large shields were quickly abandoned in favor of much smaller equestrian shields. As body shields are considered primarily Late Prehistoric period artifacts, it seems reasonable to suggest that most shield-bearing warrior images also date to that period.

Shield-bearing warriors, V-neck humans, boat form zoomorphs, and mature style horses comprise a distinctive Plains rock art tradition, but comparisons can be made to other regions. Shield-bearing warriors are relatively common in the northern Rio Grande region of New Mexico and the eastern Great Basin and Colorado Plateau (Cole 1990; Schaafsma 1980). Some Central Plains boat form animals are superficially similar to mountain sheep and elk in Great Basin and Columbia Plateau rock art; however, these figures generally are pecked into

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Figure 5. Mature style horse from the Spriggs site (14RC10), Rice County.

the stone, and their bodies are filled in. Thus, the classic incised boat form outlines are restricted to the Plains.

The characteristic and distinctive V-shoulder is unique to human figures found east of the Rockies, and the only examples found outside central Kansas are in the northwestern Plains and southeastern Colorado (Wedel 1959:482–494). Likewise, the classic mature style horse is limited to the Plains. This distribution suggests that these designs developed independently on the Plains and are not closely related to the rock art of any other region.

INTERPRETATION

Anthropological interpretations of Plains rock art have generally proposed that the designs have ceremonial or religious functions, relating to vision quests, ritual activities, and shamanism. In the first substantial attempt at rock art interpretation, Keyser (1977) cited the absence of "secular activities" and "utilitarian objects" and the association of humans with ceremonial objects and religious imagery to argue that rock art represents "supernatural" vision quest experiences, as opposed to actual events. More recently Barry (1991) suggested that rock art relates to shamanism and spirit traveling, while Klassen (1995, 1998) has further explored the relationship of Plains rock art to religious iconography and sacred landscapes.

While Plains rock art flourished in the Late Prehistoric period, the use of iconic imagery continued into Historic times, as demonstrated by some horse images. Plains Indians viewed the arrival of the horse as miraculous; its sudden appearance, mysterious origins, remarkable abilities, and advantages to humans were taken as evidence that originated in the spirit world. In other words, the historic event was incorporated into Plain's cosmology, and the horse was elevated to a sacred icon and metaphor for power (Pendy 1992). The "mythological" creature was assigned strong medicine power, and

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Figure 6. Rectangular-body figures from an unnamed site (14EW1), Ellsworth County.

horse medicine could be obtained through visions. In several Plains groups this belief gave rise to a horse medicine society, and the horse cult quickly became one of the most important medicine-bundle societies.

The preceding interpretations for Plains rock art share a common underlying iconographic theme. They explain rock art as pictorial manifestations of medicine powers derived from vision quests. This interpretation is frequently reinforced and supported by the location of Plains rock art. The images, intended solely for a supernatural audience, were placed in isolated private locations. Most sites are located on or near unusual landforms often in caves or rockshelters or on high places with sweeping vistas of the surrounding landscape. The close association of Plains rock art with these medicine rocks and sacred landscapes strongly supports the idea that the rock art resulted from vision quests and the acquisition of medicine power.

Most Plains cultures recognized shamans or medicine men as individuals with particularly powerful medicine and greater access to the powers and guidance of the spirit world. Images frequently associated with shamanic art include humans and animals with elongated or oddly shaped bodies. Humans and animals oriented in unusual positions, as if flying or falling are also typical of shamanic art (Figure 6). In Plains cultures, however, access to the spirit world was not restricted to shamans; all individuals had the opportunity to seek visions. Although shamans often helped interpret a vision, they were not a necessary go-between for people and spirits. All individuals could depict those dreams on shields, tipis, and clothing. In the end it is not surprising that Plains oral traditions often refer to rock art as having been created by spirit beings. A warrior making a pictograph or petroglyph did so under the power of his guardian spirit, and so he might disclaim personal responsibility for making the image.

A remarkable aspect of Plains rock art is its continuity as a tradition from prehistoric to the post-contact period. Similar types of images with similar iconographic meanings span the transition from the pedestrian to the equestrian period. For example,

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the distinctive V-shaped human originated in pre-contact times but continued to be depicted well afterward, and animals are shown as characteristic iconic images in both periods. These designs likely had the same significance in both periods, attesting to the longevity of the vision quest and the importance of medicine power in Plains cultures.

CONCLUSION

Rock art helped Plains Indians structure their world and maintain their place within the cosmic order. While some images may have been created especially as art, the beauty and artistic quality of many images are an unintended result of the artist's intimate relationship with the spirits, the natural world, and the landscape.

Though mystery surrounds many pictographs and rock art, knowledge and understanding of Plains rock art increase every year. Large areas of the Great Plains have never been adequately surveyed for rock art. These vast areas promise to reveal untold rock art riches when carefully and systematically examined. New discoveries and the dedicated work of many avocational and professional researchers will continue to reveal the meaning and beauty of Plains rock art.

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THE ROCK ART RECORDS OF JAMES R. MEAD

Donald J. Blakeslee
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This paper discusses notes on Kansas rock art that were made by James R. Mead in the 1860s and 1890s. The 1860s report consisted of the autograph of a French fur trader that Mead found in a small cave on the banks of the Smoky Hill River. The more extensive 1890s notes included copies of petroglyphs and pictographs from a rock cliff near the headwaters of a small tributary of the Saline River northwest of present-day Wilson, Kansas. Some of the rock art there appears to derive from either the Osage or the Kansa, who used that portion of the state for bison hunting after about A.D. 1720. One petroglyph appears to be of Comanche origin, and another may be a depiction of a Cheyenne. Carvings that appear to be earlier than the historic period probably were made by ancestors of the Wichitas or Pawnees.

Very little of an analytical nature has been published on the rock art of Kansas. Wedel (1959) described some in his classic *Introduction to Kansas Archeology,* but his intent was more descriptive than analytical. The same is true for O'Neill's (1981) booklet, *Kansas Rock Art***.** Wells' (1996b) presentation of rock art along the Saline River offers some interpretations, but other works (Garst 2003; Stein 1987, 1993, 1997, 1998) do not. Needless to say, Kansas does not loom large in a summary volume of Plains Indian rock art (Keyser and Klassen 2001).

In recent years approaches to rock art have grown more analytical in nature and now provide important insights into prehistoric cultures. In the Plains important work has been done in Missouri (Diaz-Granados and Duncan 2000), Texas (e.g., Shafer 1986), Colorado (Loendorf 2008), Wyoming (Francis and Loendorf 2002), South Dakota (e.g., Sundstrom 2004), and the Canadian Plains (e.g., Keyser 1977). These studies have taken a variety of approaches, including stylistic analysis of rock art traditions (Francis and Loendorf 2002; Loendorf 2008), dating by superposition (Sundstrom 2004) and direct dating of materials in the rock art (Francis and Loendorf 2002), motif analysis (Diaz-Granados and Duncan 2000), contextual analysis (Diaz-Granados and Duncan 2000), and so on. Some rock art has been successfully attributed to individual tribes (Sundstrom and Keyser 1998) and connected to ritual use of drugs (Boyd and Dering 1996).

J. R. MEAD'S ROCK ART RECORDS

Given the ephemeral nature of rock art, any additional information about such art in Kansas is a welcome addition to the little that is known. In that light the material recorded by an early settler in Kansas takes on importance. James R. Mead came to Kansas in 1859, where he worked first as a hunter and later as a trading post operator (Mead 2008). His hunting operation was located west of Salina and covered the region around what is now Wilson Lake. Later he bought a trading post at what is now Towanda on the Whitewater River, and still later he helped to found the city of Wichita. In his later years Mead (1896, 1904, and 1905) wrote a series of articles for the Kansas State Historical Society, dealing both with ethnographic and archeological matters.

In the 1970s the author obtained the information reported here through the kindness of Mead's daughter, Ignace Jones. At that time she had all of her father's papers in her possession, including notebooks in which some rock art was recorded. The family later donated the papers to the Special Collections Division of Ablah Library at Wichita State University.

Mead recorded rock art on two separate occasions: 1861 and 1892. On the earlier occasion he copied a single inscription and date, as follows.

The Kansas Anthropologist 36:32–49

TRVDO

1786

> The above inscription was discovered by the writer in a cave on Smoky Hill River July 1861 2 ½ miles SW of "Wilsons" Station on UPRR Kansas. At that time, 1861, it was the of the [sic] Buffalo and wild Indian Range and in a country almost unknown to white men.

In *Along Ancient Trails: The Mallet Expedition of 1739* Blakeslee (1995:98) was able to identify the inscription's author as Jean-Baptiste Truteau, in spite of the odd spelling of his name. Truteau was a fur trader who operated out of St. Louis, first in Kansas and later in South Dakota. He usually spelled his name "Truteau" but signed it "Trudeau" on at least two occasions. Both instances were in letters to Zenon Trudeau during the time when Trudeau was Lieutenant Governor of Louisiana, stationed in St. Louis (1792–1799). It seems that Truteau was trying to imply a distant familial relationship. In a manuscript, written in the late 1790s, Truteau used the abbreviation "Pados" for the word Padoucas (Apaches). Thus, it is easy to see "Trudo" as a short version of Trudeau; he was carving it in rock, after all. In the same manuscript account Truteau mentioned having lived for several years among the Republican Pawnees, and the little cave in which he wrote his name is adjacent to the spot where the Pawnee Trail crosses the Smoky Hill River. Hence, his identity seems certain.

Here is what Mead had to say about the other rock art he recorded:

> The next pages are copied from a very large number of inscriptions on the side of a cliff of Sand rock from which flows a fine spring. A favorable camping place of Indians evidently. Hundreds of inscriptions were too much defaced by cowboys and others to be recognized sufficiently to copy. I visited this place 4 miles N.W. of Wilsons Station" on July 24, 92. Had hunted buffalo and elk in the vicinity 1860–2.

The rock art panel would be located near the head of a small creek that flows north into the Saline River northwest of the town of Wilson. Other rock art has been documented in the same general region (Wells 1996a, 1996b), but the site that Mead visited is not one of those currently in the state's site records.

The artists' identities are not immediately obvious from the location. At the beginning of the historic period (A.D. 1541), the ancestors of the various Wichita bands lived to the east of the site area, and by the early 1700s Apaches lived to the west. The Wichitas moved south in the early 1700s, first to northern Oklahoma and later to Texas. The Apaches also were driven south and west to become the Lipans and Jicarillas of late times, and they were gone shortly after 1724. The Osages and Kansas replaced the Wichitas, using most of eastern Kansas for hunting territory and later villages. To the west the Apaches were replaced first by the Comanches and later by the Kiowas. With the Kiowas came the Plains Apaches. In the early nineteenth century the Southern Cheyennes and Southern Arapahos began to use western Kansas, but Pawnees from Nebraska and northern Kansas also exploited the region as bison hunting territory. In some years they were joined by the Omahas for the hunts. Finally, U.S. government policy created a series of reservations in eastern Kansas for tribes from east of the Mississippi River, and those people also moved through central Kansas to hunt bison. Thus, the number of groups that might have supplied the artists is large, and the assignment of any of the images that Mead recorded to a particular tribe must be tentative.

The author originally used tracing paper to copy Mead's illustrations directly from his notebook and more recently scanned the tracings into digital format. Unfortunately, Mead did not provide a scale for the drawings. He did indicate that most of the rock art was incised into the stone (petroglyphs), although some were painted (pictographs). He made no mention of pecked characters. A few may have been a combination of incising and painting, as in one note he mentioned "traces of paint." Mead did not record any instances of a native-drawn figure over an earlier one, although such superimposition is common and can be used to obtain relative dates for different art styles and techniques for creating rock art. He did remark that many of the images were "much defaced" by visiting cowboys. Mead did not always specify which images occurred together in a single panel. The only clue regarding

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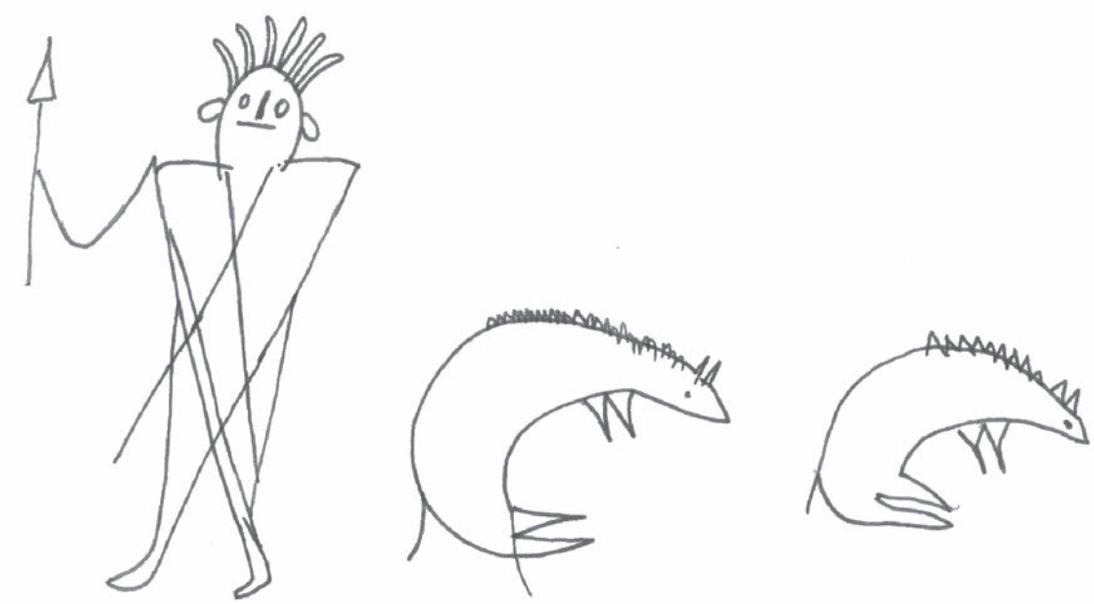

Figure 1. Images of different ages from the same page of Mead's notes. The two horses appear to be early, while the human is a late image.

associations among them is when he drew several on a single notebook page. One reasonably might assume that those reproduced on the same page were close together on the rock face(s).

ROCK ART DESCRIPTIONS AND INTERPRETATIONS

Juxtaposition on the rock does not imply that the images were drawn at the same time. An example is Figure 1, which shows two animals and a human. The human is in a late style in which the facial features are clearly depicted. The animals, however, are barely recognizable as horses, as they are drawn with larva-shaped bodies; only their manes give them away. Other less abstract horse images, also recorded by Mead at the same site, make their identity clear. In other parts of the Plains, early horse images resemble canoes with legs. Later horses were drawn somewhat more realistically with indications of hooves, horse gear, and sometimes even brands.

Figure 2 depicts what may be an entopic image. Entopic phenomena are visual sensations derived from within the eye or optical system in the absence of light (Lewis-Williams and Dowson 1988:202). They include phosphenes, created by the retina in the absence of light, such as the patterns a person sees while rubbing his/her closed eyes. Entopic images can be generated during trance states with or without the help of drugs. Figure 2 is likely the record of a vision, induced by fasting and thirst, by someone seeking supernatural power. Such vision quests were common among all of the native nations of the Plains. Even though it looks completely abstract to modern viewers, the person who experienced

Figure 2. An entopic image, probably from a vision quest.

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the vision may have seen meaning in it. Years ago Preston Holder, an American archeologist who had done ethnographic field work among the Arikara, told the author of showing Rorschach ink blots to one informant. The man reacted strongly to one of the images, saying, "That's Turtle. That's just what he looked like when he came to me in my vision." To Holder the ink blot looked like a random blob.

Another possible interpretation, and not necessarily a contradictory one, is that Figure 2 is an example of a rock art style seen across much of the High Plains and in the Great Basin, dating to the Archaic period, 4,000–5,000 years ago (Loendorf 2008:60). Rock art from this period is usually pecked, rather than incised, into a rock face and consists of spirals, meandering lines, and other abstract design elements. In spite of the similar-sounding verbal description, the Figure 2 image does not resemble any of the renderings that the author has seen of this early style from New Mexico, Oklahoma, Colorado, South Dakota, or Wyoming (Francis and Loendorf 2002, Loendorf 2008, Sundstrom 2004, Winter 1998), and it is even less like the abstract and interconnected designs seen in Missouri (Diaz-Granados and Duncan 2000).

Other art on this cliff also may have religious significance. Two are representations of what is usually called the underworld monster, the guardian spirit of the underworld (Figures 3 and 4). In many North American cosmologies, the underworld is under water, where spirits of the dead reside, and in Kansas the monster is usually drawn with protrusions along its back like the spikes on an alligator's back. Figure 3 was partly painted in alternating

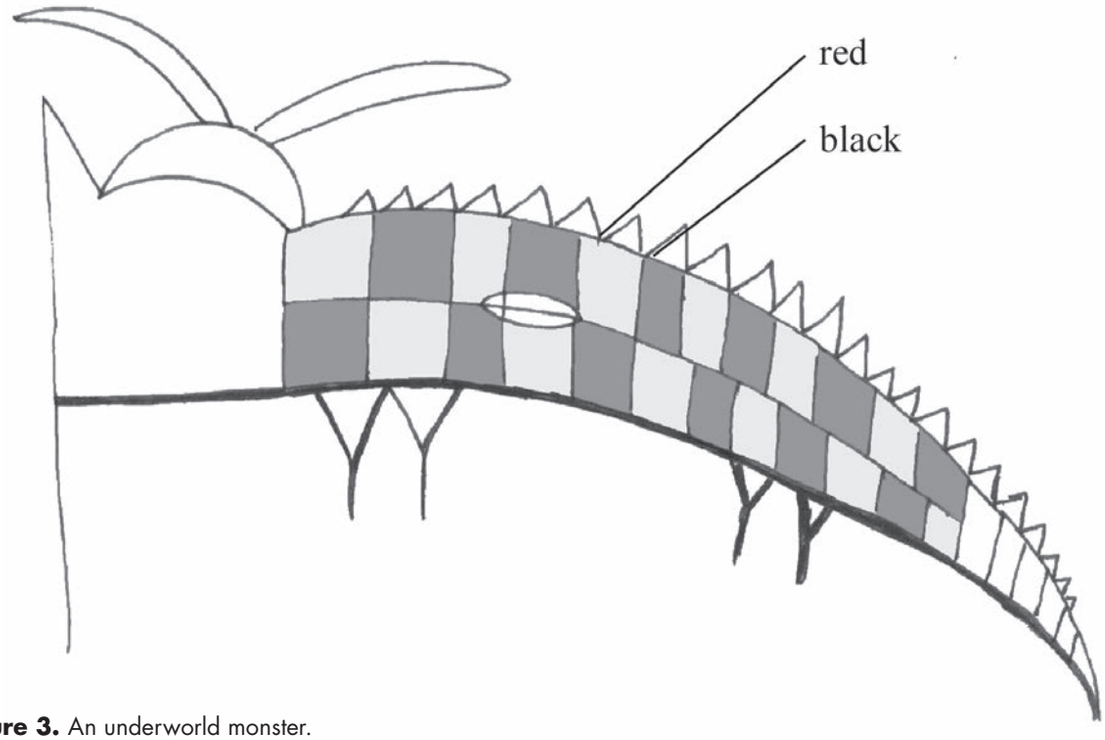

Figure 3. An underworld monster.

Figure 4. A second underworld monster.

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colors of red and black. Note the long ears or horns on the head. In some depictions elsewhere this creature is a horned serpent. Also of particular interest is the rest of the head. In some cosmologies the underworld monster opens its jaws to receive the soul of a dying person, and that may be what was intended here.

In Figure 4 the same monster is rendered far more schematically. It lacks the four legs of the other but has spikes along the back, possibly a horn on the head, and what can be interpreted as an open mouth. While this monster looks quite different from the first, the same mythological character comes in a variety of forms at other sites. Figure 5 shows five versions from site 14OT4 in Ottawa County. Interestingly, the artists seem to have difficulty in creating clear delineations of the head and mouth.

The glyph to the left in Figure 6 was recorded by Mead without comment. It consists of two concentric rings with radiating lines around a central asterisk. Artifacts from the southeastern United States may assist in interpreting the design, which appears on shell gorgets from post-A.D. 1350 Mississippian sites. The gorget on the right of Figure 6 comes from Stallings Island Mound in Georgia (King 2004:Figure 13). The design is called a cosmogram--a diagram of the basic structure of the universe. Some Mississippian gorgets show a horizontal orientation, but this case is a view from above. The central element is the sacred fire, which puts the temple in which it burns at the center of the earth. The fire is surrounded by the earth itself, while the outer ring is the ocean that surrounds the island earth. Finally, the ocean is surrounded by the stars in the sky. Note that in the shell gorget the various elements are represented by negative spaces, so that the sacred fire is the cross in the center, and the earth is divided into four quadrants.

While this may seem like a far-fetched interpretation of a fairly simple glyph, this account is supported by the presence of a second image, this one a pictograph (Figure 7). Mead's notes are copied verbatim. In this cosmogram the sacred fire is red, the earth is yellow, the ocean is green, and the surrounding heavens are blue. The radiating lines of alternating colors probably represent day and night, which symbolize male and female. The pattern is reminiscent of the alternating rectangles of black and red seen on the underworld monster in Figure 3.

The most likely explanation for Mississippian-style cosmograms in Kansas is that they were drawn by members of one of the Dhegihan-speaking tribes, immigrants to Kansas during the historic period. While some Mississippian-derived traits are found in prehistoric sites in the Central Plains, those sites were abandoned before the shell gorgets

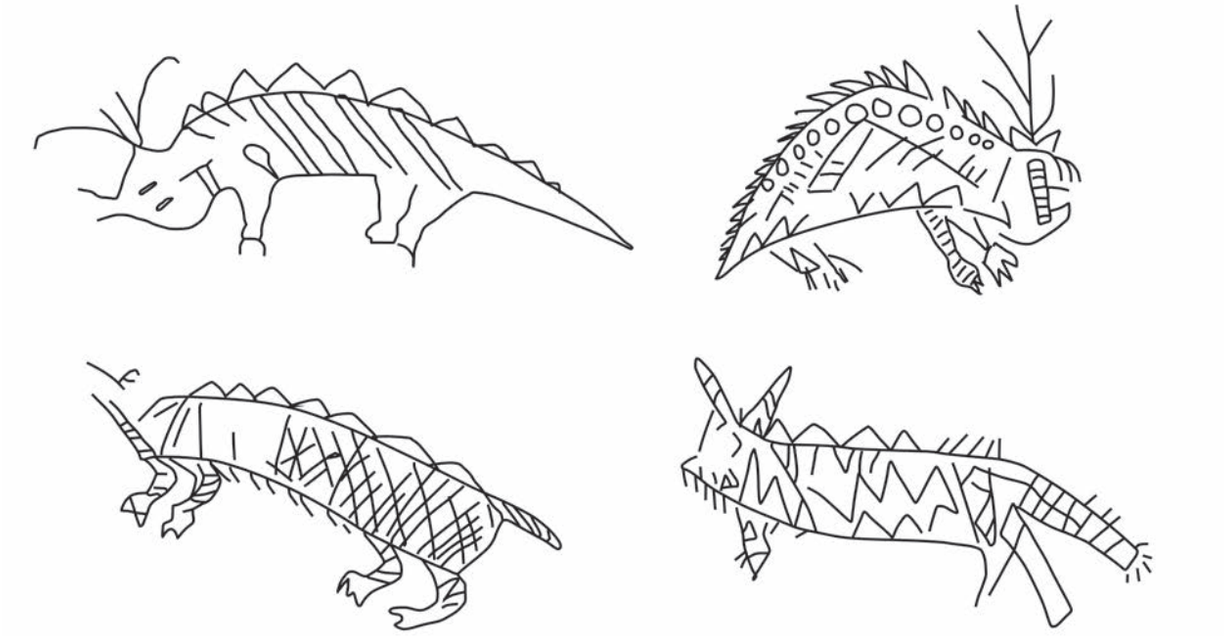

Figure 5. Variations of the underworld monster.

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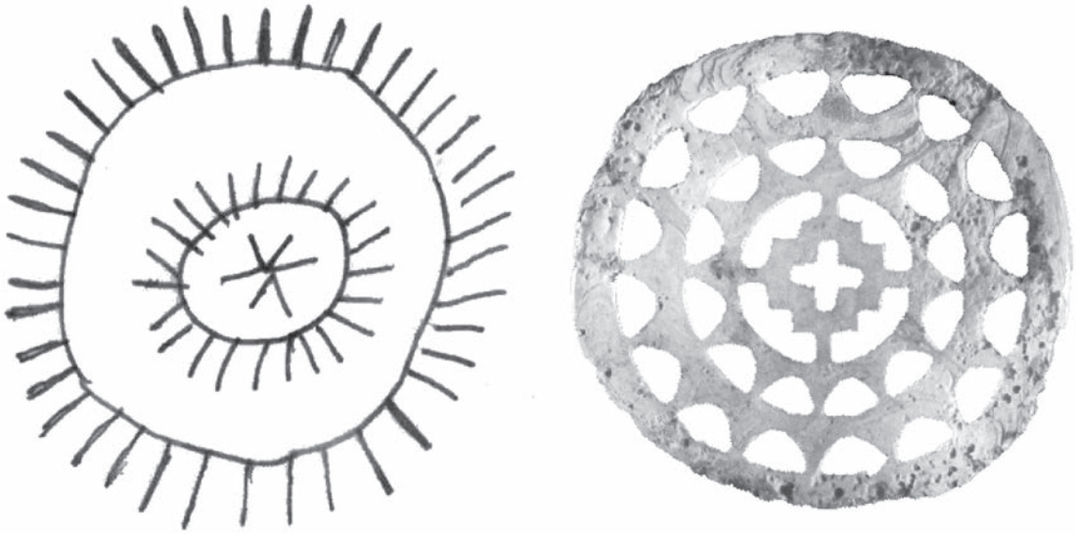

Figure 6. A cosmogram, compared to a Mississippian shell gorget.

and other cosmograms became common east of the Mississippi River. The Dhegihan-speaking tribes, however, trace their origin to the Ohio River valley and appear to have reached the eastern edge of the Plains in the mid-seventeenth century (Henning and Schermer 2004:420). In the early eighteenth century, they were still in Missouri (compare Wedel 1988), and central Kansas was controlled by various Wichita bands. The Wichitas then moved south, and the Osage and Kansa, two of the Dhegihan-speaking groups, began to use this region as bison-hunting territory.

One entry in Mead's notes suggests that some of the carvings and paintings were produced by either Osages or Kansas. In Figure 8 the person wears ceremonial garb, including a sash and an odd little hat. The extra lines on his legs may portray fancy leggings. The line coming off the back of his head may indicate his scalp lock, a long braid worn by warriors as a dare to the enemy: "Come and get it if

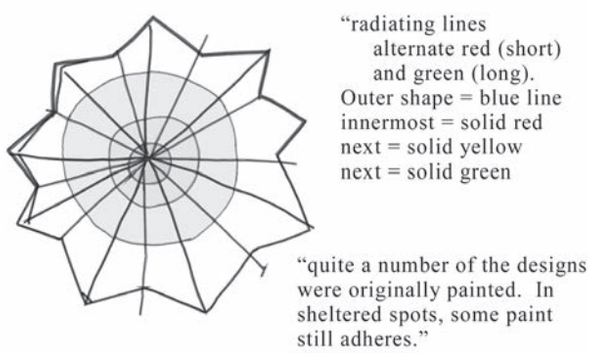

Figure 7. A second cosmogram.

Figure 8. A man in a hat, possibly Osage or Kansa.

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you can." The revealing element is the cylindrical hat with a tail. At the Picture Cave site in Missouri, a similar hat is seen in a pictograph attributed to the Osage, in part because of its location and condition. (Painted images as exposed as this one do not last for many centuries.) More to the point, however, the hat compares very well to a traditional hat in the Osage Tribal Museum (Diaz-Granados 2004:Figures 15 and 16).

This type of hat may not have been restricted to the Osage nation and quite possibly was shared with the Kansa, as Dhegihan traditions say that the two groups separated after migrating up the Missouri River. Both groups also hunted bison in central Kansas. As late as 1792 in the general vicinity of Dodge City, a Kansa band captured Pedro Vial, who was traveling from Santa Fe to Saint Louis (Loomis and Nasatir 1967), and in 1843 Nathan Boone (1929), leading a troop of U.S. dragoons, encountered several Osages in what is now Pratt County.

The weakness in this identification is that the rights to ceremonies and their regalia often passed from tribe to tribe through ritual purchases. There is at least one drawing of a Cheyenne wearing this kind of hat (Hoebel and Petersen 1964:Plate 8), and the same artist drew a picture of an Osage dance, showing four men with that hat style. So the attribution to the Osage or the kindred Kansa is a probabilistic one. Some Comanche members of a warrior society also wore it (Cavanaugh 1996:31, Plate 2).

The Osages and Kansas who may have drawn this figure and the cosmograms would not have reached this part of Kansas before A.D. 1725 or so, giving a *terminus post quem* (the earliest possible year) *for the rock art. Other images provide* clues regarding age as well, in addition to the 1786 date associated with the Trudo autograph. For instance, the larvae-like horses in Figure 1 are apt to be early in the spread of horses onto the Plains, probably predating A.D. 1700, as horses were introduced to the Plains in good numbers only after the Pueblo Revolt of 1680.

What may be another relatively early image is shown in Figure 9. In this one the horse is represented in a fairly realistic manner, complete with hooves. However, the artist was unfamiliar with modern rules of perspective, so both reins appear on the near side of the horse, while the whole body and both legs of the rider are hidden behind the horse. The warrior carries what appears to be a full-body shield of the type used before guns reached the Plains (Secoy 1992:34–37). Renderings of warriors carrying such shields are common in the northwestern Plains, where they may have been made first by Shoshonean-speaking people (Keyser 1975). Although quite effective for protection from arrows, they offered no real barrier against bullets, and they were too clumsy to handle on horseback.

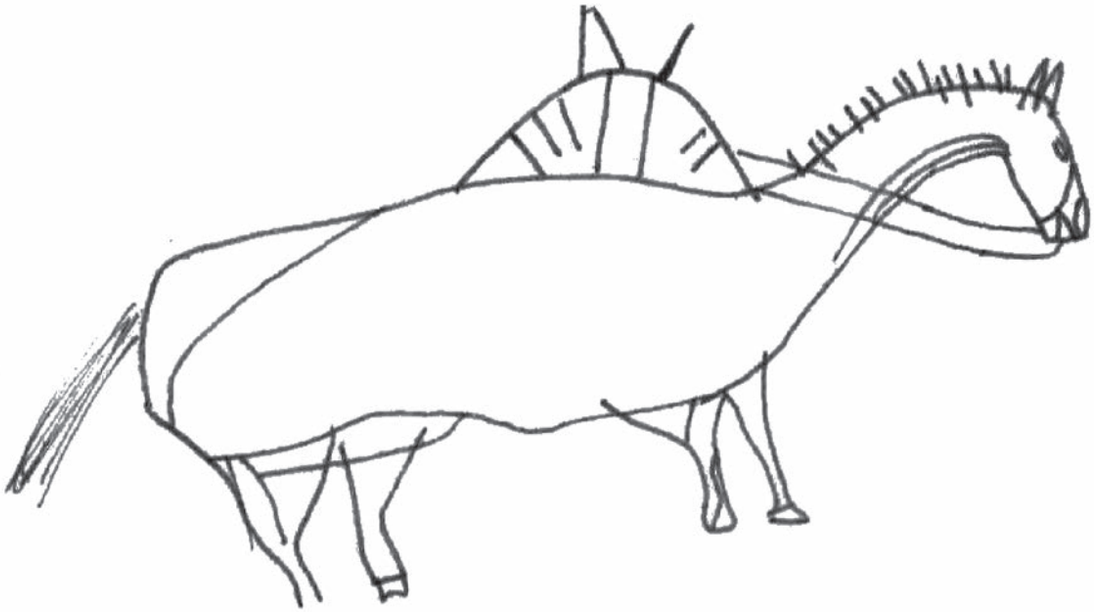

Figure 9. A mounted shield-bearing warrior, possibly early because of the size of the shield.

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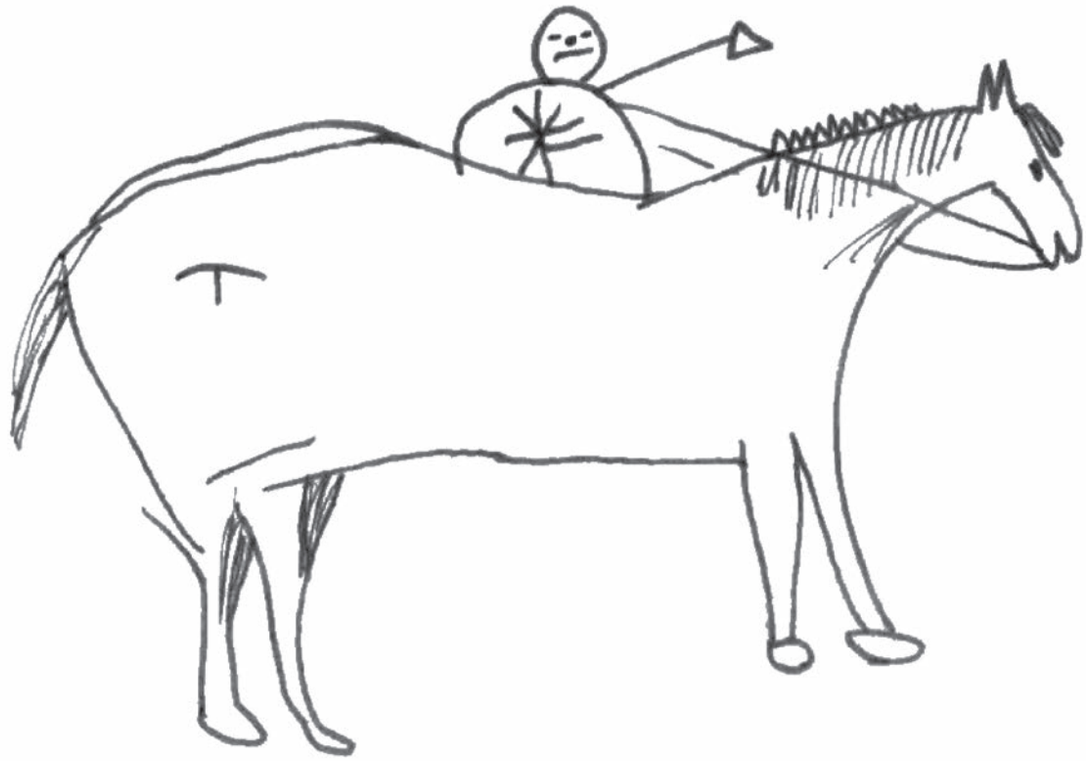

Figure 10. A second mounted shield-bearing warrior.

Using historic documents, Secoy (1992:37) dated the switch to smaller shields to about 1740. The transition may have occurred sooner on the southern Plains, where horses were plentiful earlier.

Figure 10 bears the marks of a somewhat later time frame. The warrior carries a smaller shield and a lance. The reins are shown with one strap in front of the horse's neck and the other behind. The man's body and legs simply are not drawn. The horse wears feathers attached to its head and a brand. In ledger art of the latter half of the nineteenth century, a horse with a brand signified that the animal had been stolen from the U.S. Army (Sundstrom 2004:187). In both Figure 9 and Figure 10 the artistic devices on the warriors' shields are prominently displayed. The designs were intended to give the warrior supernatural protection in battle and to intimidate the enemy.

A third horseman, this time without a shield, is shown in Figure 11. The rider is drawn with a rectangular body and head. The lower torso seemingly is behind the body of the horse, but the lower legs and feet are visible below the horse's belly. The rider has no arms, but the reins and what apparently is a bit are shown.

Figure 12 is the most detailed of the horse-and-rider drawings. The rider has a rectangular head with eyes and a mouth, as well as both arms and a bow. Both reins and legs are drawn as though on the near side of the horse, but a Spanish-style saddle with high pommel and cantle, a girth, and what may be a saddle blanket are illustrated. According to Secoy (1992:13), the Spanish-style saddle was adopted early in the eighteenth century. On the other hand, the animal is drawn with a long graceful neck and a fairly small head, reminiscent of horses in late-nineteenth-century ledger art. The hunter has wounded a bison with two arrows, and the animal is realistically rendered with eyes, nostrils, horns, a curly mat of hair on top of the head, and a beard. Only the hind legs have hooves.

Figure 13 shows all of the "footmen" copied by Mead. Considerable variety is exhibited in how they are drawn and in their clothing and items that they are handling. Sex is not indicated, except possibly 13c, who is shown with an inverted V mark that

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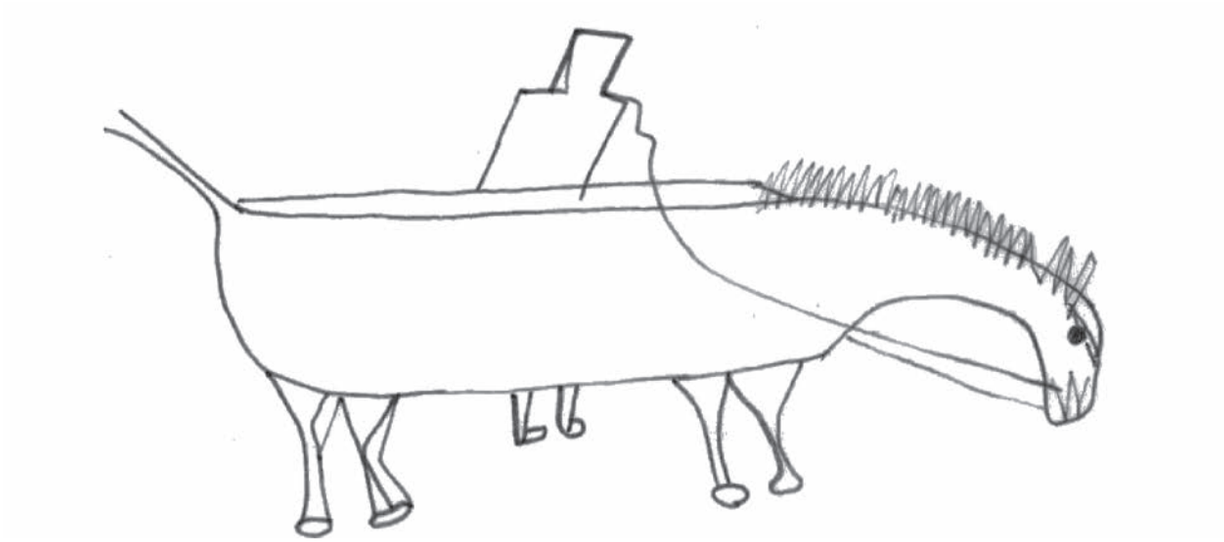

Figure 11. A third horseman.

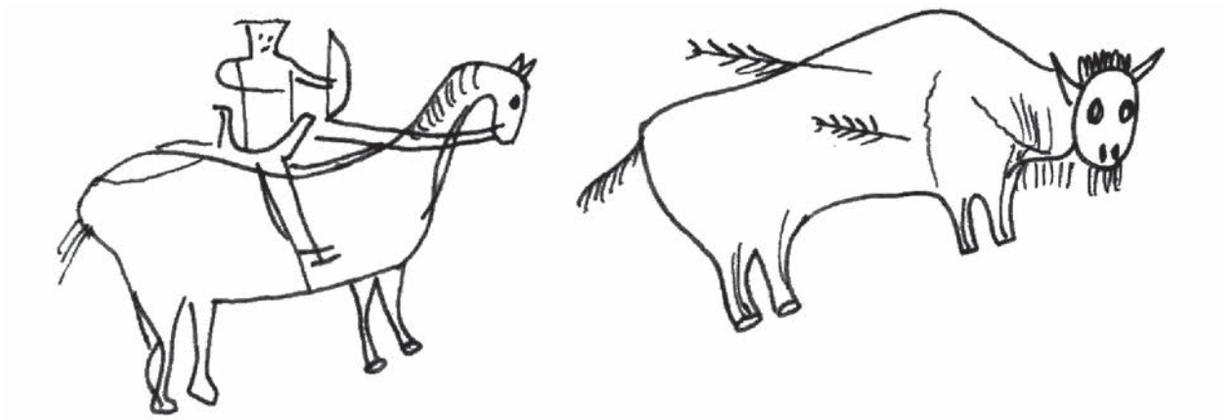

Figure 12. A horse-mounted bison hunt.

could be a vagina. The problem with that interpretation is that two other V-shaped marks are present on top of the body. Two footmen (13a and 13i) have bodies drawn with curved lines. Only one (13f) has an hourglass-shaped body, although 13h might be considered an approximation that shape. All the rest have simple rectangular bodies. Five are illustrated with V-shaped shoulders, which is a very widespread style (Francis and Loendorf 2002:132–133), but the figures in this location differ from those in Wyoming in that they do not have necks drawn as single vertical lines rising from the centers of the Vs. Some have fairly naturalistic necks; some have no neck at all, and that variation is independent of how the shoulders are indicated--either with a simple horizontal line or a V shape. Head shape is less variable. One figure has a trapezoidal head like those seen on the horsemen in Figures 11 and 12, while another is depicted as roughly triangular. All the rest are nearly circular, but facial features vary from totally absent (seven cases), to eyes only (one case), eyes and mouth (one case), and eyes, nose, and mouth (seven cases). The last category consistently shows those features with either dots or small circles for eyes, a vertical line for the nose, and a horizontal line for the mouth. Four of the bodies lack legs, one has legs but no feet, and the rest have both legs and feet. Hands usually are absent, but five examples show three-fingered hands.

Turning to clothing, there is a strong correlation between the inclusion of facial features and the presence of a headdress or hat. Nine figures have both a

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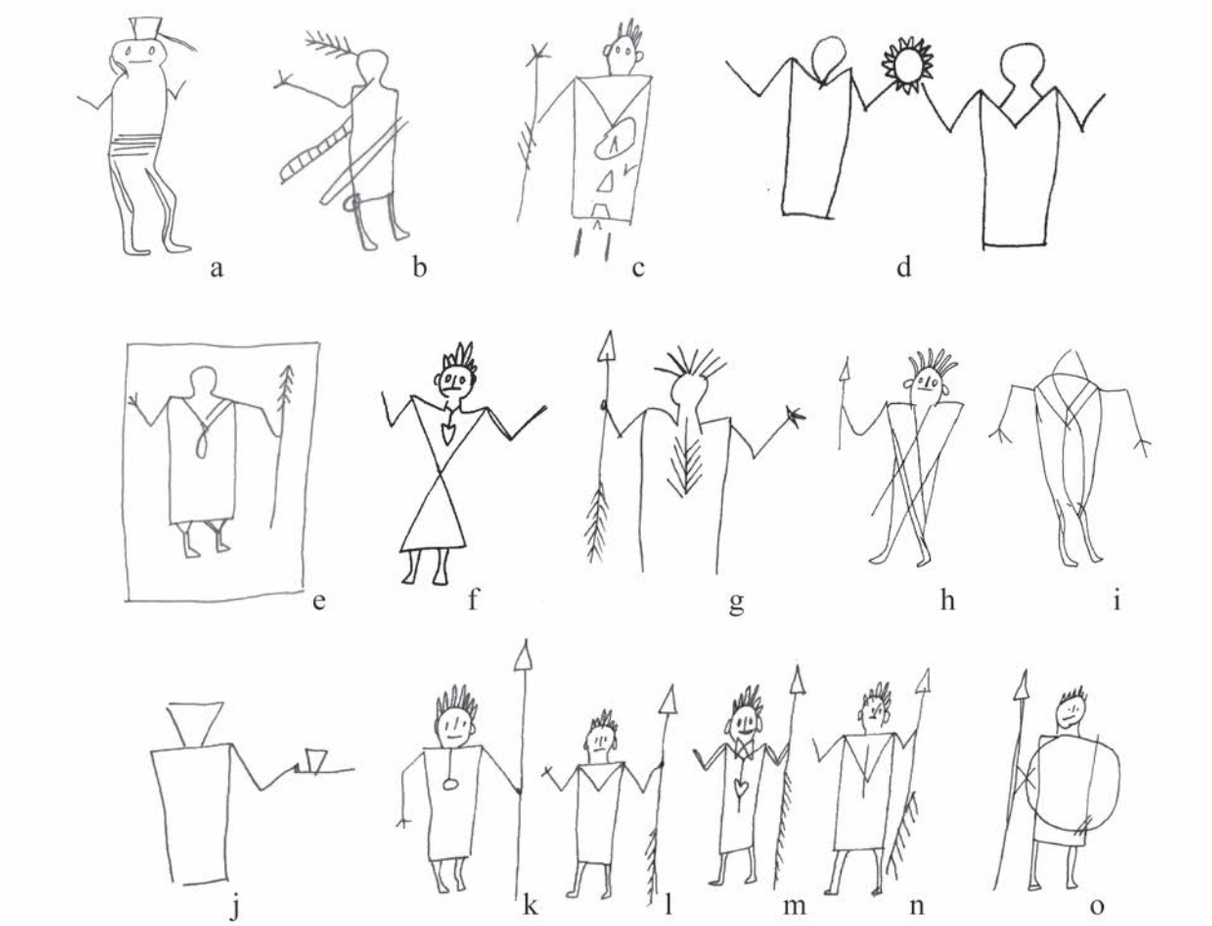

Figure 13. Mead's pedestrian figures.

few facial features and some sort of head gear, while five of the figures that lack facial features show none. Only two figures without facial features are shown bareheaded, and one of them is the sole figure with a feather on his head. No figures that have facial features lack headgear. It is tempting to see those with both facial features and headdresses or hats as self-portraits by members of a small group, and the others (with the possible exception of 13g) as something else. One reason for this interpretation is that Mead recorded Figures 13k through 13n side by side on a single page, as though part of the same panel. They are quite similar stylistically but have differences in application of facial features and in details of dress and weaponry.

Some of the faceless figures differ from the rest in notable ways. One (13b) is shown with a single feather on his head and something issuing from the spot where his mouth would be. He is one of only two figures shown with double lines for arms, and his right arm (if that is what it is) is crossed by parallel horizontal lines. Possibly this is an attempt to depict a Cheyenne warrior; members of that nation sometimes sacrificed strips of skin from their arms. The sign for Cheyenne in the Plains Indian sign language is to draw the index finger of the right hand repeatedly across the lower left arm and wrist (Clark 1982:98). In addition, members of the Cheyenne Wolf Soldiers Society wore painted diagonal stripes on their arms (Hoebel and Petersen 1964:50, Plate 6). While it is tempting to speculate that this figure might represent someone killed in battle, the image lacks any indication of a wound of the sort seen in what Keyser (1977) calls biographic art. In fact none of the images recorded by Mead have any wounds, and only the mounted bison hunter is shown using his weapon. The absence of clear references to war, aside from shields, sets this corpus of rock art apart

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from apparently contemporaneous art on the northwestern Plains.

Three of the other faceless figures (the two in 13d plus 13j) hold something other than recognizable weapons. The one held by the two figures in 13d looks like a sunburst, but the significance is not evident. Two figures on a rock art panel in Kiowa County hold four-pointed stars in their hands, which the author interprets as depictions of meteorites (Blakeslee 2003). The item in 13j might be a pipe, but, given that this individual's head is a featureless trapezoid, interpreting the horizontal line that he appears to hold is difficult to say the least.

The illustrated weapons are mostly lances with triangular points, which in five of seven cases have shafts decorated with pendant feathers. One (13c) holds what looks like a spear, but instead of a point, it terminates in a motif that resembles a star. A similar device at the outer end of the line appears to emerge from the mouth of 13b. Clothing of some sort seems to be indicated by the V shapes drawn below the shoulders and necks of six figures. In one instance (13f) the V is small and looks like a necklace from which a pendant is suspended. In fact, something hangs from the V in five of the six cases: a circle, an oval, a triangle, an elongated shape that looks like a necktie, and a simple straight line. Three other figures also wear pendants but lack the V-shaped item. In Figure 13g the object appears to be a hair pipe breastplate. Such breastplates came into use about A.D. 1850, and Ewers (1957:58) attributed their invention to the Comanches, spreading from their country to the northern Plains by around 1870.

Two other anthropomorphic beings consist solely of heads (Figures 14 and 15). The one in Figure 14 appears to wear a feathered headdress. The facial features consist of two open circles for eyes, a slender triangle for a nose, and a barely open line for a mouth. While these attributes differ somewhat from those on the footmen (dots for eyes and simple lines for nose and mouth), the differences may simply reflect the different scale at which this body-less human is drawn. The author has not encountered elsewhere any rock art that looks much like this face, except for the one shown in Figure 15, which Mead recorded at this site. It is clearly that of a European with both mustache and beard. He lacks ears, hair on top of the head, and any sort of headgear, but he has the same circular eyes and triangular nose as the face in Figure 1, and the mouth is similar as well. The two heads were not on the same page of Mead's notebook, so there is no way to determine how far apart they were on the rock canvass.

Other than the bison in the Figure 12 hunting scene, Mead recorded very few images of game animals. One exception is the elk in Figure 16. It is about as realistically drawn as most of the horses but lacks clearly demarcated hooves. Elk were both game animals and important symbols to various Plains tribes. To the Osages elk symbolized the earth itself. Mead drew this animal on the same page as one of the pedestrian humans, but the latter is carrying a shield and lance, which does not seem appropriate elk-hunting gear. Thus, it is unclear whether this elk documented a successful hunt (the lack of arrows or other signs of wounds suggests not), the hoped-for outcome of a hunt, or a sacred symbol.

Another image that could represent either a game animal or a sacred symbol is reproduced in Figure 17. It appears to be the head or skull of a

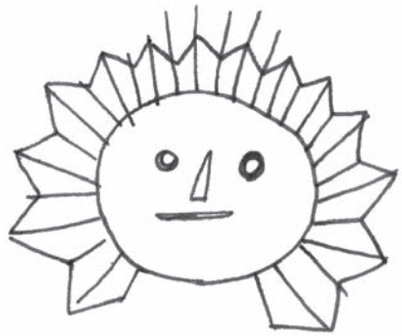

Figure 14. A head with headdress.

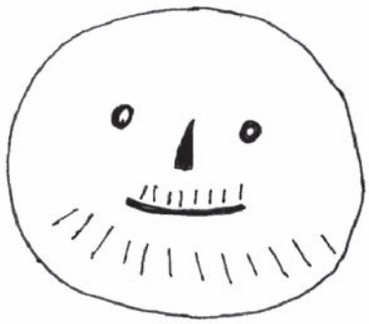

Figure 15. An undocumented alien of European affiliation.

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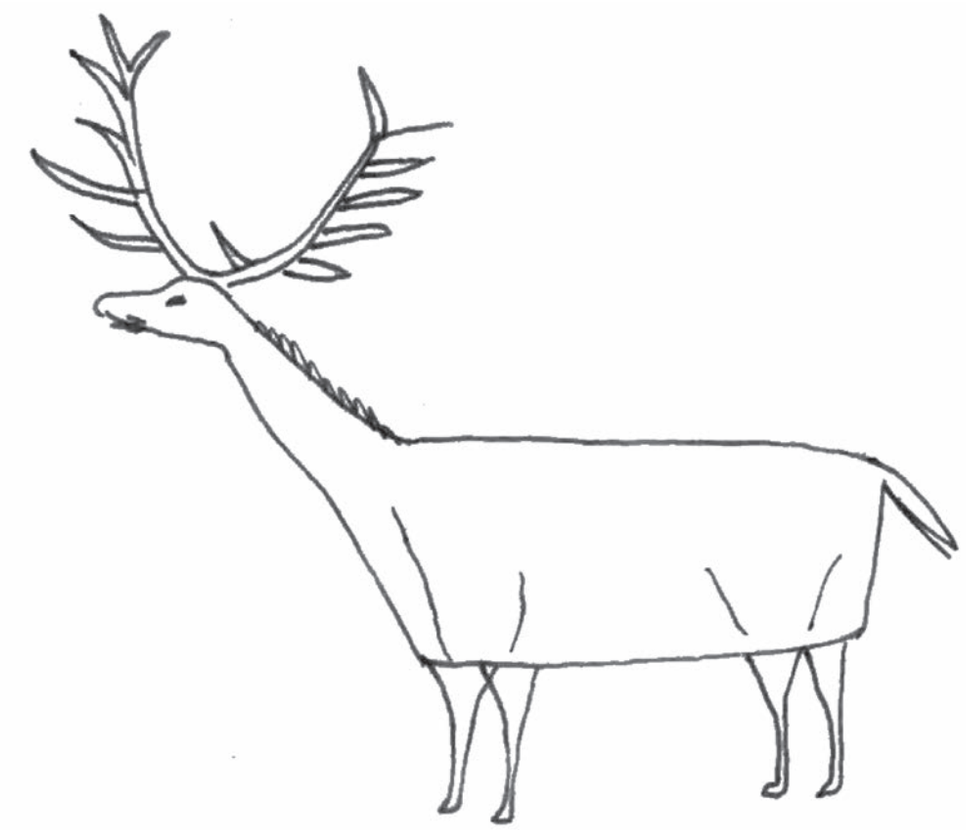

Figure 16. An elk.

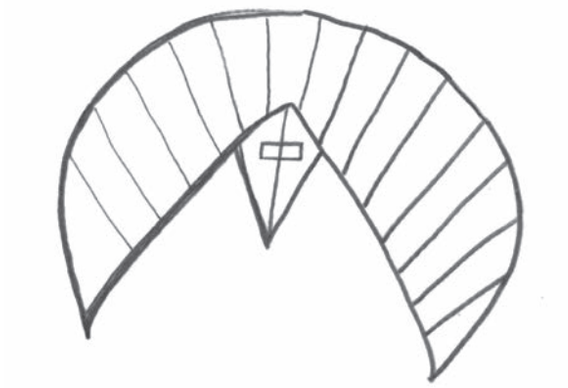

Figure 17. A possible bighorn.

male bighorn sheep. Such animals did not reside in Kansas, but the natives of this area were aware of the existence of them. In fact, there are depictions of bighorn sheep in Hopewellian sites in Ohio and Florida (De Boer 2004) that date to nearly 2,000 years ago. Its presence in a site far from where the animal would be hunted suggests that some element of religion other than hunting magic was at play.

The creature shown in Figure 18 certainly had religious significance: a turtle. It appears to have horns on its head, spikes behind the head, and a feathery tail and probably was intended to represent a denizen of the underworld. The head-down pose reinforces this interpretation. Loendorf (2008:Figure 6.10) illustrated a horned turtle from the Stone Structure site in Colorado, but in that case

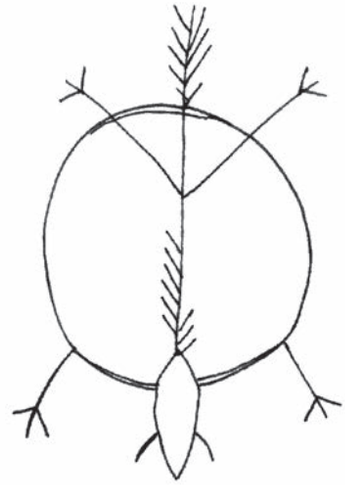

Figure 18. A horned turtle.

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the turtle was depicted with head up. He noted that contemporary Navajo and Apache informants consider turtle imagery to be war related. The same was true for the Osages.

The images in Figure 19 were on a single page of Mead's notebook. They include a bear track, what is usually called a turkey track, a zig-zag line, a bird, and an animal with wavy lines in front of its head. The bear track or bear paw motif is extremely widespread, more so than full images of bears. That animal, given its winter hibernation habits, is widely seen as a mediator between this world and the underworld. It is also viewed as having the power to cure some human diseases.

The bird's foot or turkey track motif has several possible referents. One is the constellation known to the Pawnees as the Bird's Foot, which apparently is our constellation of Cygnus, the Swan, also called the Northern Cross. In Pawnee belief the soul of a dead person rose to the Northern Star, which is not the current North Star but alpha Cygnus, or Deneb, the brightest star in Cygnus. Pawnee accounts described it as "right beside the Milky Way," and so it is. The souls of the Pawnees traveled along the Milky Way until they reached the South Star, Canopus, below the southern horizon (Chamberlain 1982). To the Turtle Mountain Chippewa, Cygnus was associated with the Thunderbird, and the bird's foot motif could be a reference to that power. Alternatively, the common name for the motif might be correct, for, as discussed below, all bird images at Mead's rock art site appear to be birds associated with the earth rather than the sky.

The bird drawn below the two tracks is shown as it would be on land rather than in flight. It has no specific markings, making problematic its identification with any particular bird species. The birds at this rock art site are drawn three different ways, and this one is the sole example of its type. Given the variation in the ways that humans and horses were drawn, it would be foolhardy to identify it with any particular kind of bird, other than one that native people associated with the ground rather than with the air.

Below and to the right of the bird is a quadrupedal animal. It, too, is impossible to identify, given a general lack of features. It has toes rather than hooves and what appear to be erect ears rather than horns. One animal whose erect ears drew the attention of native people was the wolf, the sign language

Figure 19. Various mystical symbols.

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symbol for which was the raised index and middle finger of the left hand, as the erect ears of the alert animal (Clark 1982:407). This depiction, however, lacks a tail. Inside the outline of the animal is the so-called heartline motif. The wavy lines in front of its head stand for supernatural power. The final motif is a zig-zag line, which represents lightning. Lightning is, of course, a natural symbol for divine power and has that referent in most societies.

Figure 20 depicts all of the birds recorded by Mead. The borders around sets of images indicate which ones were recorded on a single page and hence might be from the same panels. The two pages with multiple images each have an internal consistency that suggests the three birds in each might even have been drawn by the same artist. All of the birds differ from the great majority that appear in other Plains rock art in that they are not shown in flight. The frontal view with outspread wings, typical of thunderbird/hawk motifs, is absent. Instead all of the birds are shown in side view as though they were on the ground.

The birds in the two left-hand panels in Figure 20 appear to represent the same species. All that are complete enough to have an intact tail have a fan of tail feathers, and all but one have highly stylized wings that are reduced to a pair of parallel lines. Those in the lower space differ from the others in having short protrusions from the tops of their heads. Nevertheless, the author believes that they represent the same type of bird, along with the image with the barred tail in the upper right. All of the birds have a fairly elongated body and neck, typical of a turkey. The protrusions at the top

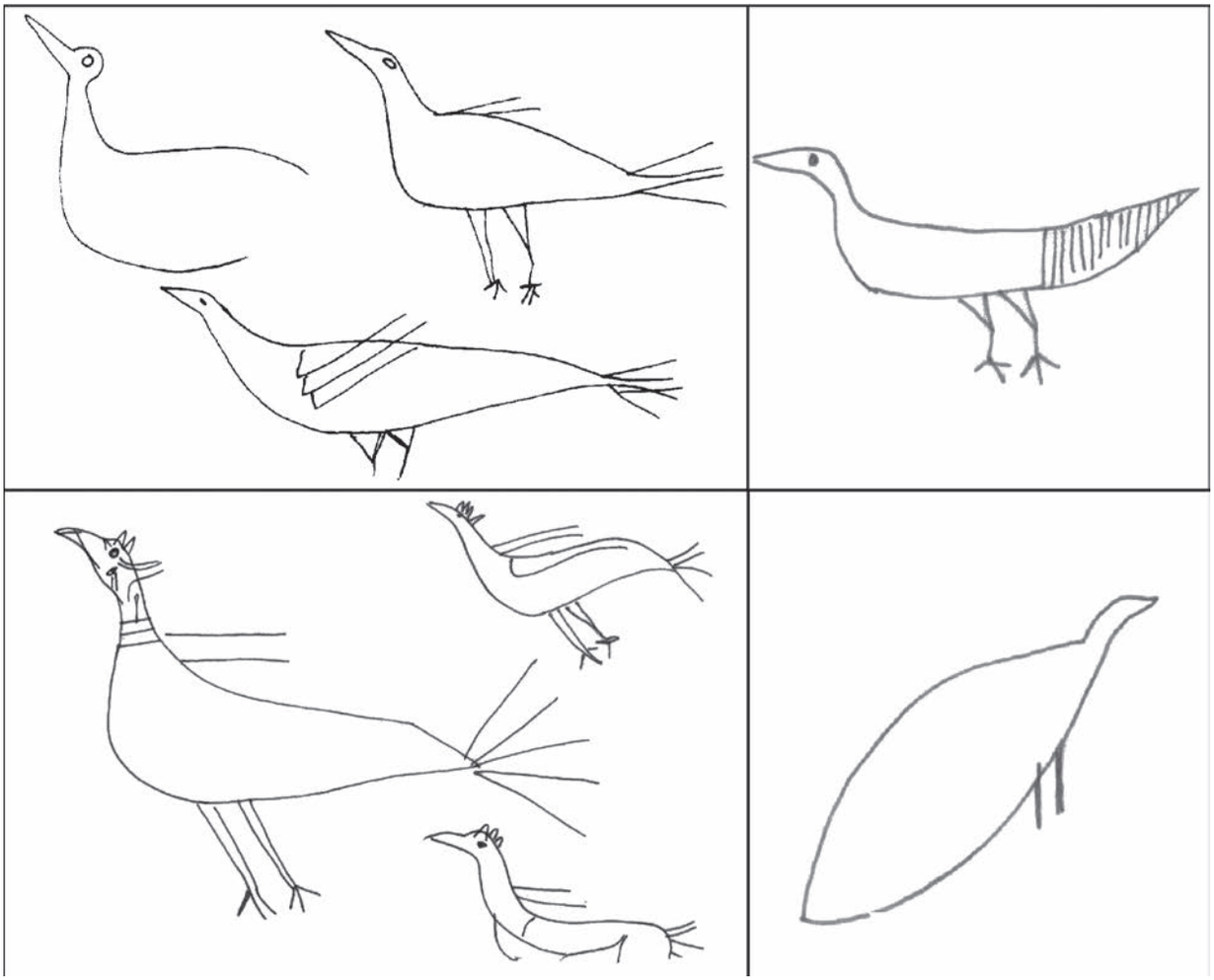

Figure 20. Mead's birds.

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of the head and on the face and neck of one bird in the lower left panel appear to be depictions of what are called carunkles. The barred tail feathers of the turkey are a familiar sight, and on a live bird they can appear as bands across the tail when it is not fanned out. Very similar land birds with barred tails show up at other Kansas rock art sites (e.g., Stein 1998:15). Fletcher (1904:173) learned that the turkey once held symbolic importance to the Pawnees, and that it was the feathers of the female turkey that were used in the Hako ceremony. If the depictions are intended to be of the hen turkey, that would explain why none of them include the showy spread tail posture of the male.

Mead's notes with the image shown in Figure 21 are terse: "unidentifiable, partly defaced." Indeed, by itself the image is definitely unidentifiable and uninterpretable. Even in the context of all other art at Mead's site, it appears unique. Viewed in light of images at other Kansas rock art sites, however, it can be identified as a reclining human (or supernatural) figure. Figure 22 replicates an image found at another site in the Saline River valley that was recorded by Wells 1996a:81). Figure 23 shows a drawing from Palmer's Cave near Kanopolis Reservoir. The similarities among the three are obvious, although the meaning behind them is still obscure. Only detail from Palmer Cave yields a little to analyze: the human appears to be drawn around a serpent. Serpent iconography is missing from the other two.

DISCUSSION

Wider comparisons are the next step needed in the interpretation of this and other rock art in Kansas. Familiarity with the art at other sites makes this locale look a bit different. Mead recorded no depictions of guns and only a few examples of what might be biographic art (three of the four horsemen). There are no four-pointed stars and only one hunting scene, which include the only bison image at the site. In addition, there is only one traditional pedestrian shield-bearing warrior, although two horsemen also carry shields.

In contrast, there are 12 animal images (and animal tracks) that may have supernatural significance, along with the two underworld monsters. Of the 16 footmen, 9 hold lances (a lance-like object in one case), and 9 are wearing some sort of clothing that creates a V shape below the neck. Seven of them have a circle or other figure drawn at or below the point of the V. The famous Ghost Dance shirts of the 1890 era often had a V-shaped yoke on the front, and sometimes a power symbol was attached at the V (compare Peterson 1976). Since Native Americans were gone from the Saline River valley by 1890, these may be images of a precursor to the Ghost Dance shirt, which was believed to provide supernatural protection against bullets (Peterson 1976:13). The combination of the special clothing and the lances strongly suggests that these images are of members of a warrior society. Leaders had special paraphernalia, including lances to shove into the ground to signal that they would not retreat. Figure 24 shows an image that has been interpreted as such a society leader. Found in Colorado (Loendorf 2008:Figure 7.7), it is unmistakably in the same style as the bulk of the pedestrian figures at Mead's site.

It is suggested, then, that one set of figures at the site relates to the activities, perhaps initiations, of a

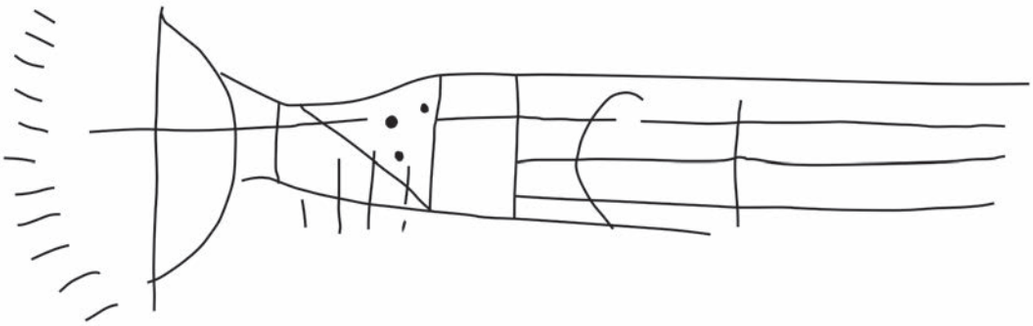

Figure 21. A figure that Mead could not identify or decipher.

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Figure 22. Reclining figure, recorded by Nova Wells.

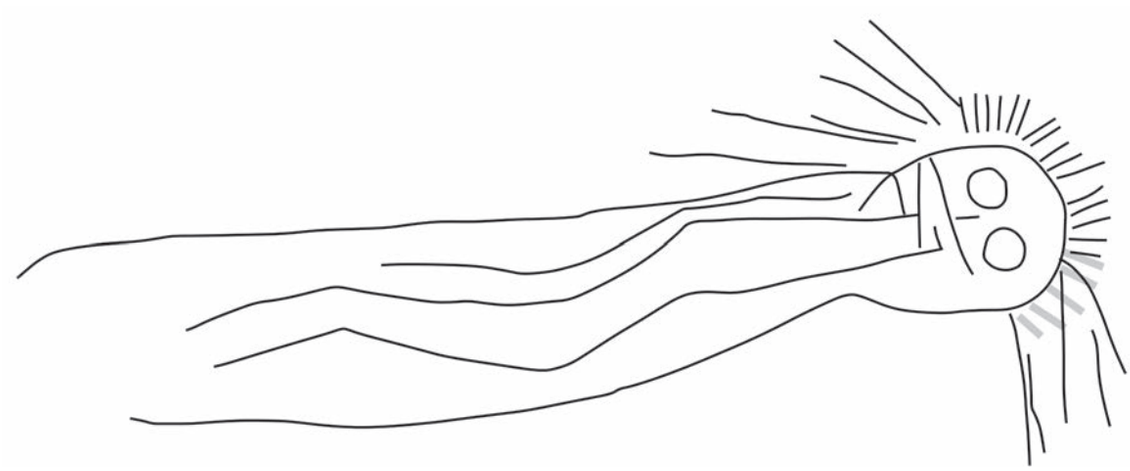

Figure 23. "Reclining chief" at Palmer's Cave on the Kansas River. Only lines clearly associated with the figure are shown. The petroglyph was drawn over older figures and is partly obscured by later ones.

warrior society of an unidentified tribe. The bulk of the remaining images are animal figures that probably have supernatural meaning. All of them, including the birds, are associated with the land and/or underworld. (The spirits of land animals dwell in the underworld in North American Indian belief systems.) Only the single turkey track motif could have a relationship to the sky. In addition, none of the art has any obvious relationship to war. Warriors sometimes wore the turkey track motif in paint or as a tattoo, but the star motif that relates to Morning Star, the god of war and warriors, is conspicuously absent here. The Pawnees believed in the existence of special places where humans could make contact with animal spirits in the underworld (Parks and Wedel 1985); Mead's site may have been one such spot for either the Pawnees or the Wichitas.

Figure 24. Apparent war society leader from southeastern Colorado (after Loendorf 2008:Figure 7.7).

Thus, it appears that two main periods of site use involved rock art, along with occasional other instances. Three images might have been made by Dhegiha speakers, and the bulk of the animal images may be of northern Caddoan origin. The people who created the images of the shirt-wearing, lance-carrying men are not yet identified.

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ARCHEOLOGICAL INVESTIGATIONS AT
CHIEF WHITEHAIR'S VILLAGE SITE (14WN143), WILSON COUNTY, KANSAS

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Site 14WN143, also known as Chief Whitehair's Village, is located in southeastern Kansas near the confluence of the Verdigris River and Salt Creek in Wilson County. The 2013 investigations involved surface collection and small-scale excavations (three block units, totaling 2.25 horizontal meters) and revealed features and artifacts dated to between A.D. 1420 and 1680. During this time the Osage people expanded westward from the Mississippi River valley and migrated into central and southern Missouri and northwestern Arkansas. Given the temporal and seasonal data recovered, the authors suggest that site 14WN143 reflects activities at a fall bison hunting camp, possibly related to the Protohistoric Osage.

Chief Whitehair's Village (14WN143) is situated in southeastern Kansas near the confluence of the Verdigris River and Salt Creek within the Osage Cuestas physiographic region (Figure 1). The site was recorded in November 2013, the result of an unanticipated discovery during construction. It is located 650 m south of the Whitehair Bridge site (14MY2328), which originally was discovered during a cultural resources survey for the Southeast Kansas Highway Corridor Project (Smith 2002; Weston 1993). At that time it was considered to represent a Middle Woodland/Early Ceramic occupation, but subsequent analysis of the collections by Smith (2002:40–41) recognized Late Paleoindian Dalton and Archaic components.

Site 14WN143 is situated on the same landform as 14MY2328, and the entire floodplain clearly had been in use by Native Americans since the Late Paleoindian, Dalton phase (Smith 2002). This setting likely was heavily used by prehistoric occupants, suggesting that the sites were related and part of a larger complex that spanned most of North American prehistory. The limited archeological

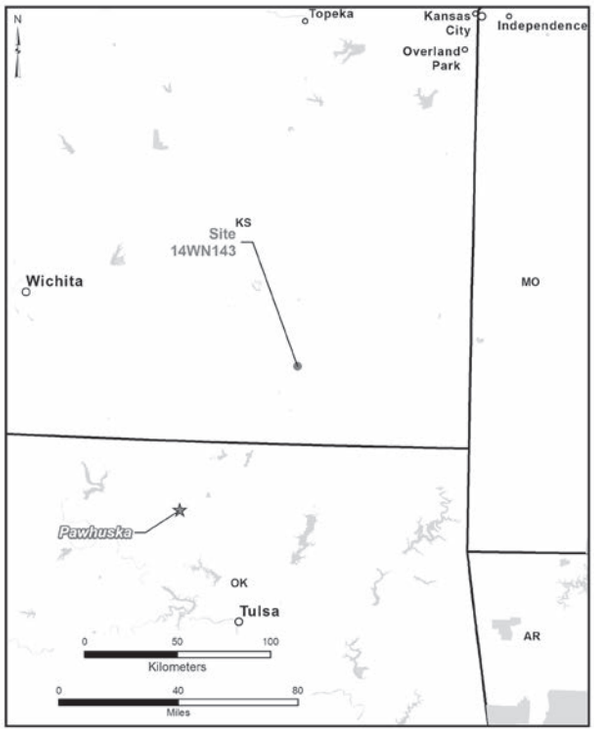

Figure 1. Geographic location and 14WN143 site map.

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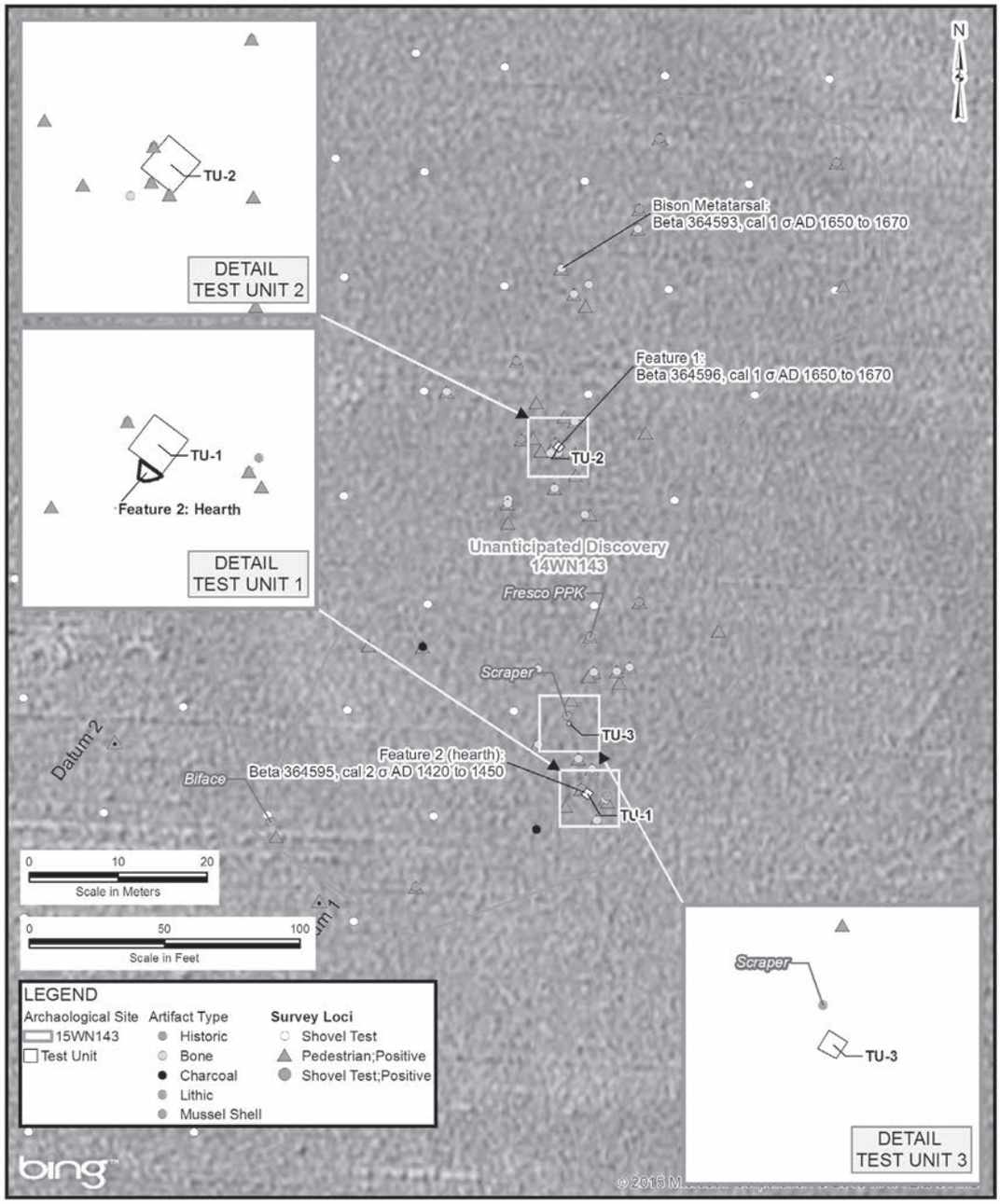

investigations at 14WN143 demonstrated that the temporal span of activity in this area extended into the Protohistoric period.

While archeological materials identified in the current investigations predated the Whitehair chiefs known in Euroamerican history, the authors believe that the site has an ancestral Osage component. Therefore, it is worthwhile to briefly review the oral traditions and other data regarding the Osage people and their relationship to this part of southeastern Kansas.

THE OSAGE PEOPLE AND CHIEF WHITEHAIR

The Osage are linked linguistically to the Dhegiha Siouan group, which includes the Kaw, Omaha, Ponca, and Quapaw tribes (Bailey 2001).

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According to oral tradition (Hunter et al. 2013:45), the Dhegiha tribes originated in the Ohio River valley and later migrated to the river's confluence with the Mississippi. This position is supported by linguistic data (Rankin 2006:572–573), which indicate that the Dheghia Siouan tribes began to divide before A.D. 500–600, with the final split occurring sometime around A.D. 1200, when the Kaw separated from the Osage. Subsequent to this, the Osage remained in the St. Louis vicinity until the end of the Mississippian period around A.D. 1300 (Hunter et al. 2013:3). They began moving west from the Mississippi Valley in the early Protohistoric period, drawn by the availability of bison on the eastern Plains (Bailey 2001). There is no doubt that the Osage are affiliated with the late prehistoric cultures of southwestern Missouri (Chapman 1948:149–155; Swanton 1984) and adjacent areas of Kansas and Arkansas.

In 1673 French explorers Father Jacques Marquette and Louis Jolliet were the first to map the Mississippi River and the location of regional tribes (Tucker 1942:plates IV and V). On their map the Osage were shown generally south of the Missouri River. These early explorers did not actually visit the Osage villages; they either recorded this information from neighboring tribes, such as the Illinois, or from Osage who were traveling. A decade and a half later in 1687, Father Anastasius Douay and Father Louis Hennepin, men of La Salle's expedition, recounted that the Osage lived by the Osage River, both stating that 17 Osage villages were situated on the river that bears their name (Cox 1922:257; Thwaites 1903:443). The number of villages may have been exaggerated, as they also reported 22 villages of Panimaha (Skidi or Skiri Band of Pawnee). Although these accounts are perhaps overstated, most likely more than one village existed.

During the last quarter of the seventeenth century, as French expeditions entered into Osage territory, contact with the tribe increased (Chapman 1974:76–77). At the beginning of the 1700s, the Osage apparently were still located primarily in southwest Missouri. Starting in 1717, several historical documents and maps indicated that the Osage had diverged into at least two groups, referred to as the Big Osage, residing in southwestern Missouri along the Osage River and its tributaries, and the Little Osage, residing in central Missouri along the Missouri River near the Missouria tribal village (Du Pratz 1758:324; French 1869:151–152; Lewis 1926:320; Villiers 1925:59–60). During the mid- to late-1700s, many Osage camps existed along the Pomme de Terre, Niangua, Sac, and White rivers in southwestern Missouri and northwestern Arkansas (Burns 2004:46–47).

By the last quarter of the eighteenth century, some band villages occurred along the Neosho-Grand and Verdigris rivers in southeast Kansas (Newman 1957). At this time the Osage had divided into three primary autonomous bands: the Little Osage, who were still on the Missouri River; the Arkansas Band, who lived on the lower reaches of the Verdigris River in northeastern Oklahoma north of the Arkansas River; and the Big Osage, who stayed along the upper reaches of the Osage River (Rollings 1992:11). The expansion of Osage hegemony impacted other Plains tribes, including the Caddo tribes of southeastern Kansas and northern Oklahoma. Through warfare and control of trade, the Osage forced the Caddo and Wichita to move farther and farther south (Mathews 1961:561; Rollings 1992:7–11). By 1750 the Osage had reached the confluence of the Cimarron and Arkansas rivers in Oklahoma, and ultimately they traveled as far south as Natchitoches, Louisiana, where they were involved in both trade and warfare (Mathews 1961:343–345).

Osage villages were clustered along the Neosho-Grand and Verdigris rivers in Kansas from 1785 until 1872 (Burns 2004:49). In May 1794 Whitehair I (*Pawhuska*) was recognized as a *considerado* (a highly regarded person) by the Spaniards and given a medal (Din and Nasatir 1983:260). By 1796 he was established as *Tsi' zhu* Great Division (Gentle Tsi' zhu clan, office of the Peacemaker) Chief, replacing Town Maker or Claremore II (La Flesche 1921:53–54). The personal name Whitehair referred to the sacred white buffalo, according to La Flesche (1932:125).

Later Whitehair chiefs were close relations or direct descendants of *Pawhuska*. The last Whitehair chief, known as Little Whitehair or Whitehair V, was chief of a settlement called the Village of the Pipe, located along the Neosho River near Oswego, Kansas. In 1865 Little Whitehair moved his village to the Verdigris River near its confluence with

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the Fall River. Numerous historical documents from Wilson and Montgomery counties spoke of Whitehair's village near the junction of the Fall and Verdigris rivers. Indeed, historical accounts of the creation of Neodesha noted that the traders who started the town chose the spot to directly serve Whitehair's Village (Cutler 1883).

FIELD RESULTS

Archeological data recovery at 14WN143 was limited and involved recording of surface artifacts inadvertently exposed after mechanical grading, two hand-excavated 1 by 1-m test units, and one 50 by 50-cm test unit.

Two distinct soil strata were identified. **Stratum I**, Ap soil horizon is an active modern alluvial plowzone, extending to a depth of 49 cm below datum or approximately 39 cm below the ground surface. This soil horizon consists of a very dark grayish brown (10YR 3/2) silt loam and, due to the mechanical grading, was observed only in TU 3, the 50 by 50-cm test unit.

Stratum II, B soil horizon is composed of alluvial silt clay, grading in color from dark brown (10YR 3/3) to very dark grayish brown (10YR 3/2). Intact buried cultural features were found within this stratum, which was excavated to a maximum depth of 69 cm below datum.

Test Unit 1 was excavated in the southern part of the site, bisecting a reddened and blackened circular stain (Feature 2), observed after grading (Figures 1–3). This circular stain with a basin-shaped profile contained charcoal, stone, and bone and served as a hearth.

Test Unit 1 (Figures 1–3) was excavated in 10-cm arbitrary levels within natural soil horizons and revealed Stratum II, composed of a very dark grayish brown (10YR 3/2) silt clay to a depth of at least 52 cm below datum. After reaching culturally sterile deposits, the remainder of Feature 2 was excavated south of Test Unit 1. Only the fill was excavated and collected for flotation in the southern portion of this feature. Test Unit 1 and Feature 2 yielded a total of 343 artifacts, consisting mostly of small chips and microdebitage recovered during flotation.

Test Unit 2 was positioned in the northern part of the site in a place where faunal remains and charcoal (Feature 1) were found on the graded surface (Figure 1). Test Unit 2 was excavated in 10-cm arbitrary levels within natural soil horizons to a depth of 52 cm below datum. Stratum II is the only soil identified in this unit; it is a very dark grayish brown (10YR 3/2) silt clay. Test Unit 2 yielded 23 specimens: a retouched flake and 22 mammal bone fragments.

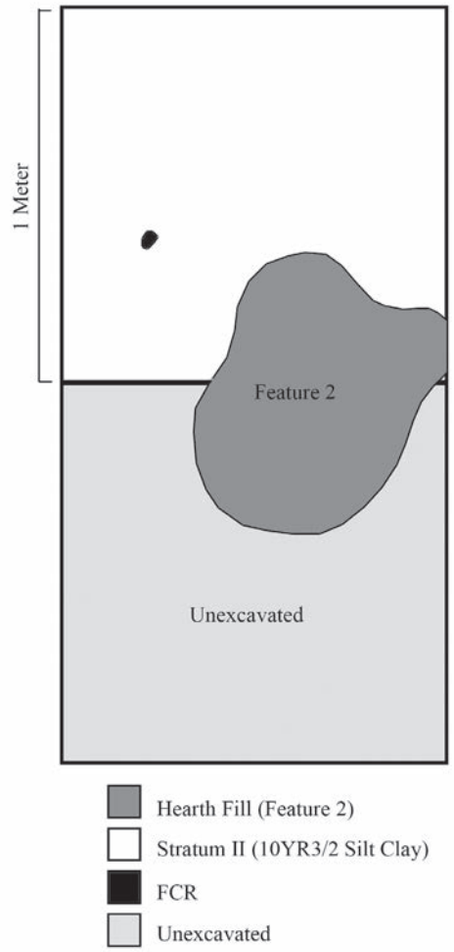

Figure 2. Plan view of Feature 2 (hearth), Test Unit 1.

Test Unit 3 was positioned in the southern portion of the site in an area of undisturbed topsoil (Figure 1). It was excavated in 10-cm arbitrary levels within natural soil horizons to a depth of 69 cm below datum. Stratum I is a very dark grayish brown (10YR 3/2) silt loam plowzone, appearing within this test unit to a depth of 49 cm below datum. Stratum II is a dark brown (10YR 3/3) silt clay, appearing to a depth of 69 cm below datum, where the test unit was terminated. Six pieces of

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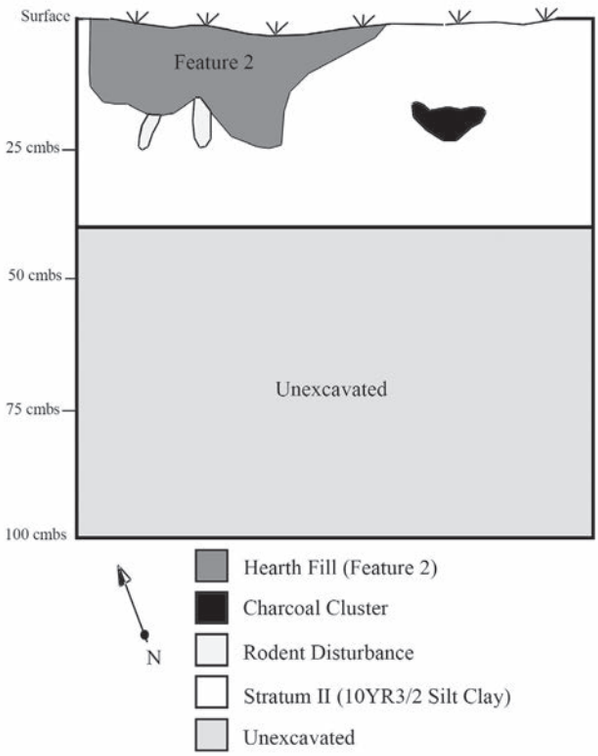
chipped stone debitage and one small bone fragment came from Test Unit 3, all within levels 2 and 3 of the Ap horizon (36–49 cm below datum).

In summary, the limited archeological investigations at 14WN143 resulted in recovery of 380 lithic artifacts: 30 from the surface, 1 from Feature 1, 343 from Feature 2, and 6 from Test Unit 3. The faunal assemblage consists of 486 pieces of bone, including 223 from the graded surface, 22 from Feature 1, 242 from Feature 2, and 1 from Test Unit 3. In addition, charcoal, burned bone, and botanical material were collected and analyzed for radiocarbon dating and macrobotanical studies.



RADIOCARBON CHRONOLOGY

Organic materials from Features 1 and 2, as well as from the graded surface, were sent to Beta Analytic for radiocarbon analysis. Radiocarbon dates were obtained from charcoal within Features 1 and 2 and from bison bone within Feature 1 and from the graded surface. Small bone chips from Feature 2 also were submitted, but they did not retain sufficient collagen to provide dates. Assays returned the following results.

- A charcoal sample from Feature 1 (bone concentration), **Beta-367453: 290 ± 30 B.P.;** 2 sigma calibration: cal A.D. 1490 to 1600 (cal B.P. 460 to 350) and cal A.D. 1610 to 1650 (cal B.P. 340 to 300)
- A bison bone from Feature 1, **Beta-364596: 230 ± 30 B.P.;** 2 sigma calibration: cal A.D. 1640 to 1680 (cal B.P. 310 to 270), and cal A.D. 1760 to 1770 (cal B.P. 190 to 180), cal A.D. 1780 to 1800 (cal B.P. 170 to 150), and cal A.D. 1940 to post 1950 (cal B.P. 10 to post 1950).
- A charcoal sample from Feature 2 (hearth), **Beta-364595: 460 ± 30 B.P.**; 2 sigma calibration: cal A.D. 1420 to 1450 (cal B.P. 530 to 500).

Figure 3. Profile of Feature 2 (hearth), Test Unit 1, south wall.

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- A bone sample from bison metatarsal recovered from the graded surface, **Beta- 364593: 240 ± 30 B.P.;** 2 sigma calibration: cal A.D. 1640 to 1670 (cal B.P. 310 to 280), and cal A.D. 1780 to 1800 (cal B.P. 170 to 150), cal A.D. 1940 to post 1950 (cal B.P. 10 to post 1950).

The radiocarbon dates demonstrate that the portion of the site subjected to investigation aligns chronologically with the Great Bend aspect as described by Blakeslee and Hawley (2006:167). Figure 4 presents a comparison of the radiocarbon dates. Given the calibration curve, some more recent dates are possibilities at the two-sigma calibration (post-1800), but most cluster between ca. A.D. 1420 and A.D. 1680. Feature 2 might represent a slightly earlier occupation than Feature 1 and the bone fragments scattered on the graded surface. The radiocarbon results from charcoal in Feature 2 returned a calibrated date of A.D. 1420 to 1450 ± 30, which is earlier than the calibrated date for Feature 1 (A.D. 1490 to 1600 ± 30). Nevertheless, these dates potentially overlap when considering the error margin of ± 30 years.

ARTIFACT ANALYSES

LITHIC ARTIFACTS

In total 380 stone artifacts were analyzed for this study, the majority of which were derived from Feature 2 (93.7 percent of all lithic items). A large amount of microdebitage was collected from flotation of Feature 2 hearth fill. Overall, debitage comprises the majority of lithic artifacts (96.3 percent), and retouched tools constitute 3.7 percent. In addition two pieces of fire-cracked rock were recovered. Table 1 provides details on lithic artifact classes present at 14WN143. The following sections summarize aspects of the lithic assemblage, including

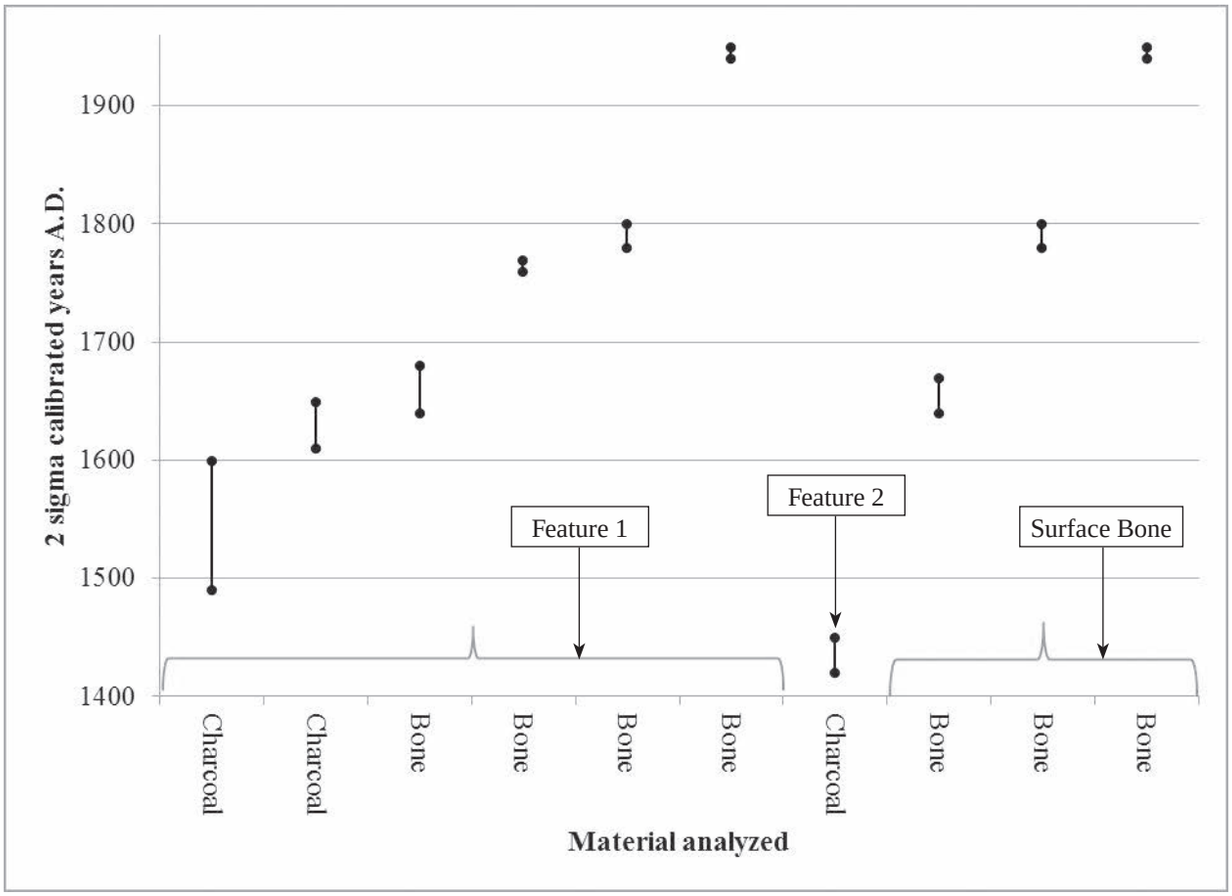

Figure 4. Radiocarbon dates for 14WN143.

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Table 1. Summary of Lithic Artifacts Recovered within All Areas of Investigation at 14WN143.

Class	Type	Total	Percentage of lithic assemblage
Debitage	Initial reduction flake	0	0.0
	Unspecified reduction flake	3	0.8
	Biface initial reduction flake	0	0.0
	Biface thinning flake	0	0.0
	Biface finishing flake	35	9.2
	Flake fragment	11	2.9
	Angular fragment	8	2.1
	Chip	9	2.4
	Microdebitage	300	78.9
	Janus flake	0	0.0
Tools	Projectile point/knife	3	0.8
	Biface	4	1.1
	Endscraper	2	0.5
	Modified flake	5	1.3
Total lithic artifacts		380	100.0
Mammal bone (n =)		486	N/A
Mammal bone (weight in grams)		539.9	N/A
Fire-cracked rock (n =)		2	N/A
Fire-cracked rock (weight in grams)		13.4	N/A

surface collections, Feature 1 (Test Unit 2), Feature 2 (Test Unit 1), and Test Unit 3.

Projectile Points (n = 3)

Table 2 summarizes the metric data for projectile points from the portion of the site subjected to investigation. Two specimens are complete or nearly complete, and one is fragmentary. FS.6, retrieved from the graded surface, is a small triangular arrow point made of Wreford chert with an impact fracture at the tip (compare Bergman and Newcomer 1983), a concave base, and a lenticular cross section. The metric and morphological characteristics most closely resemble the Fresno type common to the region (Justice 1995:227). FS.23 is a very small triangular arrow point with a straight base and plano-convex profile. It was made of Florence chert and was recovered on the graded surface. FS.22 was manufactured from white chert. It is too fragmentary to categorize within an existing typological framework. Figure 5 provides photographs of the two complete projectile points.

Bifaces (n = 4)

Four bifaces were found on the graded surface. Table 3 summarizes their metric data by stage of manufacture: one was Stage 1, two were Stage 2,

Table 2. Descriptive Information for Projectile Points at 14WN143.

Field sample ID	Provenience	Description	Maximum length (mm)	Maximum width (mm)	Maximum thickness (mm)
FS.6	Graded surface	Fresno point	Broken	15.8	3.2
FS.23	Graded surface	Small triangular point	11.1	10.1	2.1
FS.22	Graded surface	Projectile point fragment	Broken	6.8	0.9

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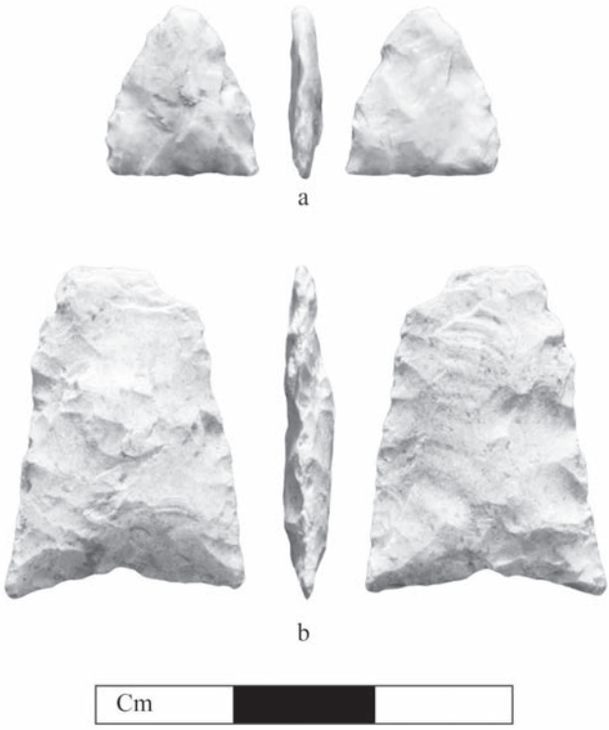

Figure 5. Projectile points from 14WN143; (a) FS.23, (b) FS.6.

and one was Stage 4. Three display plano-convex profiles, which is indicative of the use of flake blanks. The only specimen with an intact basal portion (FS.12) is a flake in the initial stage of bifacial tool manufacture. All were manufactured from heat-treated Wreford chert. Three of the bifaces are illustrated in Figure 6.

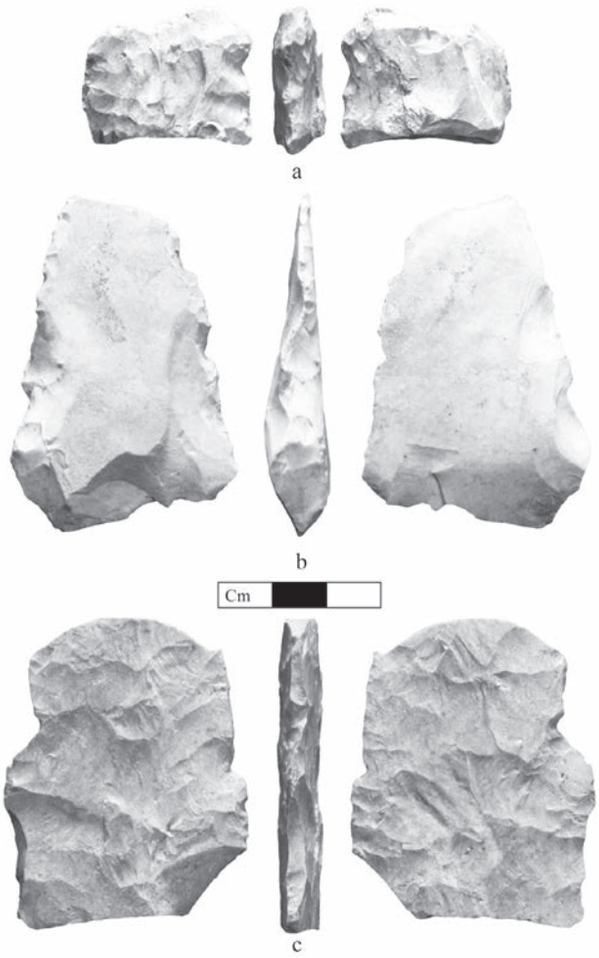

Figure 6. Selected bifaces from 14WN143; (a) FS.13, (b) FS.12, (c) FS.04.

Unifaces (n = 7)

Six of the unifaces came from the graded surface, and one from Feature 1. The majority (n = 5) are modified flakes with retouch types, varying from discontinuous utilization along one edge to more invasive scalar retouch. Retouch location is predominantly dorsal, although ventral and alternate retouch are also present.

Two formal unifacial implements were recovered, both endscrapers (Figure 7). FS.05 is manufactured from heat-treated Florence chert, and FS.15 is made of heat-treated Wreford chert. Both

Table 3. Descriptive Information for Bifaces at 14WN143.

Field sample ID	Provenience	Stage	Maximum length (mm)	Maximum width (mm)	Maximum thickness (mm)
FS.12	Graded surface	Stage 1 blank	55.1	37.1	9.3
FS.20	Graded surface	Stage 2 edged biface	Broken	19.8	5.5
FS.13	Graded surface	Stage 2 edged biface	Broken	28.9	8.5
FS.04	Graded surface	Stage 4 preform	Broken	44.6	6.6

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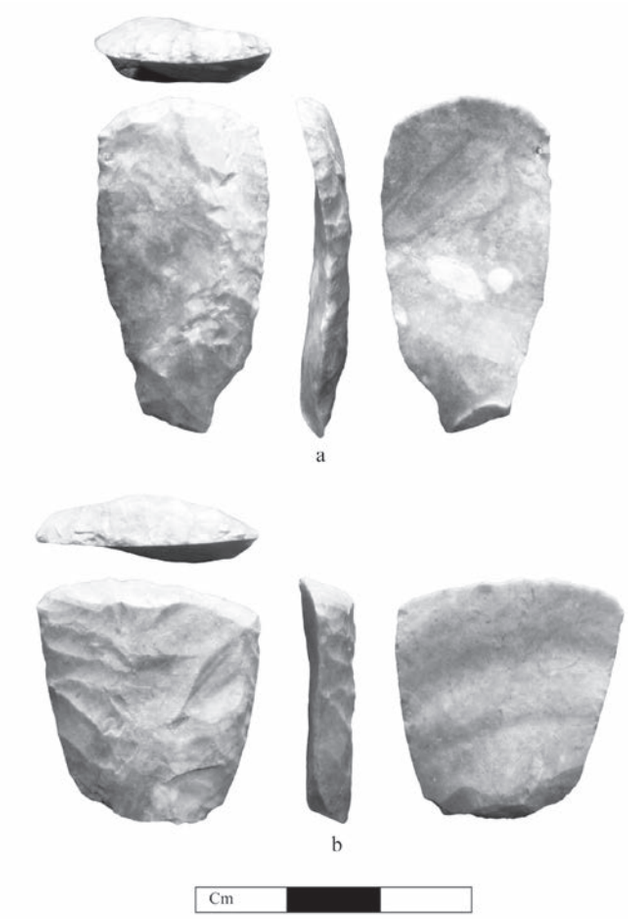

Figure 7. Endscrapers from 14WN143; (a) FS.05, (b) FS.15.

specimens were manufactured on flakes and exhibit invasive, scalar retouch on the dorsal working edge. Table 4 provides metric data for the unifacial tools.

Debitage (n = 366)

Debitage makes up 96.3 percent of the prehistoric lithic assemblage; the various classes are listed in Table 5. Debitage analysis resulted in the identification of 3 unspecified reduction flakes, 35 biface finishing flakes, 11 flake fragments, 8 angular fragments, 9 chips, and 300 pieces of microdebitage.

Table 5. Debitage Classes at 14WN143.

Debitage Class	Total	Percentage
Initial reduction flake	0	0.0
Unspecified reduction flake	3	0.8
Biface initial reduction flake	0	0.0
Biface thinning flake	0	0.0
Biface finishing flake	35	9.6
Flake fragment	11	3.0
Angular fragment	8	2.2
Chip	9	2.5
Microdebitage	300	82.0
Janus flake	0	0.0
Total (n =)	366	100.0

The 14WN143 lithic assemblage is almost entirely focused on the final stages of the bifacial tool manufacturing sequence. Microdebitage and biface finishing flakes together comprise 91.5 percent of all debitage. Most were recovered from flotation of the hearth in Feature 2, indicating that this locale was an activity area or discard spot for flake byproducts of the final manufacture or repair and sharpening of bifacial implements.

Measurements were taken on complete specimens of debitage, and Table 6 provides the metric characteristics of the 46 complete flakes, which equal 12.57 percent of the total debitage. The metric data for the complete debitage demonstrate that most items are very small, corresponding to the large percentages of biface finishing flakes and microdebitage. The only other debitage category

Table 4. Descriptive Information for Unifacial Tools at 14WN143.

Field sample ID	Provenience	Description	Maximum length (mm)	Maximum width (mm)	Maximum thickness (mm)
FS.01	Feature 1 (Test Unit 2)	Modified flake	24.1	19.7	2.7
FS.05	Graded surface	Endscraper	35.8	18.8	3.6
FS.14	Graded surface	Modified flake	41	29.8	9.3
FS.15	Graded surface	Endscraper	24	21.9	5.1
FS.17	Graded surface	Modified flake	28.2	19.2	3.1
FS.19	Graded surface	Modified flake	47	29.6	4.7
FS.60	Graded surface	Modified flake	32	20	7.2

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Table 6. Metric Attributes of Debitage at 14WN143.

Debitage type	Count (n =)	Mean length (mm)	Mean width (mm)	Mean thickness (mm)	Mean weight (g)	Length-width ratio	Size quotient (L x W x Th/100)
Unspecified reduction flake	3	27.10	19.40	5.20	3.27	1.40	27.34
Biface finishing flake	32	5.31	4.28	0.50	0.02	1.24	0.11
Chip	11	6.91	4.65	1.19	0.04	1.49	0.38

that could be measured meaningfully is unspecified reduction flakes, albeit with a small sample size of three complete flakes. These are non-cortical and cannot be assigned to a specific manufacturing trajectory. Comparing the size quotient of unspecified reduction flakes (27.34) to that of biface finishing flakes (0.11) and chips (0.38) hints that unspecified reduction flakes may derive from an earlier stage in the manufacturing sequence.

The butts or striking platforms of flakes provide insight into the level of platform preparation prior to detachment. The majority of butt types are remnant biface edges (n = 30), reflecting the prevalence of late-stage biface manufacturing flakes. Crushed butts are also comparatively abundant (n = 10) and can result during soft-hammer percussion when the blow of the hammer falls close to the edge being flaked. Plain butts are relatively common for chips (n = 5), perhaps suggesting that this category reflects all stages of the manufacturing sequence, including platform preparation.

Flakes in the collection display evidence for only soft-hammer percussion (n = 11) and pressure flaking (n = 33) as modes of detachment. The lack of hard-hammer percussion suggests that early manufacturing stages are absent in the area investigated. The prevalence of late-stage bifacial tool manufacture also is reflected in the near absence of cortex on the lithic debitage. Only one small chip retained a tiny patch of cortex on the dorsal surface.

The numbers and percentages of heated and burned artifacts were recorded for the complete flakes (Table 7). Objects that were heated, resulting in a waxy/satiny luster, were distinguished from those that were burned, as evidenced by blackened or reddened surfaces. Burned artifacts (n = 22; 47.83 percent) are more prevalent than heated ones (n = 17; 36.96 percent). That many items were affected by fire-related activities is not surprising, given that most were found in the hearth-related fill of Feature 2.

Raw Material

Knappable stone sources in southeastern Kansas are relatively well researched (e.g., Stein 2006). In this study the classification of lithic raw material was performed visually, noting the following attributes: color, translucency, luster, texture, structure, and inclusions. While results are tentative, the majority of the raw material was identified as Wreford chert (n = 293; 77.1 percent), suggesting that this raw material was favored even though it is not the closest known source to 14WN143. Table 8 shows the distances of known chert sources from 14WN143, from closest to farthest away: Foraker (70 km), Wreford (80–100 km), Florence (100 km), Tahlequah (125 km), Westerville (200 km), and Winterset (200+ km). Foraker, Wreford, and Florence are located west of 14WN143 in the Flint Hills, while Tahlequah, Westerville, and Winterset

Table 7. Artifacts Heated and Burned, by Debitage Category, at 14WN143.

Debitage class	Total (n =)	Heated (n =)	Percentage heated	Burned (n =)	Percentage burned
Unspecified reduction flake	3	1	33.33	1	33.33
Biface finishing flake	32	11	34.38	20	62.50
Chip	11	5	45.45	1	9.09
Total	46	17	36.96	22	47.83

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Table 8. Chert Varieties in Lithic Assemblage at 14WN143 in Order of Increasing Distance from Site.

Raw material	Debitage (n =)	Tools (n =)	Total	Percentage
Foraker	0	0	0	0.0
Wreford	285	8	293	77.1
Florence	58	3	61	16.1
Tahlequah	3	2	5	1.3
Westerville	0	1	1	0.3
Winterset	8	0	8	2.1
Unknown	12	0	12	3.2
Total	366	14	380	100.0

cherts are east of the site. Wreford chert is followed in frequency by Florence (n = 61; 16.1 percent). Winterset (n = 8; 2.1 percent), Tahlequah (n = 5; 1.3 percent), and Westerville (n = 1; 0.3 percent) are present in small quantities, which is to be expected, given that these sources are farther away than Wreford and Florence cherts. The absence of Foraker chert is unexpected, as known sources of it are closest to 14WN143, perhaps reflecting site occupants' preference for other toolstone.

All chert varieties present at 14WN143 were imported from fairly long distances; therefore, it is not surprising that primary reduction flakes are poorly represented. Apparently blocks of raw material were quarried from limestone bedrock sources, graded for quality, reduced in the vicinity of the quarry, and transported or traded in a worked state to the site.

Chaîne Opératoire

The prehistoric lithic assemblage from 14WN143 was analyzed using a method referred to as *chaîne opératoire* (Bar Yosef and Van Peer 2009; Geneste and Plisson 1986; Leroi-Gourhan 1964; Sellet 1993), which in English is often translated as "operational sequence" (Lemonnier 1992:26). This holistic approach to lithic analysis aims to understand the cultural transformations of a block of raw material by segmenting the actions and mental processes required during the manufacture and maintenance of an artifact (Sellet 1993). It attempts to transcend the commonly used concept of "reduction sequence" (e.g., Grimaldi 1998:19) by reconstructing and explaining the behavioral processes responsible for the formation of the archeological record evidenced by lithic artifacts (DeBie 1998:91). Figure 8 provides a schematic representation of the *chaîne opératoire* for 14WN143, and each stage is detailed in the sections that follow.

This *chaîne opératoire* analysis of the lithic assemblage revealed that manufacturing debris almost entirely was oriented toward finishing bifaces and formal tools produced from raw materials from regional sources located 80 km or more from the site. The *chaîne opératoire* initialization phase began with procurement of blocks of Wreford, Florence, Tahlequah, Westerville, and Winterset cherts, collected at primary source locations to the west and to the east of 14WN143. Decortication and initial reduction were performed elsewhere before the secondary flake blanks, preforms, and tools were transported to the site for further reduction and/or sharpening.

The exploitation stage of the *chaîne opératoire* involved mainly biface finishing around the hearth (e.g., finishing and/or sharpening triangular points or bifaces). The core-flake element (unspecified reduction flakes) probably relates at least partially to biface manufacture, in that large flakes were produced from cores and then used as blanks for biface manufacture. In some instances flake blanks or preforms were heat treated to improve quality. The toolkit consisted mostly of formal tools, such as projectile point/knives (PPKs), bifaces, and endscrapers. Although less common, informal retouched flakes also were present and probably were used for expedient on-site tasks.

The stage of the *chaîne opératoire* at 14WN143 related to use, maintenance, and discard was revealed partially by use-wear analysis, discussed

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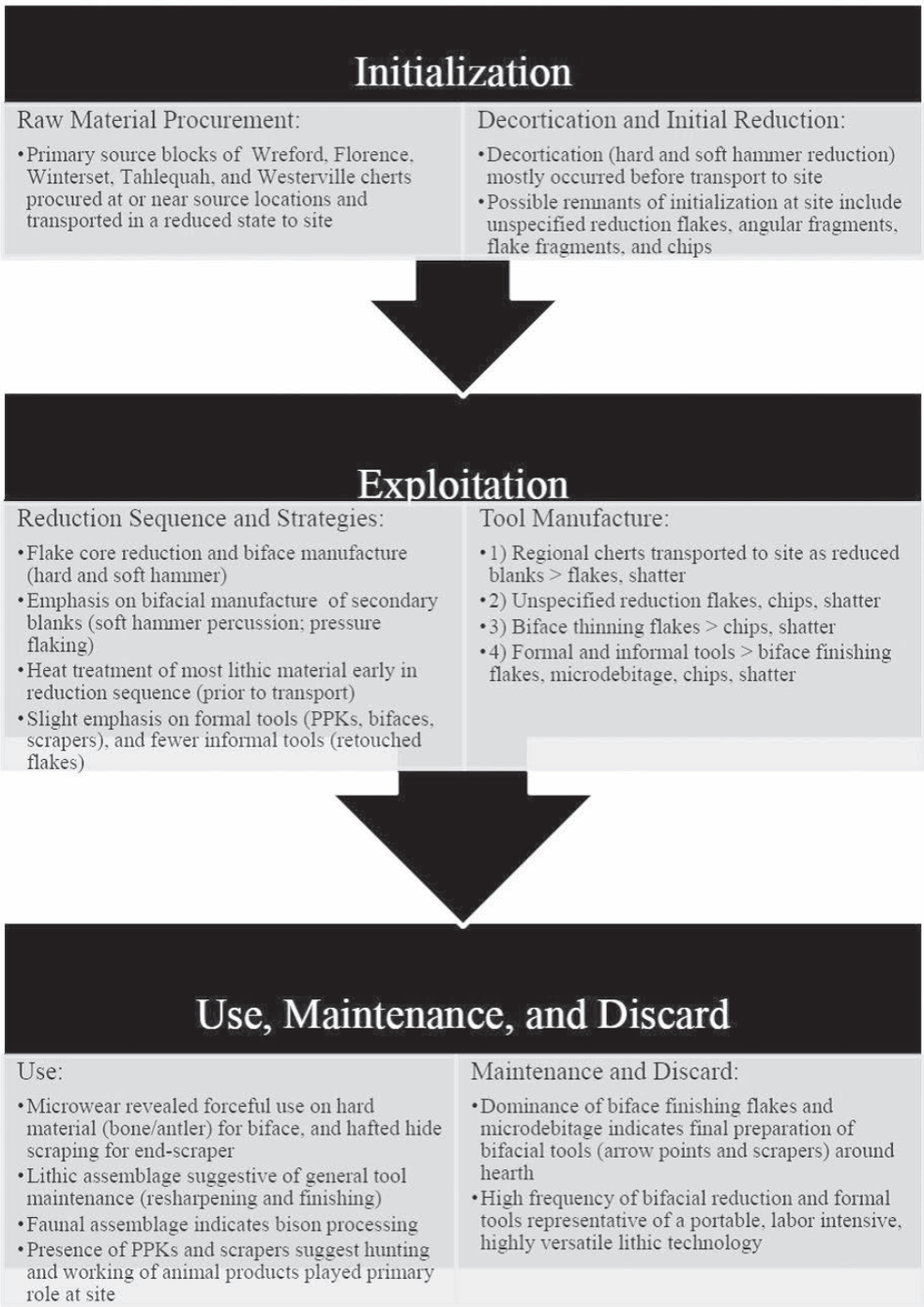

Figure 8. *Chaîne opératoire* at 14WN143.

below. In general the lithic assemblage reflects activities that involve hunting and processing of animal products. Implements were retouched here, and they were used even after their edges had broken. Such intensive use of stone artifacts in a highly curated assemblage is thought to be associated with increased raw material transport costs. The high frequencies of bifacial reduction and formal tools represent a portable, labor intensive, and highly versatile lithic technology at 14WN143.

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Microscopic Use-Wear

Two stone tools were analyzed for traces of microwear: a biface and an endscraper. FS.4 is a Stage 5 biface, manufactured of heat-treated Wreford chert (Figure 9a). The broken artifact measures 55.2 mm in maximum length by 44.6 mm in width by 6.6 mm in thickness. The roughly 90-degree angle break at the curvilinear end is likely a thermal fracture. It was found on the graded surface.

FS.5 is a complete endscraper, manufactured of banded Florence chert with fusilinid fossil inclusions (Figure 9b). It measures 35.8 mm long by 18.8 mm wide by 3.6 mm thick. The bit is relatively thin, and the scraping edge is still sharp, retaining an edge angle of approximately 65–75 degrees. Sharpening is evident, judging from multiple layers of step-fractures. The artifact also was recovered on the graded surface.

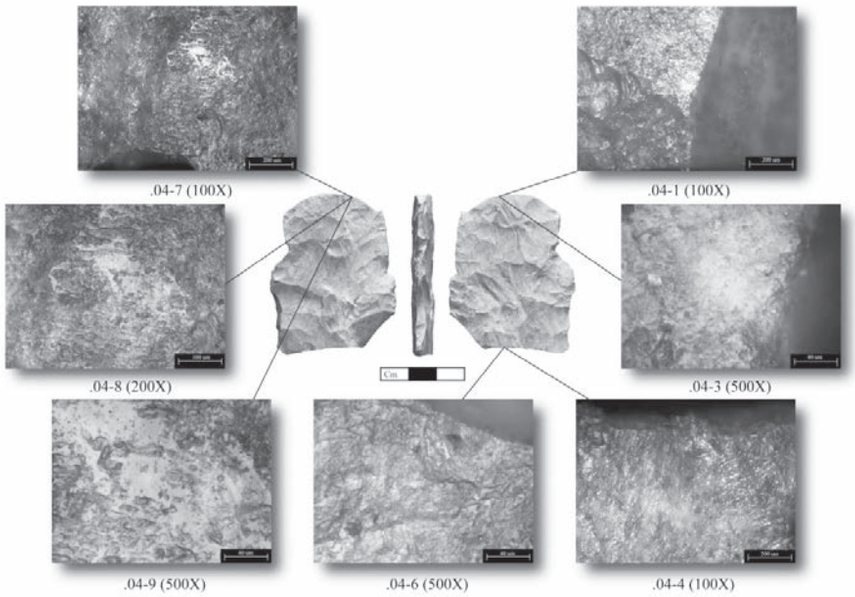

Figure 9a.
Microphotographs of use-wear results for FS.04, biface.

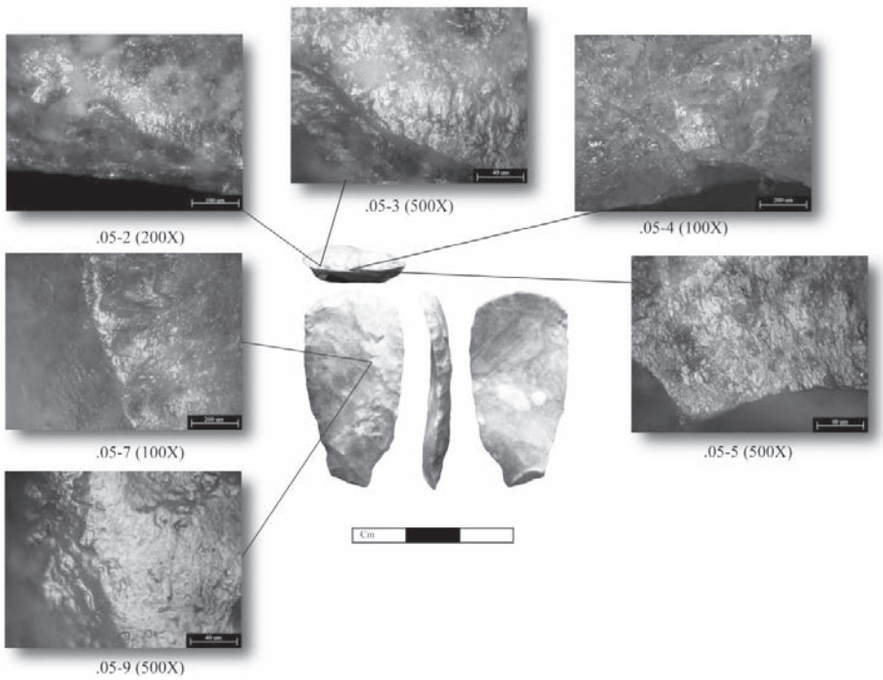

Figure 9b.
Microphotographs of use-wear results for FS.05, endscraper.

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Microscopic use-wear analysis of these specimens was performed at Texas A&M University, employing a Leica DMLA compound microscope with three objectives of 10X, 20X, and 50X, along with 10X oculars, providing viewing capabilities of 100X, 200X, and 500X. Macroscopic and microscopic use-wear was observed on both of the tools, and the results are summarized in Table 9. The biface was used with significant pressure on hard materials, such as antler and/or bone. The endscraper exhibits polish, resulting from use on soft material like hide and from hafting.

The use-wear analysis revealed that some artifacts at 14WN143 were heavily utilized. Wear traces of both hard material (bone/antler) and soft material (hide) were identified on the two objects examined. In addition, the scraper had been subjected to multiple sharpening episodes. The biface continued to be used after its edges had been broken by thermal fracturing. Such reuse and recycling of lithic material support the assertion that raw material was transported some 80 kilometers or more, and economizing behavior was a means to offset the transportation costs.

Ancestral Osage Lithic Procurement Strategy

During the estimated period of occupation at 14WN143, ancestral Osage villages were situated throughout Missouri, primarily in the central and southern portions of the state, as well as in northern Arkansas (Chapman 1985:46–47; Hunter 2014:22). At contact several Osage villages were recorded in central and western Missouri. During this time the subsistence strategy of the Osage included a major reliance on game animals. The Osage organized three hunting expeditions per year in spring, summer, and fall. Hunting for small game or outings involving fewer individuals took place year around. In the fall the Osage prepared for large expeditions, on the scale of practically a whole village traveling west onto the Plains to hunt large game. Concurrently smaller parties hunted in other parts of their territory as well. Hunting trails were used year after year, with the Osage camping in the same general locations as they traveled out to the prairie and back (Irving 1835; LaFlesche 1939; Latrobe 1835:126; Schoolcraft 1854:288–304; Sibley 1914:46).

Significantly, at least eight known Osage trails crossed the Flint Hills in Kansas (LaFlesche 1932; McDermott 1940; Newman 1957). Two of the hunting trails extended out from the Verdigris and Fall river confluence. One trail bore directly west and slightly northwest out to the Arkansas River and then to the north. This trail passed by a Foraker chert quarry in Elk County. The other trail went north for a short distance then angled northwest, curving to cut across the Flint Hills before turning back to the southwest. This trail passed numerous Wreford chert quarries in northern Butler and Greenwood counties. During these expeditions stone was gathered to manufacture game-processing tools, as well as to use for other utilitarian purposes. The practice of quarrying lithic resources from the Flint Hills is well documented, including scrapers made from Florence A chert recovered from Protohistoric Osage sites in western Missouri, specifically the Carrington site (23VE1) and the Brown site (23VE3). A chert scraper from the Carrington site was identified as unheated Florence B or Wreford chert (Jack Ray, personal communication 2017).

Table 9. Microscopic Use-wear Results.

	Micro step fractures/scraping	Polish, cutting/grooving hard material/ bone, antler	Polish, soft material/hide	Polish, haft wear	Polish, unidentified material
Artifact; description	Count (n =)	Count (n =)	Count (n =)	Count (n =)	Count (n =)
FS.04; Stage 5 biface	0	2	0	0	1
FS.05; Endscraper	1	0	2	1	0
Total	1	2	2	1	1

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FAUNAL REMAINS

Faunal remains at 14WN143 are numerous (n = 488; 540 grams). During collection of artifacts exposed on the graded surface, several large mammal bones were observed. One is a distal metapodial, largely intact but with fresh damage to the shaft. It is distinguished by a stout, composite shaft and double pulley-like distal articulation, typical of a metapodial (Figure 10). The distal epiphyses are fused, indicating an adult animal. The wide, deep midline groove and the asymmetrical outline in section distinguish this specimen as a metatarsal (Hillson 2009). The direction of offset for the midline groove and the bulkier, more protuberant nature of the bone medial of the groove signal that it came from the right leg of the animal.

The overall morphology and robusticity are diagnostic of *Bison bison*. Using a comparative metric database of bison and elk metatarsals, the size of this specimen falls near the mean for male bison. Two measurements were taken to compare it to known databases of cervids and bovids: distal width and breadth of the trochlear condyle. These data were compared to metatarsal metrics of Rocky Mountain elk (*Cervus nelsoni*) (n = 27), Roosevelt elk (*Cervus roosevelti*) (n = 10), and modern bison (*Bison bison*) (n = 36) (Lewis et al. 2005; Lyman 2010), and are presented in Tables 10 and 11.

Figure 10. Bison metatarsal from 14WN143.

Data from the tables were plotted in Figures 11 and 12. These plots show that the metatarsal falls metrically within one standard deviation for male bison and outside the range for Rocky Mountain elk and Roosevelt elk. Therefore, the metric and morphological properties are diagnostic of modern bison populations.

Table 12 provides information about the total bone collection. In addition to bison, *Cervidae* elements were recovered, which most likely belong to deer. Also, canid teeth were identified, as well as bird bones. The majority of faunal remains were found on the graded surface or in the Feature 2 fill.

Ethnographic records document that the Osage practiced a subsistence strategy focused on procurement of a wide variety of faunal species with emphasis on large game animals, especially while on the three seasonal hunts each year (Latrobe 1835:126; Schoolcraft 1854:288–304; Sibley 1914:46). Early travelers often commented on the large game that the Osage hunted, mentioning specifically deer, bison, black bear, and elk, with deer being the major source of meat. The archeological record at Osage sites in Missouri illustrates the breadth of species exploited, with deer remains predominating in the assemblages from the Brown (23VE3), Carrington (23VE1), Plattner (23SA3), and Hayes (23VE4) sites. Bison and dog were represented at all four sites as well (Chapman and Wiegers 1985:305, 311; Yelton 1983a, 1983b). Faunal remains from 14WN143 were common species used for food and utilitarian objects by the Osage.

PLANT REMAINS

Flotation samples were processed in a Flote-Tech machine with .2-mm light fraction and 1-mm heavy fraction mesh. Light fractions were size-sorted

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Table 10. Metric Comparison of 14WN143 Specimen with Elk and Bison Samples, Metatarsal Distal Width. Elk and Bison Data from Lewis et al. (2005) and Lyman (2010).

	Metatarsal-distal width				
	Rocky Mountain Elk (*C. nelsoni*)	Roosevelt Elk (*C. roosevelti*)	14WN143	Bison - male	Bison - female
Count	27	10	1	19	17
Mean	51.2	54.6	67.8	67.4	58.6
SD	2.3	2.4	—	2.7	3.1
Max	58.8	58.1	—	75.1	63.5
Min	46.6	51.5	—	62.0	54.0

Table 11. Metric Comparison of 14WN143 Specimen with Elk and Bison Samples, Metatarsal Trochlear Condyle Breadth. Elk and Bison Data from Lewis et al. (2005) and Lyman (2010).

	Metatarsal-distal width–trochlear condyle				
	Rocky Mountain Elk (*C. nelsoni*)	Roosevelt Elk (*C. roosevelti*)	14WN143	Bison - male	Bison - female
Count	27	10	1	19	17
Mean	23.6	24.8	29.6	30.6	28.1
SD	0.8	0.7	-	2.8	3.4
Max	27.9	27.1	-	35.8	36.6
Min	20.9	22.9	-	25.0	23.5

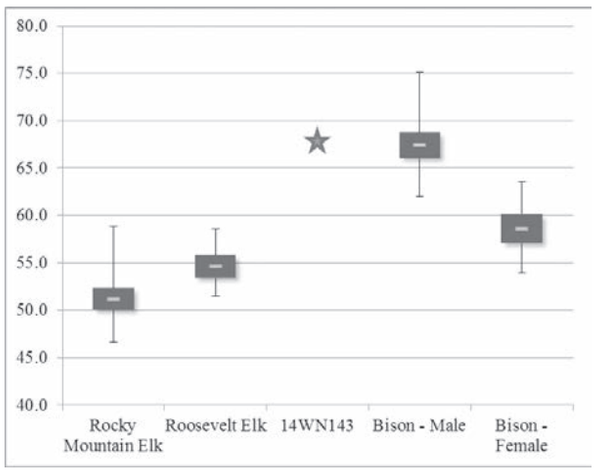

Figure 11. Comparison of metatarsal distal width of 14WN143 bone specimen with elk and bison samples. Elk and bison data from Lewis et al. (2005) and Lyman (2010).

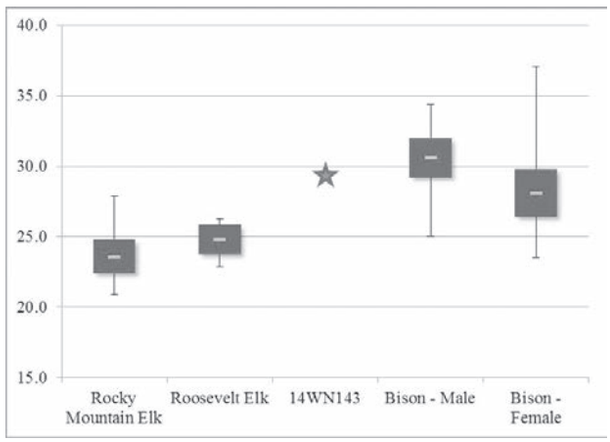

Figure 12. Comparison of metatarsal trochlear condyle breadth of 14WN143 bone specimen with elk and bison samples. Elk and bison data from Lewis et al. (2005) and Lyman (2010).

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Table 12. Bone Assemblage at 14WN143.

Faunal type	Specific identification	Test Unit 1	Test Unit 2	Test Unit 3	Graded surface	Total (n =)	Total weight (g)
Bison	*Bison bison*				1	1	26.2
Deer	*Cervidae*				4	4	24.4
Mammal bone	—	149	22	1	216	388	484.4
Mammal bone-burned	—	85			1	86	4.5
Mammal teeth	—	4				4	0.1
Mammal teeth-burned	—	2					0.1
Dog	*Canis sp.*	2				2	0.1
Unidentified bird	—				1	1	0.1
Total (n =)		242	22	1	223	486	539.9
Total weight (g)		35.6	4.3	0.1	500.0	539.9	

through a stack of graduated geologic sieves. Carbonized botanical materials that were captured in the No. 10 mesh (2-mm square openings) were completely sorted, counted, weighed, recorded, and labeled. When more than 100 wood charcoal fragments were present in a sample, the total number was calculated from the weight of 50. Weights were taken on an Ohaus Scout II 200 by .01-g electronic balance. Materials in this size fraction, other than carbonized botanical remains, were weighed and labeled as "contamination." At 14WN143 contamination consisted of rootlets, soil clumps, pebbles, and larger seeds. Materials that fell through the 2-mm mesh were examined at 7–45X magnification for carbonized botanical remains not previously recognized. Remaining materials in this smaller size fraction were weighed and labeled as "residue." Uncarbonized seeds were listed on a presence/absence basis on laboratory forms.

From each sample, whether flotation or carbon, 20 wood charcoal fragments larger than 2 mm were selected for study. If fewer than 20 pieces were present, all were removed. Wood charcoal was selected at random from flotation samples, snapped to reveal a transverse section, and examined under a stereoscopic light microscope at 28–180X magnification. When necessary, tangential or radial sections were studied for ray seriation, presence of spiral thickenings, types and sizes of intervessel pitting, and other minute characteristics that can be seen only at the higher magnifications of this range.

One carbon sample and two flotation samples, representing 12.6 dm^3 (liters) of soil from two features, were submitted for identification and analysis. Results are summarized in Tables 13 and 14.

Wood Charcoal

The wood charcoal reflects both local upland and riparian forests. The most common wood in Feature 2, river birch, has a specific gravity of .49 and so does not make especially good fuel. Like elm, which also was retrieved from Feature 2, it is used by Euroamericans for basketry (Alden 1995), while most Native American uses are medicinal, involving the inner bark (Moerman 1998). The Osage call birch the "paper tree" (LaFlesche 1932:138). Northern Plains tribes, who had access to other species of *Betula*, used the bark to make torches by shredding and binding it together (Gilmore 1977:23).

The Osage have two names for *Ulmus rubra* Muhl. (slippery elm), but in his *Dictionary of the Osage Language*, LaFlesche (1932:40–41, 60–61) noted no specific use. The Plains tribes had many uses for *U. rubra* bark. It was used to catch the spark in fire making. When boiled, it was used as a laxative and as a preservative and flavor additive to buffalo fat to render out the tallow. The Kiowa made tea from the bark, and the bark fiber was used for making ropes and cords (Gilmore 1977:24; Steyermark 1963:555).

Hickory and oak, the other wood types recovered, are dense woods that burn hot and produce long-lasting coals. LaFlesche (1932:92) and Mathews (1961:66–67, 85) reference hickory as being used by the Osage as a wood source for bows, when *Maclura pomifera* (Raf.) C.K. Schneid

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Table 13. Archeological Plant Remains from 14WN143, Counts.

Description	VEF10102	VEF20102	Total
TU	2	1	N/A
Feature	1	2	N/A
Stratum	I	I	N/A
Level	1–2	1	N/A
Depth (cmbd)	16–32	12–22	N/A
Flotation volume (cu. dm.)	6.0	6.6	12.6
		Carbonized plants	
Wood	VEF10102	VEF20102	Total
River birch *(Betula nigra)*		14	14
Hickory *(Carya* sp.)	1		1
Hardwood, indeterminable		3	3
Oak, general *(Quercus* sp.)	1		1
Red group oak *(Quercus* subg. *Lobatae)*		2	2
Elm *(Ulmus* sp.)		2	2
Nutshell	VEF10102	VEF20102	Total
Hickory, thin *(Carya* sp.)	1	12	13
Hickory, thick *(Carya* sp.)	133	107	240
Hickory/walnut family (Juglandaceae)	180	68	248
Black walnut *(Juglans nigra)*	118	20	138
Acorn *(Quercus* sp.)	1	1	2
Seed	VEF10102	VEF20102	Total
Vervain *(Verbena* sp.)	1		1
Grape *(Vitis* sp.)		1	1
Root		2	2
Indeterminable	1	16	17
		Semi-carbonized plants	
Nutshell	VEF10102	VEF20102	Total
Hickory/walnut family (Juglandaceae)		11	11
Black walnut *(Juglans nigra)*	8		8
Wood	VEF10102	VEF20102	Total
Redcedar *(Juniperus* sp.)		2	2

(Osage-orange) could not be found, and for war standards and large lodge posts.

Wood charcoal of *Quercus* spp. (red and white oak), *Quercus virginiana* Mill. (live oak), *Carya illinoinensis* (Wangehn.) K. Koch (pecan), *C. ovata* (Mill.) K. Koch (shagbark hickory), *C. laciniosa* (Michx. f.) G. Don. (shellbark hickory), *C. tomentosa* (Lam.) Nutt. (mockernut hickory), *U. rubra* (slippery elm), *U. americana* L. (American elm), and *U. thomasii* Sarg. (rock elm) was preserved and collected from Osage villages sites in Vernon and Plattner counties, Missouri. However, *B. nigra* (birch) wood charcoal was recovered from only the earliest of these Osage sites, the Brown site (Hunter and Pearsall 1986; Pearsall and Hunter 1985; Pearsall et al. 1985).

Nutshell

Nutshell was the most common plant material at the site, with 641 pieces larger than 2 mm weighing 10.01 g. Thick-shelled hickory was the most abundant nut type. Some thin-shelled hickory fragments

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Table 14. Archeological Plant Remains from 14WN143, Weight in Grams.

Description	VEF10102	VEF20102	Total
TU	2	1	N/A
Feature	1	2	N/A
Strat	I	I	N/A
Level	1–2	1	N/A
Depth (cmbd)	16–32	12–22	N/A
Flotation volume (cu. dm.)	6.0	6.6	12.6
		Carbonized plants	
Wood	VEF10102	VEF20102	Total
River birch *(Betula nigra)*		0.21	0.21
Hickory *(Carya* sp.)	0.01		0.01
Hardwood, indeterminable		0.02	0.02
Oak, general *(Quercus* sp.)	0.01		0.01
Red group oak *(Quercus* subg. *Lobatae)*		0.02	0.02
Elm *(Ulmus* sp.)		0.02	0.02
Nutshell	VEF10102	VEF20102	Total
Hickory, thin *(Carya* sp.)	0.01	0.14	0.15
Hickory, thick *(Carya* sp.)	2.71	2.99	5.70
Hickory/walnut family (Juglandaceae)	1.19	0.44	1.63
Black walnut *(Juglans nigra)*	1.82	0.69	2.51
Acorn *(Quercus* sp.)	0.01	0.01	0.02
Seed	VEF10102	VEF20102	Total
Vervain *(Verbena* sp.)	<0.01		<0.01
Grape *(Vitis* sp.)		0.01	0.01
Root		0.01	0.01
Indeterminable	0.01	0.09	0.10
		Semi-carbonized plants	
Nutshell	VEF10102	VEF20102	Total
Hickory/walnut family (Juglandaceae)		0.07	0.07
Black walnut *(Juglans nigra)*	0.10		0.10
Wood	VEF10102	VEF20102	Total
Redcedar *(Juniperus* sp.)		0.01	0.01
Contamination > 2mm	2.49	1.65	4.14
Residue < 2 mm	2.68	0.88	3.56

were found, but they lack the parallel interior ridges that characterize pecan (*Carya illinoinensis*). They are probably thin specimens of shagbark hickory (*C. ovata*). Feature 1 contained more black walnut and less thin-shelled hickory than Feature 2, but the two samples did not otherwise differ in the types or amounts of nutshell.

Hickory and walnut nutmeats are high in fat and contain more protein than most plant foods. These nutrients, particularly the linolenic fatty acids, may have been critical to hunter-gatherers, who relied on lean meat for part of the year (Gardner 1997; Hall 2000:109–110). Acorn nuts, whose shells are present in small quantities at 14WN143, contain less fat and protein and more carbohydrates than *Juglandaceae* nuts. In this respect they are more comparable to grains than to other tree nuts. Acorns require water processing to leach tannins before

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they are palatable to humans, but then they can be roasted and ground into flour (Gremillion 2002).

The Osage collected pecan, hickory nuts, black walnuts, and acorns for food (LaFlesche 1932:186, 200; Sibley 1914: 37). The Osage have several names for pecan and black walnut, the tree, nut, and hull (LaFlesche 1932:136–137, 303). For the oak the Osage have names for the oak ball, gall, tree, black oak tree, red oak tree, short stunted oak tree, white oak tree, small stunted oak tree, and gray oak tree (LaFlesche 1932:299). Charred nutshells of *Carya* spp. (thin and thick shell hickory), C. *illinoinensis* (pecan), *C. ovata* (shagbark hickory), *C. laciniosa* (shellbark hickory), *C. tomentosa* (mockernut hickory), *J. nigra* (black walnut), *J. cinerea* L. (butternut), and *Quercus* spp. (red and white oak acorns) were recovered from Osage village sites in Missouri (Hunter and Pearsall 1986; Pearsall and Hunter 1985; Pearsall et al. 1985).

Seeds

Feature 2 yielded one grape pip, and one verbena seed came from Feature 1. In addition to the obvious food uses, grapes provided important cordage, with their woody vines especially useful for lashing and hoops, such as those used on cradleboards and in games. Some species of verbena have medicinal uses (Moerman 1998).

The Osage gathered grapes for food and have names for grapes, red grapes, wild grapes with smooth leaves, dried grapes, grapevines, and smaller grapes than the wild grape with smooth leaves (LaFlesche 1932:57). Charred *Vitis aestivalis* Michx. (summer grape) seeds and stems and *Verbena* sp. (verain) seeds were recovered from all four of the Osage village sites in Vernon and Plattner counties, Missouri **(**Hunter and Pearsall 1986; Pearsall and Hunter 1985; Pearsall et al. 1985).

CONCLUSIONS

The present investigations at Chief Whitehair's Village site deserve consideration, especially in the context of cultural resources compliance. Even though the fieldwork consisted of excavation of a mere 2.25-m units, a surprising amount of data was collected and analyzed, allowing for some important observations on the site, its date of occupation, and its relationship to the Osage people.

The exposed features and artifacts are associated with dates between A.D. 1420 and 1680, placing them within the Protohistoric period and encompassing the entire temporal range of the Great Bend aspect. As discussed by Blakeslee and Hawley (2006:67), the Great Bend aspect began "at about 1425 and lasted up to the last quarter of the seventeenth century." During this time, the Osage expanded westward from the Mississippi River valley and migrated into central and southern Missouri and northwestern Arkansas (Burns 2004:Figure 5; Hunter et al. 2013:3). Osage villages and camps remained in these general locations until the Protohistoric period. The prairie environment to the west was used for subsistence and resource procurement and warfare activities, which increased over time as Europeans and other tribes attempted to infiltrate the Osage homelands. One consequence of these encroachments in southern Kansas was the displacement of the Wichita by the early decades of the eighteenth century (Vehik 2006:217).

The mammal bones and macrobotanical remains obtained from Features 1 and 2 indicate multipurpose thermal features associated with processing animal and plant materials. The presence of small arrow points (one with impact damage) and bison remains suggest that hunting of large mammals played a significant subsistence role. In addition, microwear analysis of an endscraper revealed polish related to hide preparation. Clearly meat was supplemented with plant foods. Nutshells were found in abundance within both thermal features, with 641 fragments larger than 2 mm retrieved from the flotation samples. Samples from Features 1 and 2 were similar but contained different quantities of black walnut and thin-shelled hickory.

Given that the majority of lithic artifacts were recovered from the hearth fill in Feature 2, it can reasonably be concluded that the manufacture and maintenance of bifacial tools and projectile points, as well as other general activities, occurred around the hearth. The preponderance of biface finishing flakes and microdebitage further bolster this conclusion. Feature 1 was probably a locus of similar activity, although it did not have the same level of archeological integrity as Feature 2. No specific shape could be identified during the excavation of Feature 1; nevertheless, the presence of charcoal, bones, and nutshells similar to Feature 2 suggests

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that it also once might have been a basin-shaped hearth.

Due to the small amount of ground excavated, it is difficult to say exactly what this location represents in regard to the settlement system of the occupants, although a small hunting camp or activity area within a larger encampment is probably a reasonable assumption. Plainly activities in the vicinity investigated consisted of preparation of plant and animals for food and perhaps collection of plants for medicinal purposes, as well as hide processing and replacement and repair of projectile points. These hearth-based activities may have been part of a camp supporting the seasonal subsistence cycle focused on hunting bison. The floral remains from 14WN143 suggest an autumn occupation, and as mentioned earlier it is worth noting that Historic-era Osage hunting camps, prominent in Kansas, involved bison hunts during the fall (Burns 2004:43, 61–63). Given the temporal and seasonal information amassed during data recovery efforts reported herein, 14WN143 appears to coincide with activities related to a fall bison hunt and may very well represent a Protohistoric period Osage hunting camp.

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ROCK FENCES IN THE MILL CREEK VALLEY, WABAUNSEE COUNTY, KANSAS

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Dry-laid native limestone fences are concentrated in Wabaunsee County, Kansas, just south of the Kansas River in the eastern part of the state. This same area had an unusually high level of German settlement in the mid-nineteenth century, but the rock fences so common there were not an Old-World German tradition. This paper explores the development of a cultural landscape that resulted from the interface of culture, geology, and geography, and argues that the rock fences built by early immigrants in the region are indicative of an adaptation to a new environment.

In Kansas 197 dry-laid native limestone fences have been recorded. Most are in the Flint Hills Uplands and Osage Cuestas geophysical provinces of eastern Kansas (Schoewe 1949) (Figure 1). Recent efforts to record properties with rock fences demonstrate that they are concentrated especially in Riley (n = 49) and Wabaunsee (n = 28) counties (Figure 2). The authors have recorded 23 limestone fences in southern Wabaunsee County along Mill Creek and its tributaries.

Evidence indicates that the Wabaunsee County fences were built by or for early European-American immigrants during the Kansas territorial period. Many of these immigrants were German or of German ancestry. However, rock fences are not a tradition imported by German immigrants, leading to the conclusion that the construction of dry-laid native limestone fences by European-American immigrants was an adaptation to the available resources in their newly adopted country.

FENCING BEFORE BARBED WIRE

Before the invention and effective marketing of barbed wire in the 1870s, most fences surrounding pastures and agricultural fields in the United States east of the Rocky Mountains were made of wood. In forested areas the earliest fences often were simply the stumps of trees removed from productive land and arranged to create stump fences. As these deteriorated, they typically were replaced by zigzagging worm fences made of wooden poles. These were supplanted by post and rail fences that used less wood and wasted less tillable soil (Raup 1947). Once the timber had been exhausted, wooden fences were no longer an economical option. In New England dry-laid rock fences, made of rounded cobbles of glacial till, became the most common type, and miles of rock fences cover the New England countryside today (Allport 1990).

In places without glacial cobbles, limestone served well for fences. While significant variation occurs in the fracturing properties of different formations, some limestone breaks into tabular pieces that can be stacked into stable fences. Dry-laid native limestone fences are found in several regions of the United States (USDA 1872), most commonly in Kentucky (Murray-Wooley and Raitz 1992), Pennsylvania (Glassie 1968), Missouri (Hoard and Prawl 1998), Texas (Jordan 1966, 1982a; Knott 2004), and Kansas (Shortridge 1988).

Particular ethnic groups are associated with the building of rock fences in different locations. In the Bluegrass Region of central Kentucky, Irish immigrants were hired to lay up rock fences for farmers. Ireland has a long history of dry-laid rock fences that were constructed of materials at hand or quarried (Murray-Wooley and Raitz 1992). Similarly,

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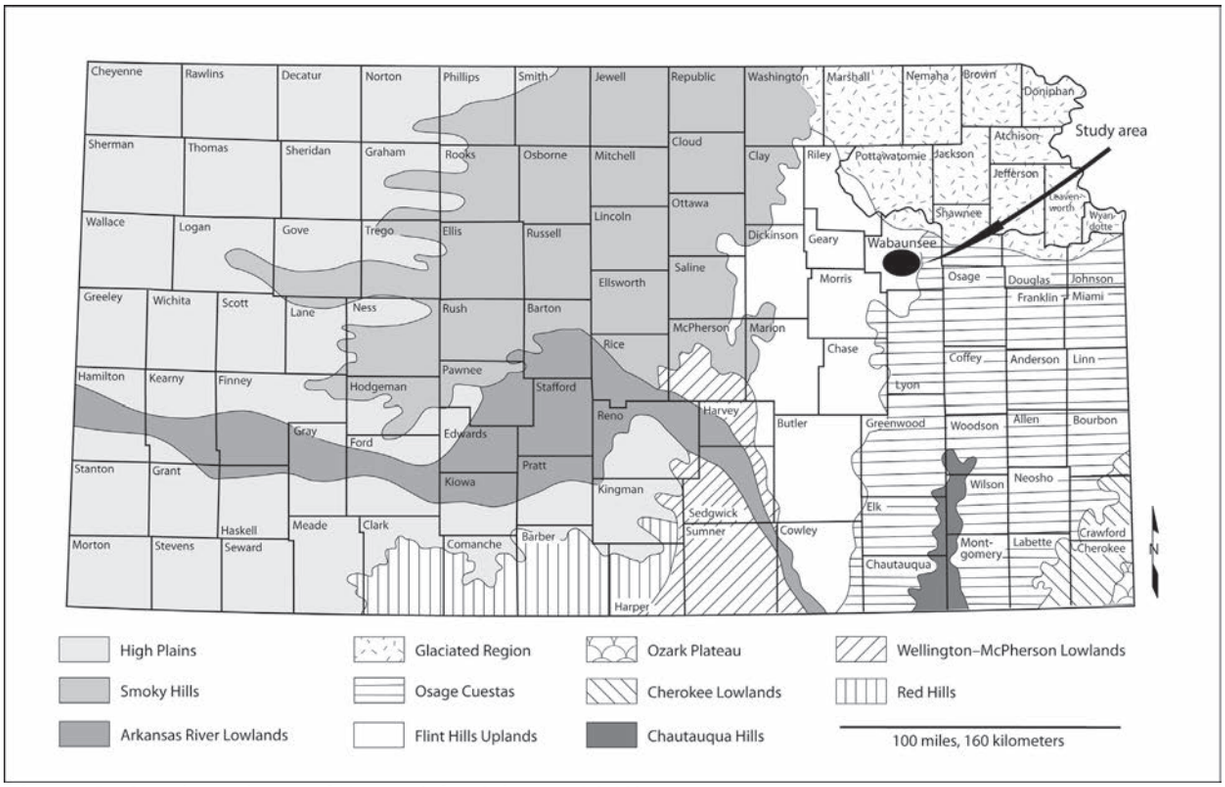

Figure 1. Geophysical units of Kansas (after Schoewe 1949).

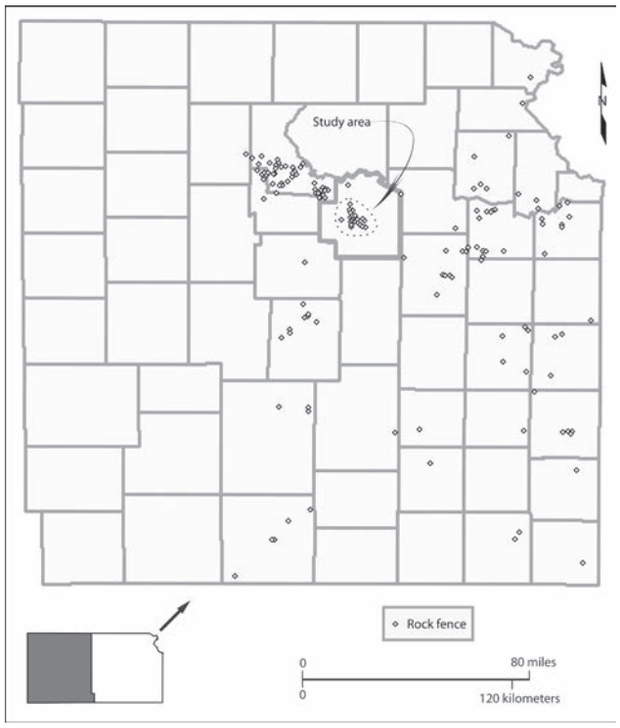

Figure 2. Map of recorded rock fence distribution in Kansas.

New England rock fences, consisting of glacial-rounded boulders removed from agricultural fields, were a product of English and Scottish settlement (Allport 1990; Hart 1975; Straight 1987). However, they were not the only people to build rock fences in this locality; African and American Indian paid laborers or slaves also constructed rock fences, and later Italian immigrants created formal estate walls that were a mark of affluence (Allport 1990). In contrast, some of the rock fences in parts of Missouri, Kansas, and Texas are associated with people directly from Germany or of German descent (Hoard and Prawl 1998; Jordan 1966, 1982a; Knott 2004; Shortridge 1988).

FENCE ROCK IN WABAUNSEE COUNTY

Dry-laid native limestone fences are very common in the Mill Creek valley in central Wabaunsee County. This part of the Flint Hills Uplands is characterized by outcropping chert- or flint-bearing Permian limestone that is up to 35 miles wide east to west and runs north to south through east-central

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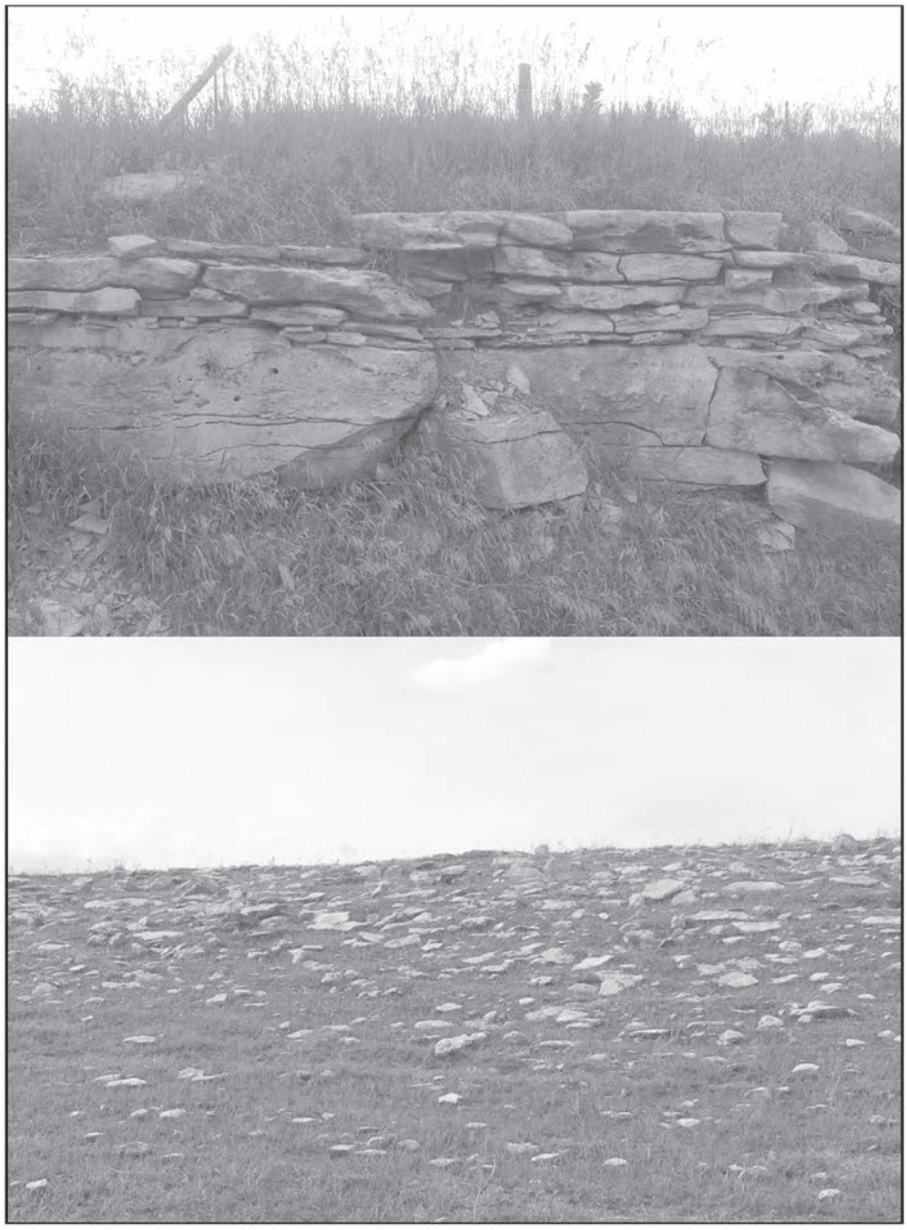

Figure 3. Flint Hills limestone. Top: Limestone ledge rock that can be easily harvested for fencing. Bottom: Tabular limestone slabs on a hillslope in Wabaunsee County.

Kansas. The Flint Hills rise 350 feet above the surrounding terrain. Durable caprock, incised by drainages, produces a dissected topography with steep slopes and flat uplands (Schoewe 1949). The layers of limestone often fracture into relatively thin tablets suitable for dry-laid masonry (Figure 3). These can be gathered directly from the ground surface on slopes, pried from ledges or creek banks, or excavated from quarries. Even though the labor to handle them is substantial, these ubiquitous rocks were desirable for creating fences in the Flint Hills landscape where trees were scarce historically.

FENCING AND SETTLEMENT

Fences were important to keep free-ranging cattle from consuming or destroying farm crops. In locations where timber was plentiful, settlers most often

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built wooden fences, but they also could plant Osage orange hedges, pile sod, or construct rock fences. In Kansas Territory an 1855 law stated that all fields must be fenced with the intent of fencing out free-ranging livestock (State of Kansas 1855). This was followed in 1867 by similar legislation (Taylor 1889). As an incentive, the State of Kansas offered to compensate landowners with an annual bounty of $2 for every 40 rods of hedge or rock fence, the latter needing to be maintained and measure up to 4.5 feet tall. The bounty was payable for fences built within 10 years of the act (State of Kansas 1867).

SETTLEMENT OF MILL CREEK VALLEY IN WABAUNSEE COUNTY

Settlement in Kansas by Old World immigrants was substantial after 1850 (Carman 1962). The 1885 Kansas state census showed 16,852 German immigrants, far exceeding numbers of any other country of origin and comprising 26 percent of all foreign immigrants (Shortridge 1995:Table 4.1). European-American residence in Wabaunsee County began in 1853, a year before the territory was opened for settlement (Wabaunsee County History Book Committee 1976). In 1855 a group of German immigrants organized in Ohio with the intention of traveling up the Kansas River to settle in Kansas Territory. Their riverboat ran aground near what is now the town of Alma. Local resident Joseph Thoes brought the stranded colonists to the Mill Creek valley. Many of these people eventually left due to political turmoil over the slavery issue, but after 1857 a large group of colonists came directly from Germany and settled in Alma and its immediate vicinity (Shortridge 1995; Wabaunsee County History Book Committee 2000). This set the stage for German dominance in the Mill Creek valley and land along its tributaries south of the town of Alma. By 1865, 160 German immigrants lived in Alma Township, comprising 79 percent of the population (Shortridge 1995).

The limestone fences of Wabaunsee County are of special interest. They are highly concentrated along branches of Mill Creek and are notably absent outside the valley. The area was settled predominantly by Germans in the mid- to late-nineteenth century, and the many stone houses and barns testify to this heritage. Shortridge (1995) noted that structures made by German immigrants tended to be of stone, whereas buildings constructed by other ethnic groups were more likely to be made of wood.

An initial focus of this study was to determine if a connection exists between Kansas territorial period German immigration and settlement in the Mill Creek valley and the limestone fences so common there. Somewhat surprisingly, research reveals that dry-laid rock fences are not characteristic of traditional German masonry. Aside from dry-laid stonework to create terraces (Knott 2004), no dry-laid masonry practice is evident in Germany, although a robust cut stone and mortar tradition is present. Apparently, this heritage was brought to Missouri by early German immigrants beginning around 1830, although freestanding rock walls were absent (Van Ravenswaay 1977).

The miles of limestone fences seen in Wabaunsee County are broadly similar to rock fences seen in the Kentucky Bluegrass Region (Murray-Wooley and Raitz 1992) (Figure 4). The Bluegrass Region rock fences most often are the double wall type: two side-by-side interlocking faces of stone that become narrower as they are laid up and thus are battered. The top course most often is not horizontal but instead presents large, thin, triangular rocks set vertically or obliquely with bases that span the width of the fence. While similar to those in the Bluegrass Region, Wabaunsee County fences are more variable (Miller 2007). Some are little more than stacked rocks, lacking a high level of workmanship.

Figure 4. A Bluegrass Region rock fence (Murray-Wooley and Raitz 1992:Figure 1.3). Courtesy of University Press of Kentucky.

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Figure 5. Wabaunsee County limestone fence associated with the Joseph Schutter homestead, archeological site number 14WB335. The oblique coping is typical of traditional Kentucky Bluegrass Region fences.

More carefully constructed fences begin at the base as a double wall, narrow to a single wall about half-way up, and often finish with a top course laid at an oblique angle (Figures 5 and 6). In other words, they resemble Bluegrass Region fences but display less rigorous construction techniques.

This raises questions regarding the origin of dry-laid limestone fences in Wabaunsee County and other parts of Kansas. Were they built by the settlers, or were masons brought in from elsewhere to construct them? Were rock fences chosen over hedge, sod, or wooden fences for practical reasons or were social factors, such as status competition or display of a strong work ethic, important?

WHO BUILT THE ROCK FENCES OF WABAUNSEE COUNTY?

The current research focuses on a sample of 23 parcels with limestone fences in south-central Wabaunsee County (Figure 7). Of these sites seven were owned by early homesteaders, settling between 1855 and 1857 (Kansas Territorial Census 1859). Ownership of 11 sites was due to military land warrants, issued by the government from 1775 to 1855, granting real estate to men who

Figure 6. Rock fence at 14WB355, typical of most in Wabaunsee County, on property owned by John Peter Thoes in 1864.

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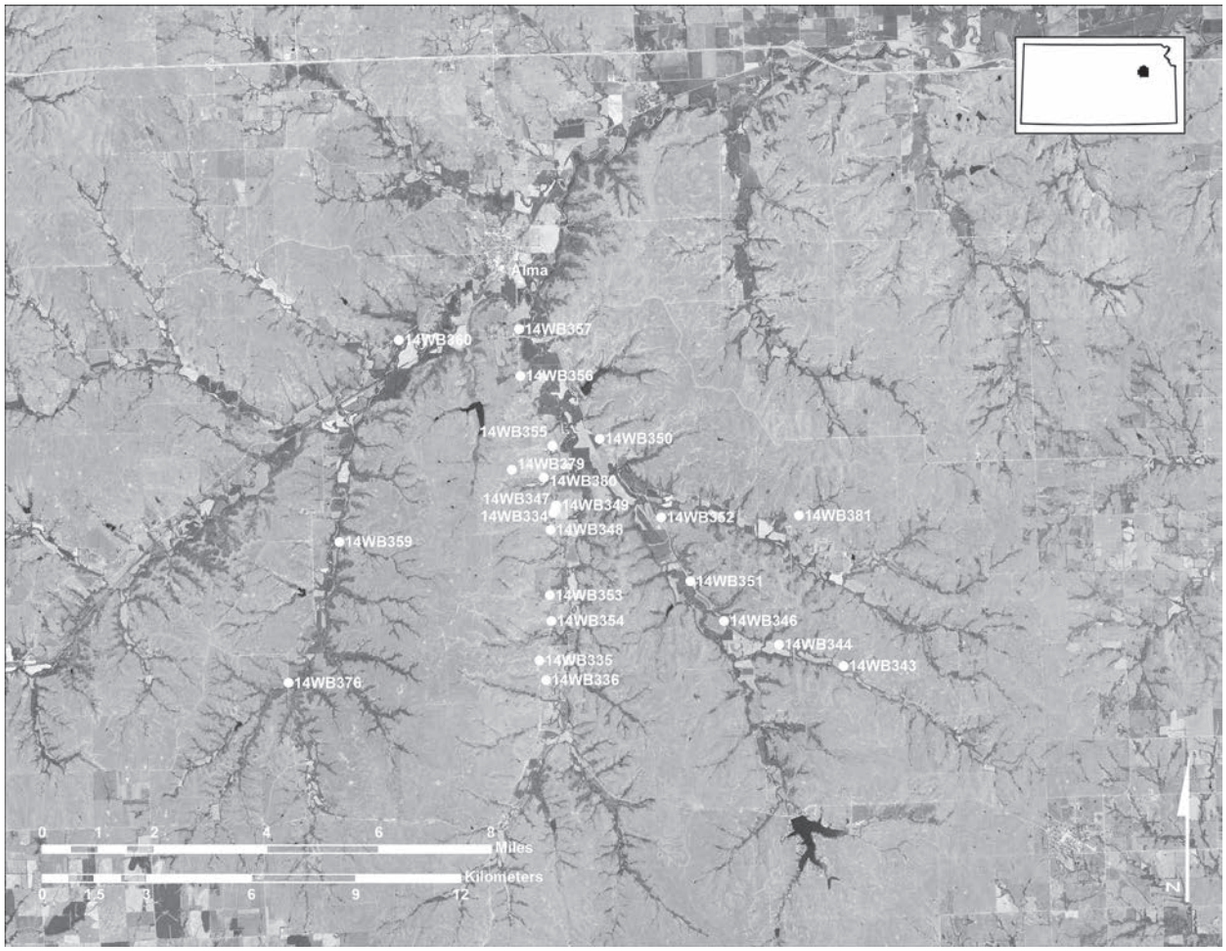

Figure 7. Study area in the Mill Creek valley of Wabaunsee County, showing locations of rock fences designated with Kansas archeological site numbers. The number 14 stands for Kansas, WB for Wabaunsee County, and the numbers are unique site identifiers.

had fought in wars or served the military in some way. All of the military land awards in the study area were made in 1860. Six of these tracts were dispensed with quickly in 1860 by their first owners; in three cases they were purchased by a party who also promptly sold them, acting solely as an intermediary. The succeeding owners, who initially occupied the properties under title, are shown in Table 1. Only one tract of land, initially listed as a homestead entry, changed ownership or went out of the family before the end of the nineteenth century.

Research into landholdings in the Mill Creek valley between 1859 and 1896 found that 31 people owned ground on which rock fences are documented. The 1867 fence law paid a bounty for fences built between 1867 and 1877. Table 1 shows that 16 individuals owned their properties before the fence law, between the years of 1859 and 1867, but only 3 of those in this sample took possession between 1867 and 1877. In short, many of the landowners listed in Table 1 already owned their properties when the fence law was enacted.

Thomson (1901) cited 1869 Wabaunsee County tax records, stating that local property owners had constructed thousands of rods—between 7.3 and 8.4 miles—of rock fence, most of it before there was a monetary incentive to do so. Table 2 enumerates landowners named by Thomson (1901), as well as their nationalities and previous residences, as indicated in the 1865 and 1875 Kansas censuses. Three of the people in this list are in our sample: Joseph Thoes, John Schwanke, and August Gerloch.

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Table 1. Landowners of the 23 Selected Parcels between 1855 and 1896. Names in bold appeared in the 1859 Census and were documented as living in Wabaunsee County between 1855 and 1857.

Land parcel and site number	Documented year of ownership*	Ownership documentation	Name	Born	Arrived in Kansas from
14WB334	1860	Homestead Entry	Anton Schewe	Germany	Pennsylvania
14WB335	1860, 1885	Military Warrant, 1885 plat map	Joseph Schutter	Prussia	No data
14WB336	1860, 1885	Military Warrant, 1885 plat map	(Herman Moehler) Hermann Miller	Prussia	Germany
14WB343	1884	Homestead Entry	Charles Martin	Tennessee	No data
14WB344	1860, 1885	Military Warrant, 1885 plat map	Charles Pafcowitch	Hungary	Hungary
14WB346	1860, 1885	Military Warrant, 1885 plat map	Henry Lear (H. Loehr)	Bavaria	Germany
14WB347	1860	Homestead Entry	**Anton Schewe**	Germany	Pennsylvania
-	1871	Homestead Entry	Andrew Thowe	Prussia	Virginia and Illinois
14WB348	1879	Homestead Entry	Anton Schewe	Germany	Germany
14WB349	1871	Homestead Entry	Andrew Thowe	Prussia	Virginia and Illinois
14WB350	1864, 1885	Military Warrant, 1885 plat map	John Peter Thoes	Germany	Germany
14WB351	1856	1855–1856 Richardson and Wabaunsee County plat map	**Wm Drebing (Drebling)**	Germany	Missouri
14WB352	1859	Homestead Entry	August Gerlach	Germany	Missouri
14WB353	1869	Homestead Entry	John Schwanke (Schwauke)	Prussia	Germany
14WB354	1869	Homestead Entry	John Schauke (same as 14WB353?)	Prussia	Germany
14WB355	1860	Military Warrant	John Vollmer	No data	No data
-	1885	1885 plat, census	**Jos. (Joseph) Thoes**	Germany	Missouri
14WB356	1860	Military Warrant, 1875 census	John A. Hankammer	Germany	Iowa
-	1885	1885 plat, 1875 census	Gus Droege (Draege)	Germany	Illinois
14WB357	1860	1859 census, Military Warrant, 1885 plat map	**Frederick Palenski,** succeeded by Chas. Polenska	Germany	Germany
14WB359	1860	Military Warrant	Edmon Hofman (Sec. 7)	Bavaria	Germany?
-	1860	Military Warrant	**Christoph Werzberger** (Sec. 31)	No data	No data
-	1885	1885 plat map	**F. and J. L. Muehlenbacher**	Germany	Illinois
-	1885	1885 plat map	M. Muehlenbacher	Germany	Illinois
-	1896	Homestead Entry	Margaretha Muehlenbacher (Sec. 6)	Germany	Illinois
14WB373	1855–1856	1855–1856 Richardson and Wabaunsee County plat map, 1875 census	Thaddeus H. Walker or Henry Polenske	Polenske-Prussia	Polenske-Prussia
-	1885	1885 census, plat map	Frank Simon or Mary Palenske	Simon-Germany, Palenske-probably Kansas	Simon-Missouri, Palenske-probably Kansas
14WB376	1860, 1885	Military Warrant, 1885 plat map	Margaretha Mahlenbacher	Germany	Illinois
14WB379	1880	Homestead Entry	Jabez D. Taber	No data	No data
14WB380	1885	1885 plat map 1875, 1885 census	N. Aner	Germany	Missouri
14WB381	1879	Homestead Entry	John Johnson	Sweden	Sweden

*Year of ownership is not precise for properties with ownership documented on plat maps, which only show ownership by a specific date.

Table 2. Rods of Rock Fence Built by Landowners in Wabaunsee County by 1869. Landowners included in the study sample are indicated in bold (data from Thomson 1901).

Landowner name	Rods of rock fence as of 1869	Born	Arrived in Kansas from	Census
Herman Meseke	350	Prussia	Wisconsin	1865, 1875
L. French	300	England	Illinois	1865, 1875
Joseph Thoes	230	Prussia	Missouri	1865, 1875
Ed Krapp	210	Prussia	Missouri	1865, 1875
Eli Walton	180	Ohio	Ohio	1865, 1875
M. Walton	160	Pennsylvania	No data	1865
John Schrouder	120	Germany?	No data	1865
John Schwanke	120	Prussia	Ohio	1865, 1875
R. J. Marrs	110	Illinois	No data	1865
A. Oetting	106	Unknown	No data	No data
Joseph Treu	100	Germany	No data	1865
Aug. Weber	50–100	Prussia	Wisconsin	1865, 1875
Aug. Wolgast	50–100	Prussia	Prussia	1865, 1875
Rudolph Arndt	50–100	Prussia	Prussia	1865, 1875
John Copp	50–100	Germany	Indiana	1865, 1875
Aug. Gerloch	50–100	Germany	Indiana	1875
L. Grunewald	50–100	Prussia	Wisconsin	1875
F. Rickerhauser	50–100	Germany	No data	1865
H. Schultheis	50–100	Germany	Ohio	1865, 1875

Incomplete fence premium payment records from Wabaunsee County between 1869 and 1881 indicated that fence premiums were paid for approximately 6 miles of rock fence, as directed by the 1867 fence law. These records show payments for 2,571 feet in 1869 and 1870, 10,560 feet in 1874, 17,902 feet in 1878, 3,964 feet in 1879, and 268 feet in 1881.

While this information might lead one to conclude that the miles of limestone fences in the Mill Creek valley were built by the many German immigrants who lived there, census data gives a broader perspective on the population structure of Wabaunsee County. According to the 1860 census, 1,023 people were living in the county, 181 of whom were from Germany or of German decent, with 169 of them living in the Mill Creek valley. Ten people were from Kentucky, where dry-laid rock fences were common in some places. In 1870 the county's population was 3,373; 426 of them were German, 82 of whom were from Kentucky. Of the 45 people of African ancestry, 3 were from Kentucky, and 13 were from Tennessee.

The Wabaunsee County limestone fences possibly were built by Kentuckians of European descent or by emancipated African slaves, who came to Kansas after the Civil War (Skeen 1938). Before the Civil War African slave labor was used by Irish masons to assist in the construction of rock fences in the Bluegrass Region of Kentucky, and American Indians and Africans, as slaves or as paid laborers, built rock fences in New England (Allport 1990). By 1880 nearly as many people of African descent were listed as masons in the Bluegrass Region as those of Irish descent (Murray-Wooley and Raitz 1992). Also plausible is the hypothesis that early German landowners in Wabaunsee County hired Bluegrass Region masons of European descent or landless emancipated African slaves to construct fences. This assertion has been raised for rock fences in Missouri as well, although direct evidence of this is rare (Hoard and Prawl 1998). In Texas the area of German settlement was contiguous with Anglo-American settlers, who might have brought their rock fence-building techniques with them (Knott 2004). Knott (2004, citing Jordan 1982b), noted

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that German Texas fences do not follow any tradition from Germany but rather emulate the Upper South rock fence tradition.

Not all localities of German occupation have dry-laid rock fences (Figure 2). For example, Ellis County in central Kansas was populated primarily by people of German descent by way of the Volga Region of Russia (Laing 1910). The first shelters of the Ellis County Volga Germans often were dugouts or sod houses. Their subsequent permanent houses typically were stone, because lumber was scarce and expensive, while stone was plentiful and free except for the labor. Later many public structures, such as schools and churches and even road culverts, were constructed of stone and remain standing today. However, dry-laid rock fences were non-existent, which could be a function of the local geology. While the Permian limestone in Wabaunsee County readily fractures into thin tablets, the more consolidated Cretaceous limestone farther west in Ellis County fractures into blocks or, in the case of the Greenhorn limestone of the Pfeifer shale member, lies in a bed consistently 8–10 inches thick that is relatively easily cut and, when exposed, hardens and is ideal for fence posts in a treeless plain (Hattin 1975). These were made to support strands of barbed wire, which quickly replaced all other types of fencing beginning in the late 1870s.

Another German enclave, the town of Hermann in central Missouri, shows a similar pattern: many well-made limestone masonry buildings, but few or no rock fences or freestanding mortared walls. An abundant supply of wood and a lesser supply of labor may account for this situation (van Ravenswaay 1977).

CONCLUSIONS

The concentration of dry-laid native limestone fences in the Mill Creek valley is unusual and striking. While it correlates with German settlements, that relationship may not be causal. Immigrants to Kansas from the Upper South who were familiar with Bluegrass Region fence-building techniques could have constructed some fences that then were mimicked by their neighbors. Equally likely is that the numerically dominate German immigrant landowners hired their Upper South immigrant neighbors to build fences. The distinct oblique coping, typical of Irish and Bluegrass Region rock fences, which appears to be a decorative touch, is in fact a functional trait. The design may discourage livestock from trying to leap the fence. It also is functional structurally: during construction the oblique coping goes up quickly and ties the top of the wall together nicely, providing strength.

Rock fences were a practical adaptation to the resources available in the Mill Creek valley of Wabaunsee County. The limestone is available virtually everywhere along hill slopes and stream banks and, in the near absence of trees, was a logical choice for fence construction. Outside of the incised Mill Creek valley, far less limestone is exposed on upland surfaces and would have required more effort to acquire, either by quarrying or hauling it in from outcrops along minor stream tributaries.

Still, significant labor was invested in building rock fences, and if the work was hired, rock fences cost considerably more per foot than wooden fences. Cost data from New England for the year 1871 state that board fences cost $1.36 per rod, post and rail fences were $1.20 per rod, and worm fences cost $1.35 per rod in comparison to rock fences that cost $2.00 per rod. The higher investment in labor for rock fences paid off in their longevity, potentially lasting more than 100 years, and in less need for repairs compared to wooden fences (USDA 1872). If landowners did the work themselves, they were spared substantial costs and had highly visible testimony to their thrift and work ethic. If hired masons laid up rock fences for German farmers, it was evidence that the property owners could afford to have this expensive work done for them. Limestone fences in Wabaunsee County arguably were status symbols, as well as functional, like they were and are in New England (Allport 1990). That they served not only to control livestock, but also to enclose the front yards of several homes and cemeteries in the Mill Creek valley suggests aesthetic and social components.

The Mill Creek valley fences cannot be considered representative of all rock fence construction in Kansas. Building histories for rock fence concentrations in Riley, Osage, and Douglas counties may differ substantially from that in this study area. As an example, cursory investigation into the early settlement patterns of nearby Riley and Geary counties (see Figure 2) shows that, while these locations

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also have a high density of rock fences, the ethnicity and origin of their early European-American and African-American immigrants were diverse and often not dominated by a single ethnic group or place of origin.

Highways 4 and 99 in Wabaunsee County are designated as the Native Stone Scenic Byway. Tourists are encouraged to visit the vicinity to see the stone houses, stone commercial buildings in towns, and rock fences. Rock fences are being rebuilt along the byway because most of the original fences had been pushed aside and replaced by barbed wire. After nearly 150 years many of those that remain have fallen into disrepair or have been scavenged for patios and rock gardens. Still, Wabaunsee County's limestone fences and numerous stone buildings provide physical testimony of the earliest Old World immigrants in the region and enhance the natural scenery.

ACKNOWLEDGMENTS

The authors thank Sherri McIlrath for assisting with the map figures, Gina Powell for assistance in recording sites, Amanda Loughlin and two anonymous reviewers for reading an earlier version of the article, Toni Prawl for previous research done on Missouri rock fences, and Paul and Nancy Miller of Wabaunsee County for sharing their time and knowledge and for maintaining their extensive limestone fences. Finally, the Native Stone Scenic Byway Committee, stonemason Rocky Slaymaker, and the hearty group of volunteers who work on weekends to rebuild limestone fences in Wabaunsee County. Their efforts support public appreciation of rock fences, local history, and cultural landscapes.

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INKWELLS OF OLD FORT HAYS, KANSAS

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A collection of intact inkwells was recovered during a series of excavations at Old Fort Hays, Kansas. This paper presents the result of a study of 30 individual inkwells to determine the date range of those artifacts.

Fort Hays was a strategic frontier post during the Indian Wars of the late nineteenth century. Active from 1867 until 1889, it was once a large complex of 45 major buildings. Only four structures remain as a state historic site, operated by the Kansas Historical Society (KSHS). Archeological investigations were conducted there by KSHS archeologists from 1966 to 1970 (Barr 1967, 1969, 1970a, 1970b; Calabrese 1966) and 1996 to 1998 (King 1999). The extensive collection of artifacts is curated at KSHS.

Ink containers are referred to as either inkwells or ink bottles. Generally, small decorative bottles, filled with ink and sitting on top of a desk ready to use, are called inkwells, while large bottles used to fill smaller ones or inkwells are known as ink bottles. "In general, ink bottles were used as inkwells in schools, homes, offices, etc." (Covill 1971:10). The vessels recovered from Old Fort Hays (14EL301) that are the subject of this paper are somewhere in between in size and could be considered inkwells or ink bottles, but this study did not attempt to make that distinction. The containers are referred to as inkwells due to their smaller size, provenience on a historic military base, and predominately conical shape. The containers could have been used with quill pens, especially as so many of them are conical with broad bases to keep them from tipping over and spilling.

Some of the containers in this collection could have held mucilage rather than ink. Mucilage and glue are both pastes; glue is made from animals, while mucilage is plant-based. Early glass manufacturing houses used the same containers instrumentality for ink and mucilage (Covill 1971). The conical glass inkwells clearly resemble the mucilage bottles shown in the household bottles section of the Bureau of Land Management (BLM) and Society for Historical Archaeology (SHA) (2016:Bottle Typing (Topology) & Diagnostic Shapes/Household Bottles (non-food related)/Mucilage & Glue).

This paper does not include the archeological findings from 14EL301, rather only descriptions of the artifacts themselves. Further analysis, combining this data and the information in the archeological records, might lead to more precise dating of the inkwells.

ARTIFACT DESCRIPTIONS

In this collection are 30 inkwells from 14EL301 that are complete or nearly complete, with only a tiny chip or fragment missing from a few of them (Figure 1). The fragments that are missing do not interfere with the measurement, classification, or identification. Using KSHS artifact catalog numbers, the following attributes were recorded for each inkwell: shape, material, color, height, base width, mouth width, and interior mouth width (Table 1).

Twenty-one inkwells are glass, and nine are ceramic. Three have corks that have fallen inside. No other items in this assemblage still have stoppers or corks. A more in-depth examination could determine if these vessels were used for ink or paste. Also, the ink color might be identified with scrutiny of residue on the corks or the interiors of the ceramic inkwells.

Ink containers are classified and identified by their size, shape, color, and labels (paper or embossed).

SHAPE/SIZE

The major inkwell shapes are barrel, central dome, cone, rectangle, round, square, teakettle, turtle/igloo, and umbrella (Faulkner 2009). The Fort

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Figure 1. Inkwells of 14EL301 included in this study.

Hays inkwells fall into the classifications of conical (n = 21), umbrella (n = 4), square (n = 4), and round (n = 1).

Nine conical ceramic containers are made of fired clay with a shiny brownish glaze and are relatively consistent in size. Pottery inkwells of this kind were manufactured by many large bottle and ink companies and were used from the early 1800s through early 1900s. "Early small ones were sold as 'penny inks' as that was the original cost" (Faulkner 2009:161). Figure 2 shows a representative conical ceramic inkwell without markings from the 14EL301 collection.

Conical glass inkwells date to around 1840. By the late 1800s almost all of the major ink manufacturing companies in the United States were using these bottles; however, without labels or embossing, it is impossible to determine which companies made them. Four of the conical clear glass inkwells, specimen numbers 3684 F201, 8828 F489 H5, and 6425 F309, bear no identifying marks. On the other hand, number 11148 F589 is a Sanford container, distinguished by the entwined letters "SMC" embossed on the side panel (Figure 3). The Sanford Company was founded as the Sanford Manufacturing Company in 1857 and changed to the Sanford Ink Company in 1947; thus, this item was made sometime during that 90-year period. This might have been a mucilage bottle, as it is the tallest bottle in the collection with the widest

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Table 1. Descriptions of all inkwells studied in this paper.

Catalog number 14EL301-	Shape	Material	Color	Height (inches)	Base width (inches)	Mouth width (inches)	Interior mouth width (inches)
3684 F201	Cone	Glass	Clear	2.523	2.561	1.012	.569
8211 F212	Cone	Glass	Aqua	2.686	2.531	.985	.567
9347 F608	Cone	Glass	Aqua	2.594	2.612	1.058	.626
9348 F608	Cone	Glass	Aqua	2.621	2.626	1.050	.598
13068 F671	Cone	Glass	Aqua	2.456	2.543	1.050	.513
8828 F489 H5	Cone	Glass	Clear	2.748	2.478	.962	.540
10596 F541	Cone	Glass	Aqua	2.814	2.426	1.034	.495
4134 F202	Cone	Glass	Aqua	2.432	2.538	1.107	.536
13071 F671	Cone	Glass	Aqua	2.611	2.562	1.048	.586
12371 F583	Cone	Glass	Aqua	2.547	2.576	1.079	.561
6425 F309	Cone	Glass	Clear	2.299	1.900	.929	.400
11148 F589	Cone	Glass	Clear	3.826	3.212	1.112	.794
7368 F374	Umbrella	Glass	Green	3.089	2.387	.960	.713
7378 F374	Umbrella	Glass	Clear	2.960	2.275	1.070	.734
7369 F373	Umbrella	Glass	Clear	2.989	2.302	1.074	.752
13616 F822	Umbrella	Glass	Clear	3.085	2.451	.980	.744
3676 F202	Square	Glass	Clear	1.109	1.308	.865	.547
10139 F612	Square	Glass	Clear	2.625	2.110	1.207	.753
2748 x130	Square	Glass	Clear	2.660	1.873	1.146	.580
2548 x119	Square	Glass	Purple	2.157	1.961	1.119	.884
2618 x130	Round	Glass	Clear	2.534	2.096	1.225	.772
13633 5051–21	Cone	Clay	Brown	2.580	2.133	.837	.500
13617 Sq51R1	Cone	Clay	Brown	2.541	2.074	.875	.479
13637 Sq051	Cone	Clay	Brown	2.550	2.044	.824	.492
13632 Sq 0–0	Cone	Clay	Brown	2.486	2.056	.850	.510
13619 Sq 0–0 Lv2	Cone	Clay	Brown	2.440	2.053	.838	.494
13583 Sq 0–51 Area 705	Cone	Clay	Brown	2.438	2.091	.880	.538
11686 Area 685	Cone	Clay	Brown	2.499	2.072	.837	.486
13638 Sq 0–51	Cone	Clay	Brown	2.482	2.014	.829	.494
10091 F612	Cone	Clay	Brown	2.536	2.479	.936	.585

opening. Today the Sandford company continues to be one of the largest ink companies in the world, marketing the brands of Sharpie, Paper Mate, Uniball, and other well-known writing utensils.

The remaining eight conical glass inkwells are aquamarine in color and similar in size. Four have no labels or embossing (Figure 4). Number 4134 F202 (Figure 5) is embossed on the base with the manufacture's name: "SANFORD'S." Numbers 8211 F212, 9347 F608, and 9348 F608 have "CARTER'S" embossed on the bases. Figure 6 shows a typical CARTER'S embossing. Carter's Ink Company started in 1858. The company grew from producing 100,000 bottles of ink in 1873 to nearly 5,000,000 bottles in 1884, making it the largest producer in the world at the time. The company stayed in business until 1976, when it was purchased by the Dennison Company, which in turn was bought out by the Avery Manufacturing Company in 1990 (Faulkner 2009).

Umbrella-shaped inkwells were developed around 1840 and continued into the early 1900s. The conical bodies of these containers have fluted sides. The most popular were 8-sided, but they also

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Figure 2. Typical conical ceramic inkwell.

Figure 4. Typical conical aquamarine glass inkwell with rolled lip.

Figure 3. Cone-shaped colorless glass inkwell with sheared lip, embossed with "SMC" for Sanford's Manufacturing Company.

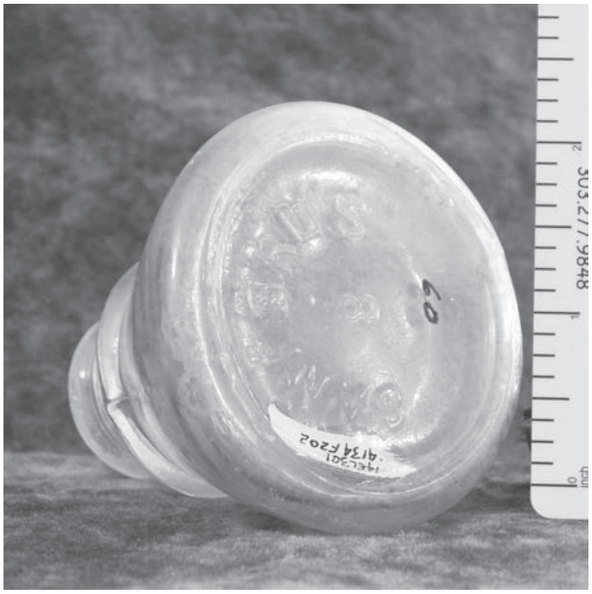

Figure 5. Embossed Sanford's conical inkwell base.

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were made with 6, 10, 12 and 16 sides (Faulkner 2009). Each of the four umbrella-shaped inkwells in the 14EL301 collection has 10 sides. Three are clear, and one is green, which can be detected by looking through the base. In contrast to the rolled lip of the conical inkwells, as seen in Figure 4, these umbrella-shaped inkwells were made with a sheared lip (Figure 7). The openings are larger than those of the conical vessels, and they could have been used for mucilage. None had any markings.

Four square inkwells are part of the assemblage from 14EL301. Three are clear, and one is purple. The smallest inkwell in the collection is specimen number 3676 F202 (Figure 8). There are no markings, but it likely was part of a desk set or designed for travel that would have been refilled from larger bottles of ink. Desk sets for the quill and inkwell date back to the early 1800s and continued into the early 1900s.

Specimen number 10139 F612 is a Carter's inkwell (Figure 9). Number 2748 x130 has the intertwined SMC letters on the side panel (Figure 10), identifying it as a Sanford's product, like the cone-shaped one in Figure 3.

The remaining square inkwell has a threaded lip for a screw cap and is the only vessel in the collection that was not designed for a cork. Covill (1971) lists zinc, pewter, brass, or cast iron as possibilities for screw lip caps on desk set inkwells. Occasionally a metal cap with a stopper or a glass cap was used. No metal closures survive in this collection, so the type of metal used for the screw cap closure is unknown. The 1904 Polk's business directory (2018) lists Kansas City Banker's Ink Company. Covill (1971:Figures 388–390) illustrated three

Figure 7. Green glass 10-sided umbrella-shaped inkwell with sheared lip.

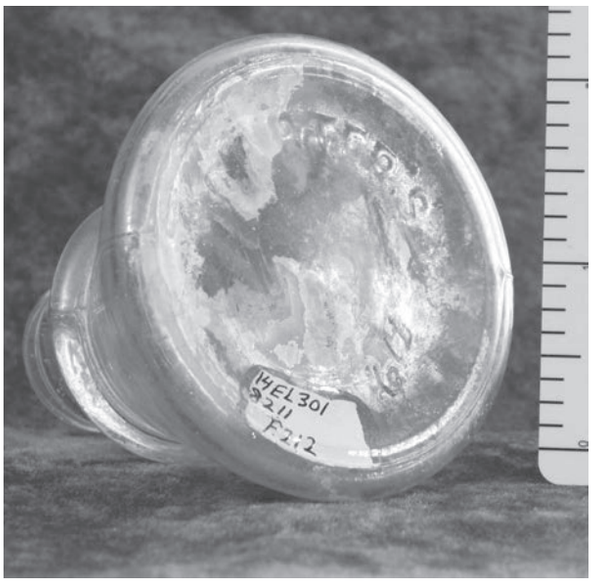

Figure 6. Embossed Carter's conical inkwell base.

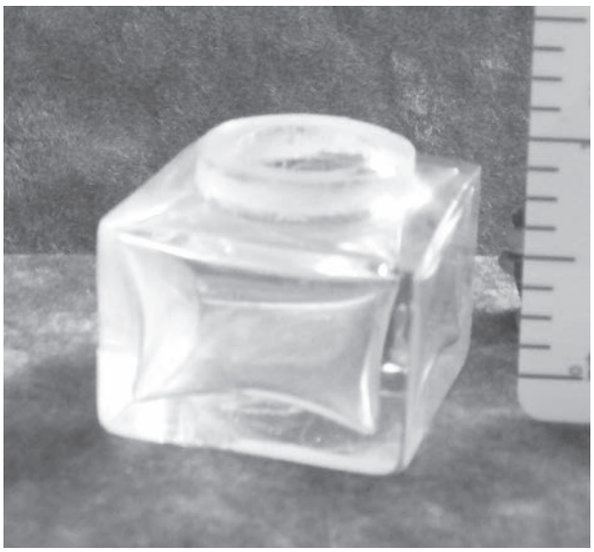

Figure 8. Small square colorless glass inkwell, typically used in desk sets.

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Figure 9. Carter's square colorless glass inkwell with double-ring lip. Cork is inside.

Figure 11. Square colorless glass inkwell with screw-cap lip, embossed with "Bankers Ink Kansas City."

Figure 10. Square colorless glass inkwell with rolled lip, embossed with "SMC" for Sanford's Manufacturing Company.

Figure 12. Round colorless glass Sanford's inkwell with double-ring lip.

Kansas City Banker's inkwells. Two of Covill's images show cork-top closures, but Figure 390, which is identical to Figure 11, probably was the most recent model of the three. Screw-top closures became popular in the early 1900s, and fewer bottles were made with cork closures after that.

The final inkwell is round (Figure 12). Its base is embossed with the Sanford name.

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COLOR

The Fort Hays inkwells can be placed in four color classifications, using the Historic Glass Bottle Identification and Information Website as a guide (BLM and SHA 2016:Bottle/Glass Colors). The nine ceramic inkwells are coated with a yellowish brown glaze. The 21 glass inkwells are aquamarine, green, or colorless/clear.

The eight aquamarine inkwells vary in shades from light to dark. Looking crosswise through the base, they are consistently the same aqua color with the exception of number 14EL301–13068, which is the deepest aqua, almost blue in color. Aquamarine color in glass results from the amount of iron in the sand used to create the glass. From the early-nineteenth century to around 1920, it was a very common color. Aqua bottles became uncommon after the 1920s, when colorless glass largely replaced aqua because manufacturers wished their products to be visible to buyers. A significant exception to this dating convention is soda bottles, such as the greenish aqua of Coca-Cola bottles. Another example is canning jars, which continued to be produced in aqua into the 1930s (BLM and SHA 2016:Bottle/Glass Colors).

One umbrella-shaped inkwell (Figure 7) is green, more specifically yellowish green or citron in the BLM and SHA classification (2016:Bottle/Glass Colors). The color can be seen by looking sideways through the base of the bottle.

The 12 colorless inkwells are clear with two exceptions: a square inkwell that has a slight grayish tint and a square inkwell with a light amethyst tint. Since purpling in the glass can result from exposure to the sun, it was classified as colorless. All these colorless inkwells are transparent. Colorless glass was a goal of glass manufacturers for centuries but was difficult to produce because it required virtually impurity-free materials. Colorless bottles are generally uncommon prior to 1870 but became widespread in the mid- to late-1910s (BLM and SHA 2016:Bottle/Glass Colors).

LABELS

No paper labels remain, nor are label remnants visible on any of the 14EL301 inkwells. Many early mucilage and ink bottles and inkwells had paper labels. Eight inkwells are embossed with the ink maker's name or initials. The remaining 13 lack any maker marks or embossing, indicating they had either paper labels or were simply a generic bottle made by the many early glass houses. Lacking labels, it is doubtful that they can be identified as coming from any particular company or glass house.

CONCLUSION

Without additional information from Old Fort Hays excavation records, the author concluded that the bottles in this collection date from the 1850s to 1930. Using the Historic Glass Bottle Identification and Information Website (BLM and SHA 2016) and comparing similar examples, the cone-shaped ceramic inkwells were placed from 1850 to 1880. In the nineteenth and twentieth centuries glass houses manufactured bottles for numerous companies who labeled their own products. The unidentified conical glass inkwells were a popular style from the early 1800s into the early 1900s. More specifically, umbrella-shaped inkwells were made from 1850 to 1910. The square Sanford's inkwell dates between 1910 and 1930, and the square Kansas City Banker's Ink Company inkwell is from around the 1920s.

ACKNOWLEDGMENTS

This paper would not have been possible without the constructive editorial assistance of Colin J. Sinn, to whom I am forever grateful. The author also thanks Virginia Wulfkuhle for her final edits and patience and Chris Garst of the Kansas Historical Society for making the 14EL301 artifacts available.

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THERE IS MORE TO SPECTACLES THAN FIRST MEETS THE EYE

AN EARLY TWENTIETH-CENTURY PAIR OF EYEGLASSES AND CASE FROM 14LV427

Jim D. Feagins
St. Joseph Museum

Eyeglasses contain a number of innovative attributes that developed through time. These not only increase understanding of the history of spectacles but can aid archeologists in dating historic sites. Specimens are less common in the archeological record than many other types of artifacts, and even then are usually damaged. They rarely are described in the kind of detail necessary to make them useful for comparative dating.

Mounted facial lenses were and still are a tremendous benefit to humankind. As eyeglasses or spectacles develop through time, they clearly incorporate innovations (Hanson 2011; McBrayer and Valenza 2012:6; Poulet 1978; Rosenthal 1984) that prove useful to archeologists for cultural understanding and dating purposes. However, their use by North American archeologists interested in historic American Indian and Euroamerican sites has been hampered by a number of factors. First, they are scarce in archeological sites, especially when compared to buttons, beads, and dozens of other classes of historic artifacts (Nassaney 2015; Woodward 1970). Second, apart from noting their presence, detailed descriptions are generally lacking in archeological literature. Third, specimens are broken and recovered as fragments in most archeological contexts. This article is an effort to make available to historians and archeologists a description of a nearly complete set of spectacles, including attributes and other information concerning this underreported category of artifacts.

SITE 14LV427 BACKGROUND

The eyeglasses described in this paper were found perhaps a quarter of a century ago by Raymond Cantrell on the western edge of site 14LV427 (Feagins 2016, 2017b)—one of the Kickapoo farmsteads that made up the non-nucleated, agricultural-oriented village led by Kenekuk, the Kickapoo prophet. Coming from eastern Illinois, Kenekuk brought his self-styled nativist/Christian religious group of Kickapoo (Cave 2006:225–243; Herring 1988; Wagner 2011), along with some Potawatomi followers, to this Kansas reservation early in 1833, following the signing of the treaty of Castor Hill on October 24, 1832. They resided on this part of the reservation until 1855, the year after their original reservation was reduced in size, forcing them to move. Additional information on the Kickapoo occupation was given by Herring (1988:77–131), Stull (1984), Wyatt (1962), and others, and a summary was supplied by Feagins (2017a:5–8).

Cantrell's Kickapoo collection from 14LV427 was described in a report to the Kansas Historical Society (Feagins 2017b). At first glance those who examined the spectacles and case assumed that they had been lost by a Kickapoo resident, but that turned out to be incorrect. While found on the site, these items were manufactured much later than the Kickapoo occupation; therefore, they were described in an appendix, separate from the main body of that report.

The 14LV427 eyeglasses proved to be of considerable interest and contain several important manufacturing innovations, the most recent of which was not available until after 1920 (Poulet 1978)—some 65 years after Kenekuk's village was abandoned. Because the author believes that the description and dating information is worthy of a wider audience, an abbreviated version of his 2017 report appendix,

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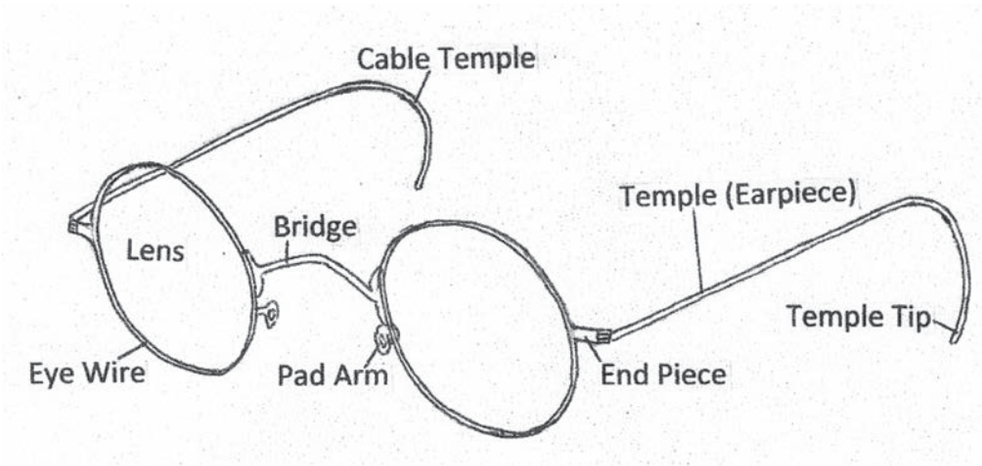

Figure 1. Diagram of eyeglasses with labeled parts.

along with figures to illustrate certain innovations on the 14LV427 example, are presented here. Figure 1 shows some descriptive terms to aid in understanding the text.

THE SPECTACLES FROM SITE 14LV427

The eyeglasses were found inside their metal case (Figure 2). Although the case itself was damaged, it clearly minimized harm to the contents from agricultural activities. Each of the two round glass lenses, including the wire rims or "eye wires," is 41.1 mm in diameter (Figure 3). The lenses are convex-concave in cross section with a center thickness of approximately 2.55 mm. According to certified optician Michael J. Epstein (personal communication 14 July 2017), their magnification is 3.75^{+}. These adult-sized spectacles were designed for close work, such as reading. The spacing between the centers of each lens is 62.6 mm (2.46 inches)—slightly narrower than modern eyeglasses. A round lens resurgence came into use well after the Kickapoo reservation was reduced in size.

The mass of the spectacles (minus a small broken portion of the right lens, shown close up in Figure 4) is 23.1 g (.815 ounces). The total mass of the eyeglasses with case is 103.1 g (3.639 ounces). The frame width, the distance including the two end pieces containing the side hinges, is 117.3 mm. The side hinges allow the temples to fold together for storage.

The frames are metal (Figure 5). The only ferrous components, which are attracted to a magnet, are a portion of each earpiece and the nose bridge. To the naked eye various parts of the frame appear to be some type of white metal alloy (Light 2000; Vickers 1923). The bridge is arched (Figure 3) and measures 28.02 mm in length, including the area of attachment to the eye wires or rims. The metal bridge cross section is 1.85 mm wide and 1.25 mm thick. The spectacles retain nose pad arms, although the plastic pads themselves are missing (Figures 5 and 6). Nose pads were not used until after the 1920s. And for that matter, the arched nose bridge style also postdated the first Kansas reservation period (Michael J. Epstein, personal communication 14 July 2017; Poulet 1978:295).

The temples or "arms" (Optometrist Attic 2017:1) or earpieces are of a general category called the "comfort cable" or "comfort cable temple" or "wrap-around" (Michael J. Epstein, personal communication 14 July 2017; Optical Training Institute 2018:2). The part of the temples near the rims is solid with somewhat limited flexibility (Figures 5 and 6). Generally oval in cross-section, it is 1.95 mm wide and 0.85 mm thick. This portion of each earpiece is weakly attracted to a magnet.

In contrast, the component that actually curved around the back of each ear, the comfort cable, is exceedingly flexible (Figures 5 and 6). Examination with a binocular microscope revealed the reason. A flat, narrow band of silver-colored metal that was twinned into an S-twist forms a gentle, continuous,

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Figure 2. Euroamerican eyeglasses in case.

Figure 3. Front view of eyeglasses.

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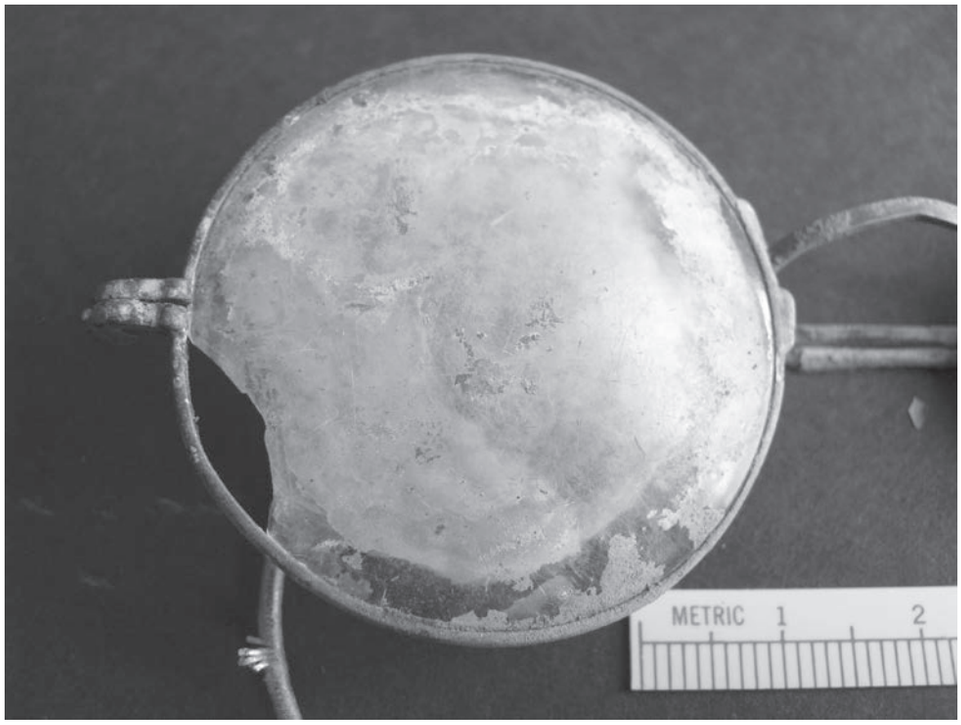

Figure 4. Detail of right lens.

Figure 5. Back view of eyeglasses. Scale in cm.

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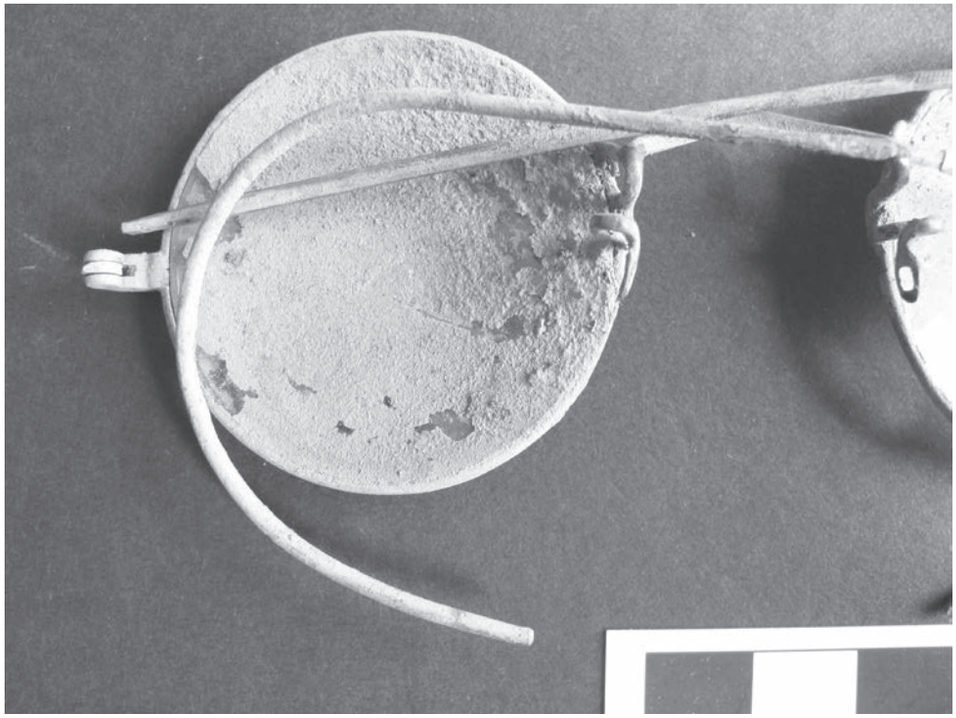

Figure 6. Detail of eyeglasses and nosepiece hooks. Scale in cm.

tight spiral. The flexible element of the earpiece proved to be a tiny cable, 1.55 mm in diameter. One small section of the cable's thin band was broken, possibly by farm equipment, and bent outward (Figures 3, 4, and 7). This break allowed the flat metal spiraling band to be measured: .35 mm wide by .2 mm thick. The damaged area also exposed below the outer layer another flat metal band, which seems to be identical except that the inner layer was spiraled in the opposite direction, forming a Z-twist. Thus, a flat metal band, spiraling in one direction (S-twist), covered another flat metal band, spiraling in the opposite direction (Z-twist). It is not known what, if anything, is under the lower layer. This cable of ingenious engineering and excellent factory workmanship enabled the curve around the ear to be maintained in any position desired and easily adjusted to fit the backs of an individual's ears (Carlton 2000:14). The innovative type of metal coil temple was introduced in the 1880s (McBrayer and Valenza 2012:6). The small distal end of the earpiece, or temple tip, is solid and rounded. The total length of the temple, including the tip, is 164.5 mm.

The case (Figures 2, 8, and 9) is a type called a "clamshell." The eyeglasses could be tucked part way under a prominent lip, and the top folded down by way of a hinge. It appears to have been manufactured of tin-plated iron and lined with cloth. The heavily rusted case has been damaged on one end, presumably by agricultural activities (Figures 2 and 8). It has a mass of 80.2 grams, a length of 132.6 mm, and a width of 63.95 mm. The hinge rod (wire) is 82.0 mm long and has a diameter of 1.9 mm (Figure 8). The broken spring is 7.0 mm wide.

The textile lining (Figures 10 and 11) displays a color of 10R 3/3 "dusky red" (Munsell Soil Color Chart 1975), which is much darker and more red/brown in color than the rust in the metal case (Figures 8 and 9). The cloth liner shows considerable use wear (Figure 10), making it difficult to identify various attributes, such as weave pattern. However, in one spot the cloth is loose, and the bottom is folded over to expose the underside, which has almost no wear (Figure 11). The warp threads are smaller in diameter than the weft threads; both are "S-twisted." The weave pattern is a simple, one-over and one-under weave. The textile most commonly used to line spectacle cases was velvet (Michael J. Epstein, personal communication 14 July 2017). The exterior apparently had been covered with cloth of a finer thread count, but extensive

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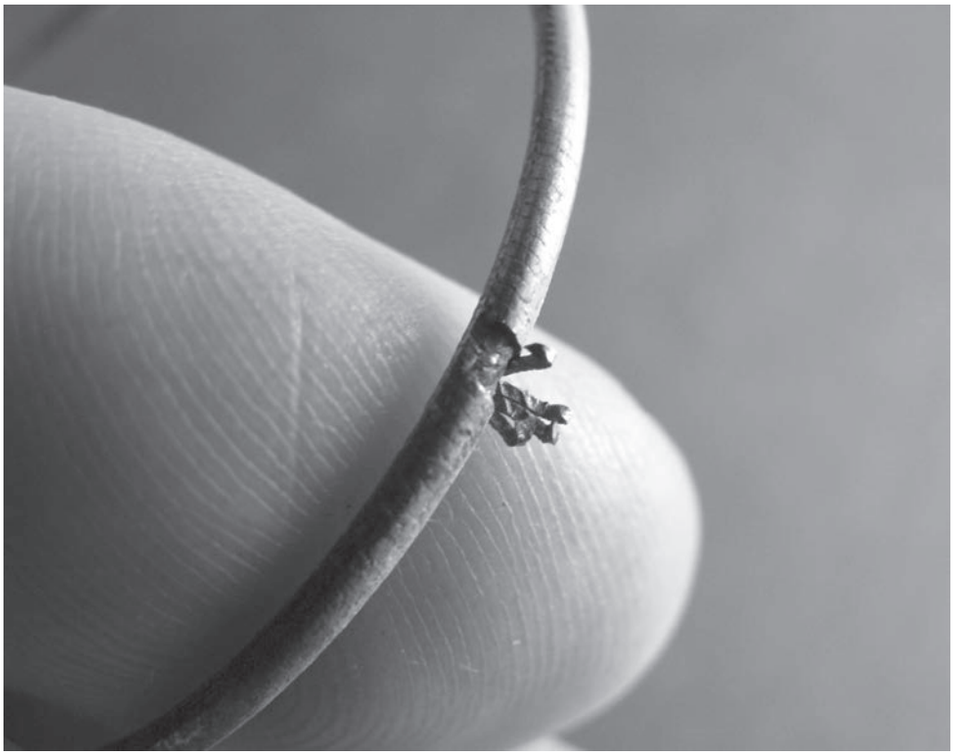

Figure 7. Detail of broken cable part of flexible ear piece.

Figure 8. Inside view of the lower part of case. Note lip at bottom, hinge at top, and damage to case at right.

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Figure 9. Inside view of upper part of case. Scale in cm.

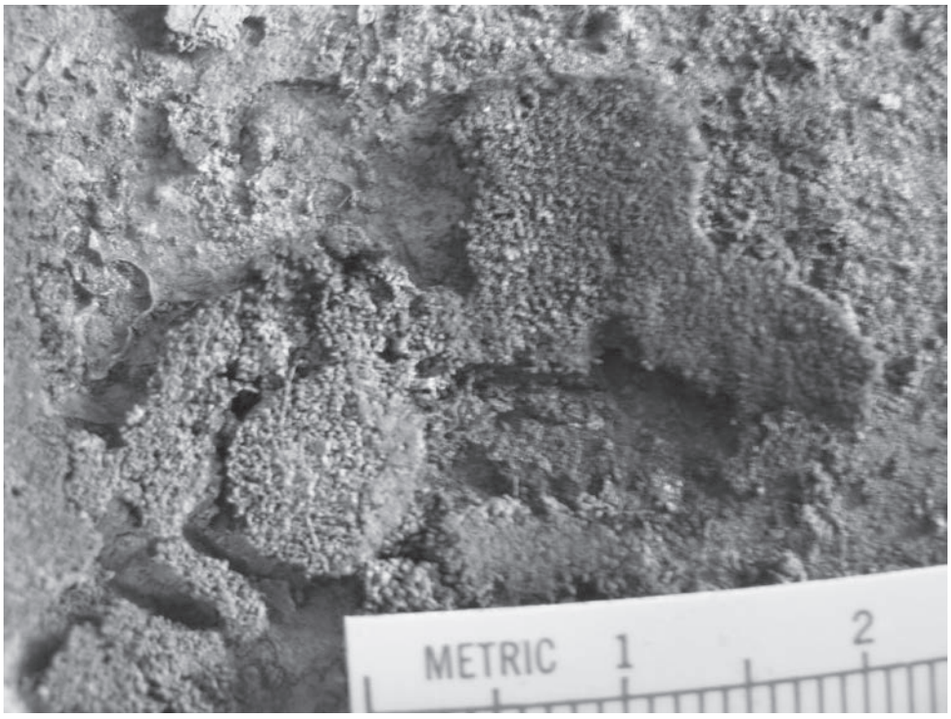

Figure 10. Detail of use-wear to the textile lining of case.

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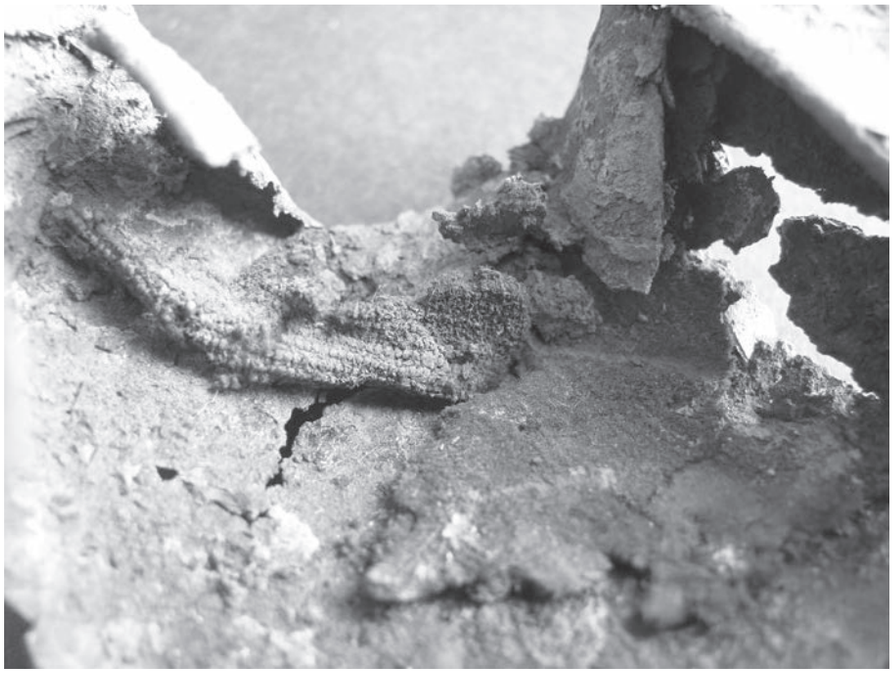

Figure 11. Detail revealing lack of wear on underside of case's cloth liner center section.

damage does not permit much else to be learned about it.

DISCUSSION AND SUMMARY

The "around the ear" temples are generally thought to have been introduced near the end or slightly after the Civil War. The style of bridge, nose pads, lens shape, cable-temple earpieces, and type of case are all attributes indicating that the spectacles were factory-made well after 1855—the date when the Kickapoo actually moved from this reservation to the first of their two diminished reservations. The cable-temple earpieces were manufactured sometime post-1880, and the nose pads were produced after the 1920s. Most likely a time lag occurred between this innovation and the date that this pair was purchased, used, and presumably lost (Adams 2003). Wear on the textile lining clearly shows that the owner had carried the eyeglasses for at least a few years.

Various types of optics, including spectacles, occasionally were obtained by American Indians (Hanson 2011). However, most Kickapoo and Potawatomi occupants of this reservation in the mid-1800s would have been hard pressed to afford them. That would not as likely be true for a Euroamerican, especially some 70 years later. The type of nose pads suggest that these eyeglasses probably were lost by a Euroamerican farmer or hunter sometime after 1920. Speaking from experience, that individual would have greatly missed these fine spectacles the next time he wanted to read or examine something in close detail.

ACKNOWLEDGMENTS

Research on this topic was tremendously enhanced by consultations with Michael J. Epstein, Certified Optician, Eye Associates of Prairie Village, Prairie Village, Kansas. His passion for researching and learning about the history of spectacles has been long known to Civil War and other historic reenactors. I consider it fortunate to have him as a consultant to aid the archeological community. My wife Peggy Feagins read and enhanced a draft of this manuscript. Ray Cantrell made the 14LV427 site collection available for analysis. A debt of gratitude is due to all the above.

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BOOK REVIEWS

***The Plains Indians: Artists of Earth and Sky*.** GAYLORD TORRENCE, editor and exhibition curator, Nelson-Atkins Museum of Art, Kansas City, Missouri. Musée du quai Branly, Paris and Skira Rizzoli, New York, 2014. 320 pp., 214 illustrations (predominately color), list of exhibited works, index, bibliography. $49.34 (hardcover, 9.75 x 11.5 inches). ISBN: 978–0-8478–4458–6. *Reviewed by* Jim D. Feagins, St. Joseph Museum.

The Plains Indians: Artists of Earth and Sky is an outstanding catalog of a remarkable exhibition of Plains Indian art, compiled from more than 50 museums in North America and Europe. This reviewer was fortunate to view the exhibit when it was at the Nelson-Atkins Museum of Art in Kansas City, Missouri. Some other Kansas Anthropological Association members saw it multiple times before it traveled to New York, which is quite a tribute to its quality and educational value.

More than artworks, the 146 objects, some of which had not returned to the New World since they were acquired several centuries ago by French traders and travelers, are material culture that reflect an anthropological perspective. In fact, looking at these artifacts solely as works of art might diminish their cultural meaning. The functional, and in some cases sacred, nature of these creations changes when they are considered only from the artistic perspective. For many individuals of Native American heritage, certain items surely inspire much more than the joy of learning and feelings of artistic awe. Rather they represent a sacredness, capable of producing powerful spiritual experiences. Undoubtedly some museum patrons experienced all three emotions, separately or perhaps simultaneously. The book, *The Plains Indians: Artists of Earth and Sky,* is quite capable of eliciting the first two reactions. The third emotion may require being in the actual presence of the objects.

The catalog follows the same format as the exhibition, which was divided into seven chronological sections: Ancient Peoples (pre-1700s), Life on the Great Plains (1700–1820), Cultural Florescence (1820–1860), Death of the Buffalo (1860–1880), Islands of Former Ancestral Homelands (1880–1910), Lives Coming Together and Apart (1910–1965), and Artistic Revival in Contemporary Life (1965–2013). The volume begins with two prefaces by Stéphane Martin and Julian Zugazagoitia, an introduction by Gaylord Torrence, and two essays: "Change and Survival on the Great Plains" by Colin G. Calloway and "Artists of Earth and Sky" by Arthur Amiotte. Most of the 30 authors contributed artifact descriptions and background.

In the "Ancient Peoples" section, the oldest piece shown is an Adena or Hopewell human effigy pipe (100 B.C.–A.D. 100) from Ross County, Ohio (barely part of the Plains). Also displayed were wood and stone bison effigies from Alberta, Canada, and Wyoming, an incised red pipestone tablet from Iowa, a marine shell mask gorget from South Dakota, a human effigy pipe made of bauxite from Spiro Mound in eastern Oklahoma, and more—the best of the best. In addition, there are photographs of wonderful Plains rock art.

For this reviewer the premier artifact in the exhibition was a bison robe (late A.D. 1600s but more likely 1700–1740). It was loaned by the Musée du quai Branly. Torrence wrote, "This robe is one of the most famous of all North American painted hides, not only because of its great age and purported history but also because of its striking design and eloquent beauty" (p. 68). Legend attributes this robe and three others as having been collected by Jesuit priest Jacques Marquette and explorer Pierre Joliette during their 1673 journey down the Mississippi River. Lacking a solid chain of provenance, it seems more likely that they were acquired later at a French trading post in St. Louis.

Other artifacts shown in the volume are feathered, horned, and turbaned headdresses, many items of clothing, including a ghost dance dress, carved wooden effigies and bowls, war clubs, shields, drawings and ledger art, parfleches, a decorative antler scraper, skin bags, Calumet stems and pipe bowls, courting whistle, courting flute, roach spreader, horse crupper, saddle blanket, cradleboards, courting and other fans, bear claw necklaces, rattles, moccasins, German silver headstall bridle, horse masks, quirt, a Missouri war axe, breastplate, bow case and quiver, doll, hand drums, model tipi,

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a winter count, and selected items of contemporary art. The book reminds archeologists that few of these perishable artifacts could survive for any length of time in archeological environments and expands appreciation of the artistic abilities of the ancient, and not so ancient, indigenous people who inhabited the North American Plains.

The exhibition debuted at the Musée du quai Branly in Paris, then traveled to the Nelson-Atkins Museum of Art, and ended at the Metropolitan Museum of Art in New York City. If readers missed seeing this extraordinary exhibition in person, all is not lost. This exhibition companion volume is also outstanding and actually offers a few advantages compared to seeing the exhibit in person. It contains much more introductory information and fuller descriptions of each object than could be presented in a museum. The large format, slick-paper publication is well written and contains stunning photography, which can be enjoyed at one's leisure. The coffee table is a good place to display the book for a time before placing it in one's library. This reviewer has compiled and inserted among its pages a list of topics for which this reference should prove useful in personal research.

The Plains Indians: Artists of Earth and Sky is an excellent, although not comprehensive, survey of Plains Indian art. Considering its size and quality, the price is remarkably reasonable. It may be obtained online or by ordering through a local bookstore. It is worthy of a place on one's library shelf.

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The Archaeology of the North American Fur Trade. MICHAEL S. NASSANEY. University Press of Florida, Gainesville, 2015. xiii + 262 pp., including 30 figures, 3 tables, 1 textbox, references, and index. $69.95 (hardcover) ISBN 978–0-8130–6157–3 or $24.95 (softcover) ISBN 978–0-8130–5469–8. *Reviewed by* Jim D. Feagins, St. Joseph Museum.

One of the most important and romantic stories in North American history is that of the "fur trade." Actually this enterprise was a series of types of fur trade, playing out with different societies in different geographic parts of the continent during different, but often overlapping, segments of time. It involved a transition of assorted dominant fur-bearing animals being exchanged for a variety of commodities by various European, Asian, and American nations, with many native cultures—all evolving through time. Nassaney gets to the heart of what the fur trade was all about with two quotations: The fur trade is "beyond the mere swapping of furs and goods, the trade involved . . . [the] exchange of ideas, languages, worldviews, commodities, practices, technologies, diseases, and genes" (Birk and Richner 2004:1, quoted p. 2). The "economic activities were only one thread in an elaborate fabric of interaction involving the trade of tangible and intangible commodities," including services, "information, languages, loyalties, and people" (White 1982:122, quoted p. 3). Handled with proper care, the material culture contexts and analyses (i.e., archeological research) have greatly enhanced and continue to shed light on this important story.

After thousands of years of trading with each other, Native Americans were astute traders well before the arrival of Europeans. Trade was not a one-way-street, nor did it involve merely material goods. As each side traded materials and learned about the other's culture, they picked and chose what to incorporate, what to adapt for particular needs, and what to reject as not useful or incompatible with their way of life and/or their spiritual beliefs. Clearly, distinct cultural groups (e.g., tribes, nations, and subsets of these) approached trade from divergent perspectives.

The Archaeology of the North American Fur Trade supplies an important overview, as well as numerous useful facts. The details include the interpretation of sites and their features (sometimes to aid the reconstruction of historic properties), and the nature and use of individual artifacts. The lines of evidence furnished by archeology can give considerable insight into daily life that is not recorded in documentary sources; this is especially true concerning indigenous participation in the trade. Archeology's involvement in fur trade studies allows more of an opportunity for "problem-oriented research with efforts to study subsistence, diet, status, ethnicity, social composition, acculturation, land use and symbolism of both European and aboriginal peoples . . ." (Klimko 2004:166, quoted p. 72).

Since most Native American sites lack documentation describing specific dates of occupation, archeologists have developed a range of relative and calendrical dating information based on types and styles of artifacts. With continued attention to detail and changes through time, archeologists continue to develop and refine the chronology of many types of trade goods including glass beads, civilian flintlocks, trade bells, metals used, types of smoking pipes and their styles, and buttons—to name but a few. As with the vast majority of prehistoric sites, historical archeologists have to deal with the reality of preservation biases. Some extremely important trade items, such as furs, textiles, foodstuffs and tobacco, are not preserved well archeologically and, therefore, are difficult to study through time.

Nassaney points out that Native Americans usually wanted goods that fit within their worldview. They were experienced traders and active consumers looking to their own wishes and needs. When feasible, they pitted the French and English against each other and later, the Americans. Along the Pacific shore the Russian maritime traders also joined the competition for sea otter and other furs.

Native American consumers often used trade goods, or the materials from which they were made, in ways not anticipated by Euroamerican manufactures and traders. For instance, it was not unusual for a native buyer to punch a hole in the top of a sewing thimble to adapt it as a tinkler for attachment to clothing or other items. Cutting up copper-alloy kettles produced material to manufacture tinklers and arrowpoints. Certain tribes on the Plains and in the Mississippi River valley melted down certain

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colors of glass beads in order to fashion triangular glass pendants, which may have been significant, especially when used in certain ceremonies.

On the other hand, some native-made artifacts actually increased in frequency as a result of the fur trade. An excellent example are chert scrapers used for processing hides. As demand for hides grew, more hide scrapers were required. These tools were mounted on wood or bone/antler handles; their working edges were maintained within a proper angle range for scraping and kept with a degree of sharpness that removed fat and connective tissue without damaging the hides as they were prepared. To work most efficiently they could not be too sharp or too dull. The Euroamerican and Eurocanadian traders offered nothing that worked quite as well for this purpose.

Many imported tools traded to Native Americans did offer considerable advantages; metal drills, files, knives, and chisels allowed faster and more intricate work in a variety of materials. Glass trade beads supplied a variety of colors, shapes, and sizes that were unattainable from other materials. Bead selection was tempered by cultural norms, sacred beliefs, and personal preferences. Guns were especially advantageous in warfare and, along with gunpowder, could be procured only from traders. Many more examples could be cited.

The presence or absence of certain types of trade items and/or their quality can inform about status, ethnicity, and gender. Cloth is a good example. Native American women usually made their dresses in original styles. If they selected a foreign style, it was simply because they desired it, not because they were rejecting their own culture.

The remainder of the book focuses on fur trading regions. Through time regional centers shifted: southern New England (as a prelude to English settlement), Northwest Territory, expansion of the Hudson's Bay Company, deerskin trade in and adjacent to the Southeast, maritime fur trade along the Pacific coast, change from beaver pelts to bison robes in and adjoining the Plains. Probably the high point of the North American fur trade took place in the western Great Lakes region, the area that Nassaney knows best and makes the major focus of his discussion.

Starting in the sixteenth century, the North American fur trade thrived for the next 400 years, influencing the history of the United States and Canada. The trade was the focus of cooperative interactions between native peoples and the newcomers. Archeologists have been blessed by the material culture that they left behind. Artifacts and features have given considerable insight into the lives of all those involved in this trade and have helped to flesh out many aspects of the ecological and cultural consequences of their choices. This is especially true for the aboriginal partners, whose history was not recorded. The archeology of the fur trade provides stories about many individuals. Few of their names are known; nevertheless, collectively they had an important impact on America's past.

Whether a reader is new to fur trade research or has been a long-time student of the subject, *The Archaeology of the North American Fur Trade* contains much to commend it. This volume can be obtained from the University Press of Florida, 15 Northwest 15th Street, Gainesville, Florida 32611–2079 or online at http//www.upf.com.

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HICKS	GARY & LOUISE	12105 WESTGATE ST	OVERLAND PARK	KS	66213–2268
HINTZ	PAULINE	211 SHORELINE DR	LOUISBURG	KS	66053–6431
HOARD	ANNA	21350 SPRINGDALE RD	EASTON	KS	66020–7156
HOARD	ROBERT & MARY	6425 SW 6TH AVE	TOPEKA	KS	66615–1099
HOFMAN	JACK	PO BOX 3453	LAWRENCE	KS	66046–0453
HOPE	JOHN	425 STONERIDGE TER	DEFOREST	WI	53532–1151
HOPPER	VIRGINIA	2633 COUNTY RD U	GEM	KS	67734–9024
HORD	CHRIS	413 SE BROWNFIELD DR	LEE'S SUMMIT	MO	64063–6020
HOWE	BRAD & MARSHA	132 S 2ND ST	LINDSBORG	KS	67456–2404
HOWELL	JEAN & BILL	90244 SW 130TH AVE	COATS	KS	67028–9441
HOYT	CRAIG	3350 RD 77	BREWSTER	KS	67732–8912
HUBER	DON	1415 OAKMONT ST	MCPHERSON	KS	67460–1910
HUENERGARDE	JIM	108 BIRCH ST	LIEBENTHAL	KS	67553–5321
ILLINOIS ST MUSEUM	LIBRARY RES & COLLECT CTR	1011 E ASH ST	SPRINGFIELD	IL	62703–3500
JACKSON	DESTRY	817 N JOYCE ST	ULYSSES	KS	67880–8406
JANEIRO	JACOB	15005 CARTER RD	OVERLAND PARK	KS	66221–8212
JOHNSON CO LIB	ACQUISITIONS	PO BOX 2901	SHAWNEE MISSION	KS	66201–1301
JOHNSON	PAUL & ROBIN	2567 23RD AVE	GYPSUM	KS	67448–9022
JULLAN	AUDRA	275 14TH RD	GENESEO	KS	67444–9033
KANSAS CITY PUB LIB.	MAIN LIBRARY, SERIALS DEPT	625 MINNESOTA AVE	KANSAS CITY	KS	66101–2805
KANSAS HERITAGE CTR		PO BOX 1207	DODGE CITY	KS	67801–1207
KANSAS HIST SOC	PERIODICALS	6425 SW 6TH AVE	TOPEKA	KS	66615–1099
KANSAS STATE UNIV	HALE LIBRARY TECH SERV. DEPT	1117 MID-CAMPUS DR N	MANHATTAN	KS	66506–1200
KAUL-HURST	LUCY	1795 E 400TH RD	LAWRENCE	KS	66049–9102
KECK	DICK & CYNTHIA	2709 W 74TH ST	PRAIRIE VILLAGE	KS	66208–3222
KENNEDY	CRYSTAL & SAM	6528 SE CALIFORNIA AVE	BERRYTON	KS	66409–9772
KRAUS	HAROLD & VIRGINIA	977 CHETOLAH GOLD RD	HAYS	KS	67601–9637
KRAUS	KURT & JULIA	3727 S XANTHUS AVE	TULSA	OK	74105–8141
KREISSLER	ALICE	6709 O'NEIL ST	WICHITA	KS	67212–6332
KURTZ	CHRIS	5508-C POMPANO DR	MINNETONKA	MN	55343–8910
LATHAM	MARK	PO BOX 134	PITTSFORD	MI	49271–0134
LEEBRICK	LANCE & BRENDA	16801 RD H	ATWOOD	KS	67730–3129
LEMASTER	LARRY	PO BOX 652	MEADE	KS	67864–0652
LINCK	RANDY	PO BOX 264	HORTON	KS	66439–0264
LINTZ	CHRISTOPHER	14909 DORIA DR	AUSTIN	TX	78728–4460
LOGAN	BRAD & LAUREN RITTERBUSH	3331 NEWBURY ST	MANHATTAN	KS	66503–0303
LOHMEYER	JAMES	607 EAGLE DR	EAGLE	NE	68347–5070
LUNDEEN	GAIL	604 NE SHORELINE DR	LEE'S SUMMIT	MO	64064–1382
MACALUSO	NICK	341 S CARDINGTON ST	WICHITA	KS	67209–1001
MADORIN	KAREN	506 N DOUGLAS	LOGAN	KS	67646–5003
MALCOM	BARRY & JANET	4748 N WYNDAM CIR	PARK CITY	KS	67219–5513
MALLOUF	ROBERT J	5 SIERRA VISTA RD	ALPINE	TX	79830–1012
MASTERS	JUDY	10583 W 181ST ST	BURLINGAME	KS	66413–8672
MATHIEU	RICK & TANYA	204 N CHURCH ST	OLATHE	KS	66061–3524
MAXWELL	MARY ELLEN & RAY	25094 160TH CT	LEAVENWORTH	KS	66048–8369
MCCABE	CAVAN	1104 PARKSIDE CIR	LAWRENCE	KS	66049–0896
MCCHESNEY	KAROL	2220 FIR RD	MUNDEN	KS	66959–8020

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MCCHESNEY	MARC	7905 NW 150TH ST	OKLAHOMA CITY	OK	73142–9783
MCHENRY	SAGE	1008 CRESTLINE DR	LAWRENCE	KS	66049–2607
MCKINNEY	SHARON	3451 SW BRIARWOOD LN	TOPEKA	KS	66611–1832
MCLEAN	JANICE & ROBERT CONARD	1034 WELLINGTON RD	LAWRENCE	KS	66049–3029
MCMILLON	DAVID & PEGGY	36 NW 48 RD	GREAT BEND	KS	67530–9087
MEEKS	JOSEPH R.	DECEASED			
MELTON	BETTY & DON	815 N INDEPENDENCE AVE	BELOIT	KS	67420–1639
MINER	ANN & ROBERT AIKEN	1835 HARVEY AVE	COLBY	KS	67701–1551
MISSOURI ARCH. SOC	MSU	901 S NATIONAL AVE	SPRINGFIELD	MO	65897–0027
MOORE	MARGARET	221 N CAMPBELL AVE	BELOIT	KS	67420–2427
MOORE	TERRY & CAROL	PO BOX 187	ST GEORGE	KS	66535–0187
MOSIER	JOSEPH	1904 TULIP TER	MANHATTAN	KS	66502–4958
MULDER	CLEVE	721 UNIVERSITY PL	SALINA	KS	67401–2574
MUNKRES	JAMES	118 S BERRY	NORMAN	OK	73069–5411
MURPHY	MITCHELL	DECEASED			
MURRAY	KENT & GLENNA	29146 NE 1830 RD	GARNETT	KS	66032–8344
NADEN	MELANIE	4272 EAGLE LAKE CT	BEL AIRE	KS	67220–1719
NANCE	ZACHARY	217 MILL ST	HARTFORD	KS	66854–9418
NICHOLAS	JOE, ADAM, ZACK	10344 CHEROKEE LN	LEAWOOD	KS	66206–2511
NICKEL	CHRISTINE	3638 COUNTRY CLUB PL	WICHITA	KS	67208–3036
NIOCE	MARVIN & BECKY	4023 SW DRURY LN	TOPEKA	KS	66604–2414
O'BRIEN	DR PATRICIA J	501 HOUSTON ST #3	MANHATTAN	KS	66503–6293
O'HARA	LINDA	2523 US 24 HWY	BELOIT	KS	67420–3024
OLIVA	BONITA	3095 F RD	WOODSTON	KS	67675–9004
OLNEY	BRAD	8936 CEDAR LN	PRAIRIE VILLAGE	KS	66207–2218
OLSON	BILL & BETH	203 W COLUMBUS ST	LINDSBORG	KS	67456–1527
OSAGE NATION HPO	DR. ANDREA HUNTER	627 GRANDVIEW AVE	PAWHUSKA	OK	74056–4141
OVERMYER	NANCY	PO BOX 1213	TOPEKA	KS	66607–1213
PAUL	DENNIS	1422 LUTHER ST	EMPORIA	KS	66801–6041
PEARSON	GAIL	501 N WESTERN AVE	BELOIT	KS	67420–1849
PEARSON	GENEVA	710 N MILL ST	BELOIT	KS	67420–2352
PETZ	AL	819 BANNOCK BURN RD	HUTCHINSON	KS	67502–2033
PITTSBURG STATE UNIV	AXE LIBRARY	1701 S BROADWAY	PITTSBURG	KS	66762–5856
PLUMER	VAUGHN	DECEASED			
POLSON	DAVID	15890 GARDNER PL	GARDNER	KS	66030–9669
POWELL	GINA & TIM MEADE	4025 HOLMES ST	KANSAS CITY	MO	64110–1125
RACK	KIM	5113 KINGSMILL RD	LAWRENCE	KS	66047–1897
REED	EVELYN	PO BOX 141	COLDWATER	KS	67029–0141
REED	TERRY & TYTUS	403 S CORONADO	LINDSBORG	KS	67456–2736
REED	MARGIE	2635 DEBORAH DR	SALINA	KS	67401–3567
REXROAD	VIRGINIA	3712 ALDERSGATE APT B	HUTCHINSON	KS	67502–2367
RIGGS	JOE & LAVEDA & WESLEY BURK	214 E GRAND	LACYGNE	KS	66040–0127
ROBERTS	JAMES	1036 ARROWHEAD RIDGE	INDEPENDENCE	MO	64056–1179
ROBERTS	PAUL	PO BOX 201	DENTON	KS	66017–0201
ROECKERS	HENRY	106 PARK PLAZA N	GARNETT	KS	66032–2303
ROECKERS	RICHARD & SHIRLEY	224 E 2ND AVE	GARNETT	KS	66032–1204
ROPER	DONNA	DECEASED			
ROWLINSON	DANIEL & JIMMETTE	2911 SW WHITNEY LN	TOPEKA	KS	66614–4814
ROWLISON	DON	RT 1 BOX 57M	STUDLEY	KS	67759–9326
RUDKIN	JANN & TOM	15000 BLACKBERRY HILL RD	LOS GATOS	CA	95030–7504
RYAN	SHANNON	2715 PONDEROSA DR	LAWRENCE	KS	66046–5157
SAGE	SHARON	9130 SW 97TH ST	AUBURN	KS	66402–9610
SALLEE	KENT	PO BOX 592	INMAN	KS	67546–0592
SALTERS	STACY	2300 SW 34TH ST	TOPEKA	KS	66611–1817
SCHEER	DAVID	5723 S 98TH PLZ APT 2B	OMAHA	NE	68127–3234
SCHMIDT	JANIE & REX	14026 U ST	WILMORE	KS	67155–5437
SCHMITT	KELLY	403 N WALNUT	BELOIT	KS	67420–2445
SHERIDAN	ALAN	656 OLD HWY 40	WILSON	KS	67490–8777
SHIVELY	BARON	823 N ELM ST	MCPHERSON	KS	67460–2813
SMITH	KARL & JANICE	PO BOX 39	FREELAND	WA	98249–0039
SMITH	RANDALL	15264 NW PRAIRIE CREEK RD	NEWTON	KS	67114–8035
SOMMER	VERMA	1024 E 1292 RD	LAWRENCE	KS	66047–9610
SPILLER	JACK & GAYNELL	1601 WATSON ST	EMPORIA	KS	66801–5211
ST HIST SOC OF WISCONSIN	LIB ACQUISITIONS SECTION	816 STATE ST	MADISON	WI	53706–1417
STEIN	MARTIN	PO BOX 1477	CARLSBAD	NM	88221–1477
STELLWAGON	KIEFER	915 W 29TH ST	LAWRENCE	KS	66046–4635
STEVENSON	JENEIZE	305 W WAVERLY ST	NORTON	KS	67654–1731
STIPPICH	JULIE A	1556 N DELLROSE ST	WICHITA	KS	67208–2219
STITES	DEAN & VALORIE	405 W BUFFALO ST	GIRARD	KS	66743–1407
STRICKLER	BRENDA				
STROM	BYRON	632 E DOUGLAS AVE	DES MOINES	IA	50313–4567

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STUBBS	MICHAEL	PO BOX 5040	SANTA BARBARA	CA	93150–5040
SUDEKUM	STELLA	3519 W 48TH TER	ROELAND PARK	KS	66205–1524
SULLIVAN	MELONIE	1720 PRESTWICK CIR	LAWRENCE	KS	66047–2086
SWANEK	ED	12779 HEADWATERS RD	HARVEYVIILLE	KS	66431–9319
TAYLOR	CHRIS ATCHISON CO HIST SOC	PO BOX 201	ATCHISON	KS	66002–0201
TAYLOR	DOUG	308 N BIRCH ST	HILLSBORO	KS	67063–1135
TERRY	TRACY	518 E 25TH AVE	HUTCHINSON	KS	67502–8404
THIERER	JOYCE	2886 N HWY 99 RD R	ADMIRE	KS	66830–9171
THIES	RANDALL	DECEASED			
THOMPSON	ROBERT (DECEASED) & FREDA	817 COLLEGE ST	ATCHISON	KS	66002–3057
THURMOND	J PETER	RT 1 BOX 62B	CHEYENNE	OK	73628–9729
TITUS	REV MARY AL	700 MONTEREY PL APT 506	HUTCHINSON	KS	67502–2248
TRABERT	SARAH	3113 RIDGECREST CT APT 921	NORMAN	OK	73072–7558
TREMBLAY	LELAND	316 N MIDDLE ST	HILL CITY	KS	67642–1740
TUCKER	VITA	7015 W 133RD ST	BURLINGAME	KS	66413–8778
UNIV OF KANSAS	WATSON LIB	RETRIEV SERV DEPT SERL			
		1425 JAYHAWK BLVD R 210S	LAWRENCE	KS	66045–7594
UNIV OF OKLAHOMA	LIBRARIES SERIALS DEPT	401 W BROOKS ST	NORMAN	OK	73019–0001
VEHIK	DR SUSAN	2622 S PICKARD AVE	NORMAN	OK	73072–6922
WAGGONER	TRICIA, DERECK, JACK, CHEYENNE	1416 SW JEWELL ST	TOPEKA	KS	66604–2733
WALKER	DANNY	1687 COUGHLIN ST	LARAMIE	WY	82072–2321
WALLACE	DENISE	6709 N CAMPBELL ST	GLADSTONE	MO	64118–3460
WALLEN	ROSE MARIE & MIKE	116 E MILL ST	LINDSBORG	KS	67456–2815
WALLEN	ANNE	1720 W 22ND ST	LAWRENCE	KS	66046–2724
WALLEN	MIRIAM	1829 2ND ST APT 4	SAN RAFAEL	CA	95901–2656
WALTERS	NICHOLAS	7396 FLUSH RD	ST GEORGE	KS	66535–9405
WARN	DENTON	3405 HOMESTEAD	HUTCHINSON	KS	67502–9669
WATKINS	KENNETH	DECEASED			
WEDEL	DALE	2675 MONROE ST	LARAMIE	WY	82070–6551
WERDER	DOLORES & FRANK	16645 KING RD	VALLEY FALLS	KS	66088–5046
WERNER	NORBERT	2302 POST AVE	DODGE CITY	KS	67801–2556
WESTON	TIM KSHS, SHPO	6425 SW 6TH AVE	TOPEKA	KS	66615–1099
WIECHERT	ALLEN & SANDRA	813 HIGHLAND DR	LAWRENCE	KS	66044–2431
WILDGEN	MIKE	801 LOUISIANA ST	LAWRENCE	KS	66044–2649
WILLIAMS	BARRY & HEDY	1720 NORTH CENTER VALLEY RD	SANDPOINT	ID	83864–7154
WING	EUGENE	9751 PINE KNOLL RD	MOBILE	AL	36608–9239
WITTY	THOMAS	5910 S 91ST ST	LINCOLN	NE	68526–9542
WORKMAN	FRANK	304 MERCURY ST	SILVER LAKE	KS	66539–9607
WULFKUHLE	VIRGINIA A	840 N 1500 RD	LAWRENCE	KS	66049–9195
YARMER	ROBERT E	PO BOX 158	ELLINWOOD	KS	67526–0158
ZEMAN	JODY	PO BOX 322	WAKEENEY	KS	67672–0322
ZOLLNER	ELIZABETH & JOSEPH	637 NOTTINGHAM RD	LAWRENCE	KS	66049–8905

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