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The Kansas Anthropologist

KANSAS ANTHROPOLOGICAL ASSOCIATION

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

Types of memberships and dues:

Individual	$27.00	Subscription	$30.00
Family	$30.00	Life	$400.00
Contributing	$40.00	Student	$5.00

Applications for membership and dues should be addressed to the treasurer at the address listed below. Memberships begin on January 1, and annual dues are payable at that time. Students may join for $5.00 from June through August of each year; this enables them to attend the annual training program, but it does not include publications.

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PUBLICATIONS

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

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BUILDING BUFFALO BIRD WOMAN'S HORTICULTURAL TOOLS

JOYCE THIERER
Emporia State University

BUFFALO BIRD WOMAN'S GARDEN

My favorite way to learn is hands-on, a method that is a little tricky for historians, of course, because literal time travel is rumored to be impossible. However, I do find it easier to imagine the behaviors and choices made in the past when I am immersed in activities as close to those of the past as I can make them. So when I read a Hidatsa woman's account of her gardening tools and saw pictures of nineteenth-century Plains women's equivalents of a pick-up truck, I determined to make these items myself. I also wanted to garden as Buffalo Bird Woman did so that I could understand how each tool worked. The account that follows describes why this historian is involved in experiential, hands-on history and then provides instructions for building three gardening tools—a beef scapula hoe, a digging stick, and a rake with guidelines for using them to create a garden—and directions for building a travois or pony drag. My goal is to share what I have learned, including my accommodations to contemporary culture, so that others who lean toward the kinesthetic can build on my building, and those not so inclined can find enough detail to be satisfied.

BACKGROUND

I always have enjoyed experiencing history as a hands-on activity, especially if it involves horses or agricultural tools. I could blame my interest in old stuff on my family. I grew up in the country, where, unable to afford newer technologies and farming relatively small parcels in a rugged Flint Hills grazing area, we still used my grandparents' and great-grandparents' farming tools. My parents built Mill Creek Museum in our farmyard, encouraging me to live with, if not in, the past and developing my passion for history.[1] I could also blame this interest on my childhood reading—anything and everything about the West, Indians, or archeology. As long as I can remember, I have been interested in material culture, especially objects that, when I was a child, were called "Indian" (Figures 1 and 2).

My fourth grade teacher and I were often at odds. One day I was engrossed in a Landmark book on archeology. I still remember the findings, now outdated, about the daily lives and tools of American Indians. My teacher asked what was so riveting that it distracted my attention from her math lesson. To me the various uses of horses and travois by Plains Indians were far more interesting, so I announced to her and my classmates that I was going to be an archeologist. She expressed doubt that I even knew what that big word meant. So with all the self-righteousness of a wronged child, I explained. Then she crushed my dreams by pronouncing that only boys could be archeologists. She also remarked that I would be lucky to graduate from high school, much less college. When I did get to Kansas State University, however, my interest in the past intensified once more in Dr. Patricia "Pat" O'Brien's classes and digs. (Ha! A woman archeologist!)

In addition to my interests, my preferred learning style is also a contributor to my passion for things archeological. I am a kinesthetic learner and love to handle, manipulate, and analyze things. As a child, anything I could touch, take apart, or put together was in danger of my intense exploration. A passion for horses led me to want to make and use every horse-related item I read about. I cobbled together bows, arrows, lances, and a travois, testing them from the back of my horse. Ah yes, poor Trixie! My most profound rides down the trail of experiential history began in 1960, when at age 11 I purchased an amazingly tolerant young strawberry roan mustang mare. Her early life as part of a wild herd in Montana helped our bonding—she knew a lot, but as a youngster she would have been low in

Figure 1. Author leads the pinto horse named Pepper, using a twisted horsehair hackamore (a type of halter) and lead. Pepper's gear includes a saddle, Hudson Bay trade blanket, and travois.

the herd hierarchy. She was a far better horse than this child deserved. She patiently dragged the first travois I built and suffered spears to be thrown from her back. She taught me much about life, as well as about horses. My Curly dog was another partner, sometimes willingly pulling a dog-sized travois.

In the mid-1950s and early 1960s, reenactment and living history were not yet part of my vocabulary, but I attempted to live the stories I read and those I heard from my parents and grandparents. In spite of archeology's sway over me, though, I did not become an archeologist. Nor did I become a farmer—another option that I seriously considered. Instead I evolved into a historian, having found another way to merge childhood passions and an academic career.

Child and adult, passion and scholarship came together, not for the first time, but in a significant incident in the mid-1990s near Chadron, Nebraska, where I was attending a conference. At the nearby Museum of the Fur Trade my attention was arrested by the sight of a garden near a log house beyond the main building. I walked out to what the museum billed the "Anglo trader's Indian wife's garden patch" near their "trading post cabin." I was eager to learn about American Indian farming methods.

I was disappointed. A very visible green garden hose watered tidy rows of crops. Something other than the method of irrigation was wrong, though. The garden did consist of corn, beans, and squash, which I later confirmed as the traditional "three sisters," so that was accurate, but they were growing in rows. European Americans planted in rows, and American Indians planted in hills. Here, the three sisters were separated from each other in very Euro-American cropping patterns when the corn should have been planted in the center of the hill to support the beans planted around it, and the squash leaves next to the beans would shade the hill to anchor roots and maintain moisture.

Suddenly I was full of questions. I morphed into one of those dreaded museum visitors who asks sincere but tough questions. To make it worse, that day there were only volunteers to put on the

Figure 2. Twisted horsehair hackamore and lead strap with chemically tanned leather knotted ties was used to lead Pepper.

spot. Fortunately for me, even though I could not find out whether this garden was supposed to interpret Euro-American or American Indian practices, someone directed me to the gift shop for a book that made a significant difference in my research. First published in 1917 as and reissued in 1987 as , this is 's (Buffalo Bird Woman's) story, as told to ethnographer Gilbert Livingstone Wilson in sessions from 1912 to 1915, with her son Edward Goodbird acting as interpreter.[2] This delectable primary source contains not only Buffalo Bird Woman's words, but also photographs of her, her tools, her garden, and the village. All this data is enhanced by wonderful line drawings created by Frederick Wilson (Gilbert's brother) and by the Wilson brothers' careful measurements of Buffalo Bird Woman's tools.

Generally I enjoy the jolt that comes when a serendipitous find reconfigures one of my paradigms, and that was true this time. I felt like a kid again. It was as though I were seeing agricultural hand tools for the first time, and I approached familiar objects with renewed wonder. I immediately yearned to make tools like Buffalo Bird Woman's, but the book presented less description about the construction of the tools than about their use. I must confess that this became an obsession. Could I make tools like hers, and would a garden like hers grow, unwatered, in east-central Kansas? The short answer is "yes."

THE HOE, THE DIGGING STICK, THE RAKE, AND THE TEST

Most of my reading to that point had been about tools used by men for fighting or hunting because most of the authors were male. I always had been more interested in agricultural history and women's history than warrior sagas. Now with Wilson's book I had both! I read about Buffalo Bird Woman's life and tools in the car on the way back from Chadron. When I got home, I located my copy of anthropologist Robert Lowie's (1954) , which I had read as an undergraduate. Written in 1954 to interpret the American Museum of Natural History's collection, the book includes brief sections on women's tools. I put Lowie alongside Wilson and began the comparison process.

While I was gaining insights into Hidatsa life and agriculture, a fresh enthusiasm for the subject matter overcame me and merged with my academic research interests. When my grandfather, George Thierer, was a young farmer, he found a scapula shaped like a hoe almost washed out of a creek bank on our Flint Hills farm near the site of a former Kanza village and field, according to family stories. As a child I had handled the bone blade with awe. Somehow family members knew that the scapula was a hoe. It became part of family lore,

an imminent linking of our people with those who came before and, in fact, had overlapped for a brief time in their use of the land. Later my experiences with various "Indian finds" on our family farm were similar to archeologist Janet D. Spector's fascination with a woman's awl unearthed in a site that she was investigating. Her professional charge was to find information on and describe the awl, but for her that was not enough. She also wanted to speculate about its origin—who had made it, used it, and lost it—and she did so in a splendid book, (Spector 1993). Her work resonated with me, and like her I not only wanted to make those tools and plant a garden, but also wanted to think about the women who made such tools and planted such gardens a century and more before. And I did.

The Hoe

First I made the hoe. I thought of the scapula hoe both as the beginning of my quest and potentially as the culmination. I examined authentic and recreated hoes at the Kansas State Historical Society, the Smithsonian's National Museum of Natural History, and several other Great Plains collections of American Indian tools. I dreamed about it and talked about it until one day a friend of mine, who is also of the kinesthetic persuasion, suggested that I quit talking and do it.

Any such process begins with making lists of materials and gathering them. I propped Wilson open to page 12 and Lowie open to pages 19-20, only to discover that Lowie was citing Wilson without mentioning the title of Wilson's book. In other words, he wrote Buffalo Bird Woman out of the story, making Wilson, rather than the gardener herself, the expert. Nevertheless, the illustrations in either of these books will be most helpful if you want to build a hoe. You can get along with my illustrations, but I hope that you are inspired to add both of these books to your library—or to borrow them from a public or university library.

Even with such seemingly simple objects as a hoe and a digging stick, there are times when there is not enough written information and a gap exists between the words and understanding. I found myself trying to use common sense and deductive reasoning to ask what another woman would do with the resources at hand at that time. I also reminded myself that no two hoes would have been alike for a myriad of reasons. Whether my creations are "authentic" or "correct" can always be argued, but I am sharing with you the problems I faced and the solutions I chose. Yours may be different. My first goals were to find out if a sturdy hoe could be made to look like the illustrations and to try it in a garden, testing if it would accomplish the tasks for which hoes are used.

materials that go into a hoe	rawhide
	scapula
	wood
tools needed when the materials have been assembled	something to cut with
	container of water
	tree limb pounder
	tree with a notch

A woman whose family hunted deer for meat and skins gave me a raw hide—a skin that has been scraped clean on both the hair and meat sides but has not been tanned. Ties made of the rawhide hold the hoe's blade to its handle (Figure 3). Practice on a small piece from a scrappier area of the rawhide by cutting a circle the size of a coffee cup rim. Starting at the outside, cut evenly about a thumbnail's distance from the last cut and continue cutting in a spiral to the center (McPherson 1993:Chapter 1). I used a metal knife because I was trying for authenticity for Buffalo Bird Woman's era, but metal scissors were also trade items and likely were used by some women (Gillman 1982). Work with scraps until you feel comfortable with the process and then cut a circle about the size of a large dinner plate from one edge of the hide, leaving room for at least two more circles of the same size. Beginning at the outside of one of the cut-out circles, cut around and around, spiraling toward the center to create a long strip. You will need at least three long strips of rawhide. Be very frugal with the hide—a common lament today is that you never have as much rawhide as you wish, and I speculate that this was true in the past.

Figure 3. In this picture the hoe materials are laid out on a deer skin: rawhide, cut strips of rawhide, scissors, beef scapula, ash handle, rawhide ties.

Wilson (1987:12) states that "the blade is made of the shoulder bone of an ox." By the late nineteenth century the Hidatsa were living on a reservation, and the bison that Buffalo Bird Woman's ancestors would have used were no longer available. An ox or an adult steer (castrated male bovine), bred for size to pull a plow or a wagon, would be the logical second choice. In 2001 I had to settle for a smaller beef scapula, although now, because bison producers have proliferated, I suggest that you contact one to obtain a fresh or "green" buffalo cow scapula. (A dry bone that has been lying out in pasture will crumble on use.) And buy some meat while you are at it because you will need your strength. I was told by several local butchers that raw bones cannot be sold due to health risks, so I called the nearby meat packing plant. After numerous calls and much explaining to people at various levels in various departments, I ended up listing Ride into History, my historical performance touring troupe, as a living history site, which somehow smoothed the way. Eventually I was passed two bloody scapulae in a plastic bag and told that this was a one-time deal—one of those events that officially never occurred.

Fresh bones should be stored in the freezer until you are able to work with them and then let them thaw at room temperature. A "green bone" is malleable and flexible, with a somewhat oily or gristly texture and feel. You can score and mark green bone with a flint knife or chip, but a dry bone is more brittle and virtually impossible to score, like trying to cut hard wood. My 2001 hoe made of this green bone is still in 2012 slightly oily and not at all like a dry bone.

Buffalo Bird Woman remembered her grandmother's bone hoe as having the spine of the scapula, the ridge that is perpendicular to the flat portion, cut off and the area smoothed (Wilson 1987:105). On the other hand, when Buffalo Bird Woman and her son Edward built a hoe for Wilson, they left the spine on, and I, too, opted to do the same. In my experience the spine is best left on because it serves as a brace, as well as matching Wilson's (1987:12) illustration of Buffalo Bird Woman's hoe. I did attempt to cut the spine from one scapula but gave up after my metal knife made only shallow marks before dulling. A flint chip did better, but after 30 minutes with little progress, I determined that I would commit to keeping the scapula intact. (Later someone told me that the bone for one museum replica was altered with a band saw.)

The handle for my hoe was crafted from a live green ash tree with the sap still flowing, making the bark supple and easy to remove. I selected ash because I knew that its wood was desired by American Indians for the same reasons we choose it today:

it is hard but light in weight with tensile strength. Weight is a key factor because a hoe can get very heavy as you use it. Tensility is important because a bit of give in the handle is more ergonomic. (This characteristic is missing in some of the woods used in modern hoes.) Each geographical area supplied a variety of trees to American Indians, so expect some variation in your particular eco-region.

I looked for a grove of densely growing saplings to find a tree that was slender and taller than I with few branches (the more branches, the more knots, the less suppleness or springiness). The scapula attaches to the wood from the base end of the tree limb, and the upper part is where your hands will hold the hoe. Encircle the tree with your thumb and forefinger at about waist height, as though gripping it. A gap of about an inch between your thumb and forefinger will make the handle comfortable to hold. It was worth the time to find the right tree. I considered my time selecting materials as shopping in Mother Nature's hardware store. I tried to think as women before me may have thought. I think this is an important part of the honoring process in such an endeavor as recreating American Indian tools.

With an ax I felled the tree, smoothed the bottom, and limbed it. Next I measured it from the ground to my ear by hugging the tree on one side of me, standing it up with the base on the ground and using a knife to mark it at ear height. This method will make the hoe just the right height for the gardener (Figure 4).

My tree that was tall enough to use the lower portion for the hoe handle and the upper portion for my digging stick. I noted the dimensions of the digging stick specimen that Wilson (1987:12) described (more on this later), used my metal measuring tape to get the right length, and cut accordingly with a saw. Subsequently I bemoaned the fact that I had not used authentic tools and processes for this step. So I suggest instead that you wedge your newly cut tree at an angle in the crotch of a tree, serving as a vice where the tree and a branch join at a tight V, with the base/widest part on the ground. Score the cut tree repeatedly (cutting around it from the outside with a knife), being sure to cut deeply. Apply pressure against the pole. If you have scored the wood deeply enough, it will break where you want it to. If you break it too short, you will have to find and cut another sapling.

Figure 4. Author sizes finished hoe on left and finished digging stick on right.

I also used the crotch of a tree to hold the sapling while I removed its bark, standing with my knees and feet steadying the pole as necessary. It is important to work while the wood is still green because, as the bark dries, it shrinks and stiffens, making the task much more difficult. I used a metal knife to peel off the bark. I also tried a flint chip. They both worked equally well, and both needed the same amount of sharpening. Remember that after the initial cut, you are no longer cutting but sliding the knife under the bark and between the white line of the tree's thin cambium line and the harder wood core. Peel or skin the bark off, much as you would an orange, creating a long strip of bark that you draw toward your body. These strips make great tinder for starting fires, so dry them for your flint and steel practice.

Smooth the handle to prevent blisters and splinters while hoeing. Although the bark must be

removed from the entire pole, only the gripping portion of the hoe handle needs smoothing. Again, this should be done while the wood is damp. With the pole still braced and held by the crotch of the tree, hold the knife in both hands, draw it toward you, cutting with the grain, to remove rough spots. A coarse rock acts like sandpaper and also works well. Buffalo Bird Woman's grandmothers likely did not have access to sandpaper or a bit of glass to smooth the handle.

Now that I had a cow scapula for the hoe blade, an ash sapling trunk for the handle, and rawhide strips to hold them together, it would seem that the end was near. First, however, I had to figure out how Buffalo Bird Woman and other women secured the scapula to the handle in a way that did not need constant attention, to withstand the force of hoeing. The tree had to be split to accept the blade, but not so that it split its entire length. I found this step difficult, and before the process was complete, I was yearning for modern tools.

The wider end of the handle would hold the blade. With the small end of the pole still braced in the crotch of the tree, but repositioning it as necessary while I worked, I measured the sapling from my elbow to the end of my middle finger. At this point on the sapling, I tied one of my long rawhide strips, now wet and stretched, around the handle, crossing the ends and wrapping a second time, letting the long ends dangle. (I would split the sapling down to the leather and wanted it to go no farther than that, or I would have to start all over again. Don't ask how I know.) Using a sturdy hunting knife and a strong stick about 18 inches long and comfortable to hold for a pounder (the cut-off lower part of the ash, for instance), I began the splitting. The first few hits caused the knife to bounce, but I found my groove and follow-through, and once the knife blade entered the wood, the pace picked up. I suggest that you hit the knife on one side of the handle, and then on the other, so the split is even. It is very much like splitting a log for a fire, but instead of using a maul and wedge, you are using the smaller piece of wood and a knife. The last few inches go very quickly, so check often because the wood must not split beyond the tie. If the entire handle splits, it is back to Mother Nature for another sapling. The split may not be wide enough to accept the scapula, in which case tie another strip a little lower on the handle and undo the first knot before further splitting.

Do a test positioning of the scapula into the handle. Find another sturdy green tree limb that fits the dimension of the scapula and slide it in. Keep sliding until it wedges securely, inserting so the longer ends protrude on either side of the handle. This functions as a bracing wedge between the scapula spine and the handle and prevents the scapula from twisting as the final ties are made. Mark the protruding ends of this limb with a knife. Cut off the excess while retaining the new brace where you can access it easily once you are ready for the final ties. I did not see such a brace in the illustrations of Buffalo Bird Woman. However, I could not figure out any other way to keep the scapula braced without this small wedge, and I found that such a wedge was needed for the scraping hoe to function properly in the garden.

You will need another person for the wrapping and tying. In my experience four hands, four feet, and one tree were barely enough to hold everything at the right angle. Soak the three rawhide strips, including the tails of the strip already tied onto the handle. Note that you will tie three separate strips. Wring out the excess water, pulling and stretching the rawhide until it is at least double, maybe triple, its original length. How far? You will know by the feel—it just stops feeling stretchy. Do not pull so hard that it breaks. It is a good idea to practice first with your coffee cup-sized practice spiral, your practice rawhide. Each hide is different in thickness, and this affects the tensile strength of the string created. Hang the now stretched and still wet rawhide strips where you can easily reach them as you prepare to make the ties. Hint: Keeping these rawhide strips wet now will help with the later wrapping, and pulling the leather tight is crucial to ultimately keeping the scapula blade in its proper place.

Position the scapula and insert the small brace again, preparing for the final steps. Arm strength is required to wedge the brace carefully and securely between the scapula's spine and the handle. While one person positions and holds the scapula in place with her hands and the base of the handle with her feet at a slight angle, the other stands on the opposite side of the holder and inserts the brace between the scapula and handle, watching that her fingers do not get pinched. The holder should try to hold the

handle out from her body to aid the one who is inserting the brace and later doing the ties. Carefully remove or tap out the other wedge or knife blade previously used to hold the split open; thus, the split is now held open by the scapula and the bracing wedge. Hold the scapula to keep it secure and in position as you remove the other wedging devices. If something slips or falls out, repeat the steps and learn from what the mistakes.

All I can advise here is patience. It took my helper and me several tries to get everything positioned. The holder's entire body almost hugs the hoe to keep all the angles right for the duration of the tying process. The other person proceeds to make the appropriate ties with the wet rawhide. My respect for American Indian women, already high, increased immensely at this stage. I also longed for an elder to teach me!

The first tie is around the scapula and the handle, ties crisscrossing each other to hold the scapula in place. I used the tails of the first knot on the handle for this. I tied square knots. The second tie braces the "V" formed by the angle between the scapula and the handle. This is fundamental to the physics of the hoe. Look at the angle of any garden hoe, and you will see that modern manufacturers still use this angle. For this brace, loop the middle of a rawhide strip around the blade and twist the two strips around each other. Twist like a tourniquet, using a small stick along the back of the hoe handle to increase the tension. Twist as tightly as you can and carefully tie it off. This tension is critical to a quality scraping hoe (Figure 5).

The end piece is the third and last tie. This wrapping ties the other side of the split handle tightly around the scapula and acts as a clamp. As you tie, continue to stretch the leather strips and tie tightly because, as the rawhide dries, it shrinks and tightens. There is also a bit of glue in the hide that helps the tie stay where you put it. If it moves, moisten the leather, loosen the knots, and repeat the above process. Warning: If the hoe ever gets too wet, your rawhide will fall off, and you will have to retie everything, so watch out for sudden thunderstorms. I suggest that you use square knots. Remember to keep your rawhide wet as you work. It is almost as though a rubber band were holding all of the parts together.

The final step is really the hardest one yet. Wait while the rawhide dries thoroughly. How dry? When you strike the bracing with your thumb, it sounds like a drum. DO NOT use the hoe until it does. I can testify that if the leather is the least bit damp, the tool falls apart, and the tying process must be redone. The good news is that, as in everything we try, it becomes easier with repetition; however, it might be more difficult to persuade that kinesthetic friend to wrap her body around your hoe the second time around.

Once my hoe was made, I felt proud—and curious to learn if I could make the other tools. Take

Figure 5. Finished hoe rests on a wool trade blanket, showing the configuration of rawhide ties.

heart, if you followed the instructions, because the hoe is by far the hardest to make, and the tools and materials needed for the digging stick and the rake are readily available.

The Digging Stick

The digging stick was much easier to make. Not coincidentally, it is considered by many to be one of the first human-made tools, created by gathers and foragers and later adapted for use in planting domesticated crops.

Select a sapling trunk and cut it the right length, using the skills and steps used to make the hoe handle. Start a wood fire. (It is crucial that this fire will reach its height as you finish fashioning the digging stick.) Strip off the bark as for the hoe handle. Rest the larger end in a tree notch and the smaller end on a log. From the smaller end, measure up about a hand's length from wrist to fingertip. At this place use an ax to make an aggressive whack into the side and downward to create a one-sided extended wedge, rather like a finger with a very sturdy nail extending beyond the finger itself (Figure 6). Practice on another tree trunk until you feel comfortable and then cut the wedge. Otherwise, repeated cuts on your selected wood will make the stick too short for effective use. Do not make a pencil-type point because this will easily break as you work to loosen the soil, and it is not as efficient at levering.

At the fire seal in the tree's sap and harden the stick's point. Do not burn the wood; rather rapidly sear the sap out of the green wood point in the flame. There is no need to harden the whole stick, only the point. It will be strong enough to pry numerous holes in the garden. Warning: When using, do not jab or pound the ground with the digging stick as if putting in postholes. Hold it vertically on the dominant side of your body. Place your dominant hand (the hand you eat with) on the very top and with the other hand reach across the front of your body at waist level. Now bend your knees, shifting your weight onto the stick. The stick will sink into the ground. When it stops, rock it circularly, keeping the point in the center and loosening the soil in a cone shape. Lightly pry to widen the hole. Think of the digging stick as a wedge that becomes a lever as it pries the soil loose. The motion becomes easier with practice. Switch hands and sides as you tire. offers the best illustrations and dialogue about how to dig hills in the garden and other uses for the digging stick (Wilson 1987:12). See Wilson's discussion on planting throughout the book for more hints on the use of the tool.

The Rake

I did not try crafting the handle rakes that Wilson (1987:14) and Lowie (1954:19) described. In spite of my aversion to leaning over, I chose to make a handheld antler rake, anticipating that I would not

Figure 6. Leaning an ash limb against a tree, the author demonstrates how to remove bark using an old trade hunting knife. Note the fire-hardened point.

use a rake often enough to justify the time and energy involved in attaching the antler to a handle.

Select an antler to use as rake, considering the three-pronged metal garden tool sold today. The best style to work the soil is small, lightweight, three-tined, and dramatically inwardly curved, looking like three fingers curled into a claw (Figure 7). The bigger the antler spread, the heavier and harder it is to use. I found some antlers shed by deer, and hunter friends supplied several of the preferred odd style—not the kind typically desired for a trophy.

I have found this antler superior to any metal handheld rake and consequently often use it in my other gardens. I think that most of our garden tools have evolved from bone and wooden tools of the past. Look at the styles and shapes—form follows function, and materials are those around us.

Testing the Tools

Now that I had my basic tools (Figure 8), I began to test them in a real garden plot. The digging stick worked wonderfully to loosen the soil so that I could drag it into mounds with the hoe. I soon found that metal hoes and bone hoes are used very differently; in fact, the function of a bone hoe was to scrape the soil, not to break it. I recalled that my Anglo grandmother had a hoe for just this purpose—to create mounds. She called it her scraping hoe. When I tried this, walking around the hills as she had done, it worked. Remember: Bone hoes are not designed for heavy impact but for scraping earth.

The antler rake, too, worked well to loosen the soil. Mostly I had to change my thinking to adapt to the new tools. Working with them was very satisfying, and they functioned well when used as Buffalo Bird Woman told Wilson she had used them. They do not slice the earth quickly like metal hoes but rather encourage meditation, coaxing the soil and working with it to provide food.

THE GARDEN

As I made the garden tools, which was my original project, my desire to test them grew. Would the tools really work? How much success would I have if I planted Buffalo Bird Woman's "three sisters," corn, beans, and squash, in hills as she had? I had to find out.

Figure 7. Deer antler rake on a wool trade blanket.

Inevitably there would be differences between Buffalo Bird Woman's gardens and mine. By Buffalo Bird Woman's time, the Hidatsa people lived and gardened in what is now North Dakota, while I live in east-central Kansas with different growing conditions. Nonetheless, I decided to follow her instructions closely, and I advise you to do the same by using the instructions in Wilson's (1987) book.

I decided to plant three small test plots, holding climate and soil constant among the three. In the first plot I would plant heritage, open-pollinated (not hybridized) seeds in hills, as described by Buffalo Bird Woman. The second plot would be 1930s style: open-pollinated seeds in rows. The third would consist of contemporary hybrid seeds in rows but without irrigation. In each I would use the tools appropriate to the era.

Seed Seeking

I used standard seed catalogs only as a source for the third (modern) plot to select hybrid seeds, modified for contemporary gardening methods—single-crop rows and irrigation, for example. For the other two plots I needed heritage seeds.

I had researched open-pollinated seeds before, but now I became more specific as I sought seeds as close as possible to those Buffalo Bird Woman would have used. I wanted to find organizations and people who were dedicated to growing the older types of plants and maintaining the quality of heirloom seeds by selecting seeds from the best plants each year to improve generations of plants the following year. Hybrid seeds, on the other hand, are

Figure 8. Artfully arranged on a wool trade blanket are the tools needed for planting: scapula hoe, buffalo rib that serves as an arm extender to loosen garden soil, digging stick, buffalo femur for pounding, antler rake, gourd bowl holding bean seeds, and buffalo scapula shovel.

not fertile, so require new seed purchases from a seed dealer each year.

I turned to the Internet, using the search terms "seed savers" and "heirloom seeds." Further narrowing the search by state, the results show local farmers for that region. Using "Buffalo Bird Woman's garden" as a search term results in a list of sites, as the Wilson book is the foundation for many others' work. Likewise, entering "Rocky Mountain Land Library" as a search term leads to seed information and other useful books, such as *Native American Ethnobotany* (Moreman 1998) and *Enduring Seeds* (Nabhan 1989). I also consulted Suzanne Ashworth's (2002) book *Seed to Seed: Seed Saving and Growing Techniques for Vegetable Gardeners*, which contains a list of seed sources and regional information, as well as other information useful for beginners and experienced gardeners.

I ordered seeds for the first two plots of my test garden from Seed Savers Exchange (www.seedsavers.org). From the selection of beans, I chose Hidatsa Shield OG (OG means organic); planting instructions were provided. I also chose a variety of Pueblo Beans and a running bean variety. From the squash/pumpkin family I selected a butternut and a summer squash. From among the corns I chose a Pawnee Corn and the Mandan Bride variety. (I also suggest the Cherokee Trail of Tears bean, Arikara Yellow and Painted Pony corn types, and Cheyenne bush squash. All of these are adapted to the Great Plains.) The seeds are more expensive than those purchased locally, but the initial investment is small considering that collected seeds from the fruits of this year's plants will be used next year—for free!

Planting the Garden

I carried my copy of *Buffalo Bird Woman's Garden* out to my plots. Buffalo Bird Woman was the expert, and I followed step-by-step what Wilson transcribed in the book. As she suggested, I planted sunflowers in a row along the south side of two plots to break the harsh winds that would have burned the gardens. I previously had harvested dried sunflower seeds from my pasture, using Buffalo Bird Woman's method. Sunflowers serve as a wonderful wind block, and I am convinced that they saved the three sisters and 1930s gardens. I did not plant sunflowers for the contemporary garden, so I am not sure if they would have helped.

Next I prepared the soil in the first plot for the three sisters. One of the hardest tasks was to think in circles instead of straight lines. I started working spirals with the digging stick to loosen the soil. The process felt alien to me, a farm woman who always had been judged by the straightness of her rows. I actually used a measuring tape to see if I were following Wilson's translations of Buffalo Bird Woman's directions, and afterward I felt foolish. After the fourth circle the patterns and logic started to feel right, if not to make sense. In fact, to make the learning process easier, I suggest that you let go of Euro-American planting standards as you loosen the soil, scrape it into mounds, and plant the seeds—the corn on the hills, the beans outside the corn on the sides of the hills (to climb up the corn), and the squash or pumpkins between the hills (to shade the soil and retain moisture). For me with time and practice, the use of the digging stick—create a spiral circle, step, repeat—became a meditation, and I found myself very much in connection with nature. The process involved a lot of leaning, causing me to shift my perspectives. It became an immense pleasure not only to feel the soil in my fingers, but also to feel my mind shift to another time.

All of the tools worked as they should, which was, to be honest, a very pleasant surprise. Reminder: If you use your scraping hoe to chop, you will have to lash the bone on the handle all over again.

Tending the Garden

The North Dakota growing season is similar enough to that of Kansas and heritage seeds were more available, so I followed Buffalo Bird Woman's planting and weeding schedule, as well as her methods. In Plot 1 I planted the seeds as directed by the notes that Wilson (1987) made, but I used no water on my test plots.

In Plot 2 I copied what I recalled of the methods of my two grandmothers and my mother. At the Mill Creek Museum in 1961-1982, I helped my mother demonstrate the techniques of 1900-World War II. Plot 3 was grown using current garden tools and seeds but minus the intensive watering that these hybrids require to thrive and produce.

The Harvest

As I anticipated, the American Indian-style garden did the best, then the 1930s-style plot, while the plants from contemporary seeds dried up and died. Admittedly I would have starved had I been dependent on any of these gardens for my food, between what little I produced and the raiding raccoons. However, this was meant to be a learning experience, and I harvested exactly what I wanted: knowledge and enough seeds to encourage me to try again the following year (Figure 9). What else could an experiential historian want?

Plan your size of scale and seed purchases for your first year according to your own goals. Press onward each year as you learn from your mistakes, and you soon will grow more food and also come to the realization of how much information we have lost over the generations. Good luck as you try new ways of doing and seeing in your own garden. It is very satisfying to use these tools and to see the plants grow.

THE TRAVOIS TO HAUL THE HARVEST HOME

A travois, also called a pony drag or dog drag, is a wooden structure used to transport goods between distant locations. As its French name implies, one end of the frame is at the shoulders of the horse or dog, while the other end drags on the ground. In between is a basket-like platform. It is a very effective means of wheel-less transport—or when the terrain is too rugged for wheeled transportation.

There are three basic decisions to make. First, which four-legged animal will be hauling your load—will you partner with a horse or a dog? In describing the steps in building a travois, I presume the involvement of a horse, but the basics apply to

Figure 9. Deer antler rake, air-dried gourd bowls and dipper, buffalo femur pounder, ears of corn, buffalo scapula shovel.

	Plot 1	Plot 2	Plot 3
Soil preparation	Buffalo Bird Woman's replica tools	1930s eye hoe with deeper blade	metal garden hoe and shovel
Seed selection	Hidatsa shield bean	Hidatsa shield bean	hybrid varieties
	Pueblo bean	Pueblo bean	
	running bean	running bean	
	butternut squash	butternut squash	
	summer squash	summer squash	
	Pawnee corn	Pawnee corn	
	Mandan Bride corn	Mandan Bride corn	
Planting method	hill	row and hill	row
Watering	none	none	none
Tending	few weeds; better soil moisture	more weeds; dryer soil	many more weeds
Harvest yield	handful of seeds to store for next season	handful of seeds to store for next season	nothing to harvest or store

both. I have built both dog and horse travois, and divergences in technique for a dog are noted.

Second, what type of load you will haul? This determines its complexity. To haul camp gear, you can lash it onto 2 to 4 cross poles, using only 8 to 16 rawhide strips. But if you wish to carry the harvest from the field, you will need willow wands or young dogwood saplings woven through the cross poles and the commensurate rawhide strips to secure them.

Third, are you building for a one-time use or will you want to reuse the travois? In the first case the bark need not be stripped from the poles. For reuse make the travois as invulnerable as possible, including removal of the bark from all of the poles (more on that below).

Hoe-making skills transfer to making a travois. You know how to cut saplings and peel the bark and how to make rawhide and use it as ties. For a

travois you will create two long drag poles and tie cross poles to them with wet rawhide. Whether you make your travois for a dog or a horse to pull, the method is the same; the difference is only a matter of size and scale.

A cooperative horse or dog is essential. In my experience it easier to convince a horse than a dog to cooperate in this experiment because horses are more accustomed to standing still while people do silly things with them. On the other hand for most people, a dog is more readily available, so do what works for you. When I was a child, my first dog Curly was a willing large old mutt who patiently tolerated a travois, probably because he was from working lineages. The canine buddy I use now started as an eager-to-please pup. SunKa, a Border Collie-Blue Heeler rescued from a shelter, was selected in part because he resembled the dogs in nineteenth-century photographs of American Indians and because he was intelligent and an extrovert. He assumed that pulling a travois was part of our early games, and he knew that work was play. Likewise I partnered with my pinto pony, rather than my larger horses, when it came to travois-pulling because he was patient and looked the part (Figure 10).

You will need a lead or leash to help you control the chosen draft animal and something to secure to the animal's body that will provide a place for attaching the travois poles. With my pup I cheated; because he was growing so fast and I had limited access to rawhide, I purchased an adjustable web harness at a local pet store. For my horse I have an accurate reproduction of an American Indian woman's saddle.[2] A hook in front of and under the horn was created for attaching a travois. I also successfully used my horse travois on a regular western saddle with a good pommel and horn.

There are two basic parts to a travois: the long poles that support the platform and attach to the means of locomotion and the woven platform on which the load rides. The first step is to take measurements. Although instructions below are for a

Figure 10. Author and Pepper with travois are ready to haul the harvest home.

horse, the same procedures work for a dog. Ideally you will have at least three other people to help, and avoid measuring on a windy day when it is difficult to hold the measuring tapes in place. The old adage "measure twice and cut once" is especially critical if you have limited access to cottonwood trees. Measure the horse and measure it again and carefully again, using two long tapes. The measuring tapes are stand-ins for your future drag poles. Helper #1, holding the horse's head, should be aware that the horse may not respond positively to sudden tape-measure noises, so acquaint your horse with those sounds before you begin. Helper #2 will hold one end of each of the two tapes at the pommel and horn area, while you and Helper #3 adjust the tapes until the proper angle along the horse's body is achieved between Helper #2's ends and the ground. Visualize an X made of four marks; the top two are very short, and the bottom two are very long. That translates to the X crossing at the pommel immediately in front of the saddle horn with only about 2 to 3 feet of each pole in the top of the X. The poles must drag a goodly distance behind the horse and in a way that does not pinch the sides of the animal. Record the measurements, adding at least 2 to 3 feet in front of the pommel and horn to your overall measurements. Measure the total length again.

With the two measuring tapes still in place, use a third tape to measure the width of the top of the platform area. To do so, choose a spot along one of the two tapes at least 1½ feet beyond the horse's tail swish. Measure across to the same point on the other tape. This measurement plus about 2 feet will be the length of the top platform cross pole, thus 1 foot on either side of the drag poles. Measure for the bottom cross pole, again adding about 2 feet to the total. The pictures indicate that there is no one specific place for this bottom cross piece. The number of cross poles and their placements are determined by the terrain, clearance, and type of load. Therefore, transport through tall grass will require much more clearance to reduce the drag and thus the horse's fatigue. If, however, the travois is for demonstrations or use in mowed areas, choose a point a foot or more above where the first measuring tape meets the ground.

To determine the number of cross poles for the platform, decide what kind of loads will be carried. For hauling corn, measure up from the ground at least 12 inches and from pole to pole. This will be the length of the bottom cross pole. The other two cross poles will fit between these. Add at least 6 inches to the end of each cross pole to be sure to have enough to lash onto the main poles. For a dog everything is scaled down, but the same angles apply, with the tie made over the dog's shoulder blades and the X over its neck.

Write down all these measurements. Yes, that is very Euro-American. Later if you make more travois, you will be able to spot and eyeball your measurements.

For the long drag poles I searched among closely growing cottonwood trees for long, straight saplings with few branches, smallish in diameter yet tall enough to meet the length requirements. Think lodge poles or a stair rail in diameter. Young cottonwood trees have flexible tensile strength and were and are still readily available in Kansas, thus my choice of cottonwood. Choose saplings that are substantial but supple; if too narrow, the poles will break. The trees should be at least 12 feet long. You can always shorten them. I used an ax to fell the young trees and limb them to make two long drag poles. While in the midst of the cottonwoods, I secured tree limbs or other shorter cottonwood saplings for two to four cross pieces to attach by rawhide to the two drag poles.

For repeated use the next step is to peel the bark off the drag poles and cross poles, as you did for the hoe handle. Bark left on encourages rot and over time slips under the knots, which causes the entire travois to loosen. If, however, the travois is for a single harvest or event, leave bark on in the interest of time—just be sure to explain your shortcut should anyone show interest in creating one of their own.

Wet rawhide strips tie all these parts together, as described for making the hoe. You will need one sturdy strip one knuckle wide (1 inch or so, as leather tends to cut irregularly) about 3 to 4 feet long (depending upon the hide), another one-knuckle-wide strip about 2 feet long, and numerous fingernail-wide strips to function as ties for as many cross pieces as will be used. The rawhide strips must to be soaked and stretched. The number of strips needed, and whether or not willow wands are required, is determined by the style of travois, which in turn is determined by what will be transported.

Assembly of the travois is easier with help—three or four people make this process easier and, yes, more fun. While Helper #1 holds the horse's head with one hand, Helpers #2 and #3 each pick up a long pole and, with the smaller end toward the horse, drag the pole over the ground and up along either side of the horse with the goal of creating an X as with the measuring tapes. The animal's body dimensions will not allow the X to be at the pommel area; the X will be skyward and above its neck. With the crossing of the smaller pole ends, note the area over the pommel and horn area, as the dimensions of the horse will affect this, and with the real X crossing about 2 or so feet closer to the horse's head. Adjust the drag poles carefully along the horse's body so as not to rub or gouge its sides or flanks. On both poles mark the crossing point near the pommel with a knife to show the location of the key tie, which will take the bulk of the pull or drag weight. Reach up to where the X overlaps and mark another place for a tie to keep the foremost part of the poles from separating. (This is where you will tie a square knot later.) The pommel area strap is critical, as this is the point of maximum pull (Figure 11). While one person holds the poles in place over the saddle, another walks to the back of the horse, positioning the poles so that there is no contact with the horse.

Pick up one of the prepared cross poles and place it at least a foot beyond the horse's tail, so it can swish without getting caught, thus avoiding potential accidents or at least a cranky horse. Mark with a knife where the ties will be made. Proceed to the area about a foot or more above the ground. Again, place the cross poles and mark. Remove the poles from the horse for ease of assembly, lay it back out on the ground, aligning all the marks, and tie. If your horse is docile, continue tying cross pieces at the marks rather than lowering the travois to the ground, making adjustments as you go. For my first travois I used a saw horse instead of a real horse as I worked, propping the crossed end on the "horse." This saved my back and made my helpers less grumpy than working on the ground.

The primary pressure point is on the key knuckle-wide long strap of rawhide that rests on and over the pommel and slides back against the horn area (Figure 11), so be sure to use a sturdy piece of rawhide here and make a careful secure twist and end with a square knot. When the horse walks forward, this strap will catch against the horn area and rest upon the pommel area while the horse drags the poles forward.

The leather tie where the poles cross in an X above the horse's neck keeps the front secure, while the cross pieces behind the horse keep the back of the poles securely in position. Use the other knuckle-wide 2-foot-long rawhide strip and fasten with firm knots.

Last, determine what you will be transporting. I was going to be hauling small bundles, so I returned

Figure 11. This shows the correct position for maximum pull and catch for stability. Note the twisting deer rawhide wrap on peeled cottonwood poles, seated on the saddle prong near the horn.

to Mother Nature's hardware store—the draws and thickets along the edges of our pasture. I looked for soft-to-the-touch, bendable willow trees or wands not more than my finger in width and long enough to span the rectangle I had created with cross poles, about 5 feet long. I cut the tender saplings and removed branches. Because construction of the travois was not on site, I put them in a bucket of water to keep them supple. I wove these willow limbs over and under the four cross poles, each next to the other, to create a large, flat, crosshatch-design flat platform basket (Figure 12). I also made up some loops of willow in back along the ground end of the poles, an endgate effect to keep loose ears of corn and other small items from sliding off. Rawhide instead of willow wands can be used to create this woven pattern.

Figure 12. Tender willow saplings are woven over and under and knotted with rawhide.

Figure 13. Finished travois features peeled cottonwood poles, willow saplings, and rawhide ties.

Now test the travois with your chosen draft animal (Figure 13). Note how the travois can jump a curb and slide back much easier than your car or truck. Backing up is very difficult, so avoid tight corners and other dead ends. If the horse backs, it will dislodge the harness, causing a wreck. Make wide loops because the turning radius is based on the length of the drag poles. (Think of how a semi-trailer truck turns.) American Indians did not invent the wheel, but they did invent skids that are superior to wheels on uneven surfaces and much better suited to their needs and style of travel.

To unhitch the travois from the horse, lift the front of the travois up and off of the pommel and pull slightly forward away from the horn. Holding the travois up, ask the horse to step forward or have someone lead the horse out from under the travois. It can be stored leaning against a tree, but if the rawhide gets wet, it stretches, requiring reties.

After all this labor was it worth it? YES! I cannot wait to order more seeds; I have a list of other Seed Savers Exchange varieties to try. My hoe, digging stick, and other tools sit across the room from me as I write this, calling to me. My travois is propped up in the barn. I eagerly await new tool-making experiments next spring when the sap will flow and the saplings will be supple once again.

ENDNOTES

1. These days I lecture about not picking up points or anything else, but in the 1950s we thought differently about collecting artifacts, including a great many "arrowheads." And, no, I am not an avocational archeologist.

2. The Hidatsa Indians are first mentioned in historical sources toward the end of the eighteenth century, when they were living at the mouth of the Knife River in what is now North Dakota. In the past the Mandans, Hidatsas, and Arikaras lived in separate villages along the Missouri River, and each had its own government, leadership, and language. However, after many of their people died of smallpox in the 1800s, the three allies merged into a single nation, now known as the Three Affiliated Tribes. The Mandan and Hidatsa fed Lewis and Clark's Corps of Discovery during the winter of 1804-1805 and, therefore, have been well documented over the years.

The Hidatsas were farming people, and the women from different families worked together to raise crops of corn, beans, squash, and sunflowers. Buffalo Bird Woman (ca. 1839-1932) was a Mandan-Hidatsa who lived in what is now the Fort Berthold Reservation in North Dakota. She learned and practiced traditional Hidatsa skills, such as gardening, food preparation, weaving, etc., held to the traditional ways of her culture, and shared them through her stories and teachings.

3. Having been selected to be a part of the historical interpretation for the 2004-2006 Lewis and Clark Corps of Discovery events in Atchison, Kansas, I wanted the highest level of accuracy for my horse gear. The saddle was made by Kevin Hiebert of Bear Paw Traders (bearshand@mtelco.net) out of cottonwood, covered with rawhide and stitched with sinew.

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AN ANALYSIS OF CERAMICS FROM 14SC409

Sarah Trabert
University of Iowa

During the summer of 2009, the Kansas Archeology Training Program (KATP) surveyed and tested sites in Scott County State Park in western Kansas. 14SC409, a previously recorded site in the park, was revisited by survey crews, and a 20-m^2 grid was established over the site. KATP volunteers opened test units near surface artifact concentrations under the supervision of Virginia Wulfkuhle. This testing yielded Dismal River aspect and Puebloan artifacts, but no features were uncovered (Hoard 2009).

There are a total of 322 sherds recovered from this excavation (Hoard 2009), but only those sherds larger than .5 cm^2 and with intact interior and exterior surfaces were selected for analysis (n = 304). Of the 304 sherds in the sample, 271 (89 percent) are body sherds, 32 (10 percent) are rim sherds, and 1 (1 percent) is a cross-mended pipe fragment. Sherds were assigned to classes based on size of surface area (established by Beck 2006) (Table 1); in the sample 92 percent (n = 281) were assigned to Class I, 6.5 percent (n = 20) to Class II, and only 3 (<1 percent) sherds were assigned to Class III.

Ware categories were assigned based on previous descriptions of Dismal River aspect ceramics, described by Champe (1949), Brunswig (1995), and Metcalf (1949), and Southwestern wares described by Adler and Dick (1999), Eiselt (2006), and Ellis (1964) (Table 2). Dismal River aspect wares include Lovitt Plain, Lovitt Simple Stamped (known collectively as Dismal River Gray ware), and Lovitt Micaceous (later referred to as Ocate Micaceous and Cimmarron Micaceous) (Brunswig 1995). Southwestern wares from 14SC409 include Tewa Red, Kapo Black, Penansco or Tewa Micaceous, and unidentified Southwestern. This unidentified Southwestern category was based on paste characteristics (fine texture, sand tempered, often with caliche and quartz inclusions) and surface finishing (most are slipped and/or polished). More specific ware identification was not possible due to the size of the sherds and damaged surfaces, but they do not meet expectations for Great Plains ceramics (Table 2).

In the identification of wares, special attention was paid to surface treatments (slips, polishing, simple stamping, smoothing), paste characteristics (temper, inclusions, texture), and method of manufacture (coiling, smoothing, wiping). Inclusions, identified with the aid of 10x and 20x hand lenses, include caliche, quartz, and mica (Table 3). Due to the fragmentation of the collection, vessel and rim form data was collected from only a few of the larger rim sherds, and results presented here are based on criteria explained in Beck and Trabert (2011) (Table 4).

Table 1. Class Sizes Sherd Counts.

Class Size	Rims	Body	Pipes	Total (n = 304)
Class I (0-5 cm^2)	28 (87.5%)	253 (93%)	0 (0%)	281 (92%)
Class II (6-16 cm^2)	4 (12.5%)	16 (6%)	1(<1%)	21 (7%)
Class III (17-49 cm^2)	0 (0%)	2 (<1%)	0 (0%)	2(<1%)

Table 2. Ceramic Ware Descriptions.

Ceramic Ware	Description	References
Tewa Red	Fine paste with sand temper, occasional caliche and quartz inclusions, slipped, is red or red-orange in color, polished	Addler and Dick 1999 Ellis 1964
Kapo Black	Fine paste with sand temper, polished, black or gray-black in color	Addler and Dick 1999 Ellis 1964
Penansco or Taos Micaceous	Tempered with thin flakes of mica, sherds are thin, scraping marks from corn cobs common, often golden orange in color	Addler and Dick 1999 Eiselt 2006
Indeterminate Southwesern	Fine paste with sand temper, caliche and/or quartz inclusions common, usually slipped and polished, buff or buff orange in color, not similar to Plains ceramics	Beck and Trabert 2011
Dismal River Gray ware (Includes Lovitt Plain and Lovitt Simple Stamped)	Fine textured compact sand tempered pastes with few inclusions, thin, well-fired, generally dark in color but can range from black to gray-buff, decoration infrequent, not generally slipped or polished	Brunswig 1995 Champe 1949 Metcalf 1949

A surprising number of the sherds recovered from 14SC409 are Southwestern in origin (n = 174, 57 percent). Of the 32 rims sherds in the sample, 6 are Tewa Red Ware, 10 are Kapo Black, 11 are unidentified Southwestern ware, and only 5 are Lovitt Plain. Of the 271 body sherds, 40 are Tewa Red Ware, 10 are Kapo Black, 96 are of unidentified Southwest origin, 1 is Penasco or Tewa Micaceous, 101 are Dismal River Gray ware, and 23 are simply unidentifiable due to damaged surfaces (Table 3). Distinguishing Dismal River Gray ware sherds from similar Southwestern culinary wares was based primarily on differences in paste characteristics and surface finishes. Kapo Black wares are described briefly in publications with little detail other than that sherds of this ware are black and polished (Addler and Dick 1999; Ellis 1964). During the summer of 2010, Sunday Eiselt of Southern Methodist University was shown a few of the sherds from 14SC409, and she identified one of the larger rim sherds (catalog # 409-12-1) as Kapo Black, based on rim form, paste characteristics, and surface polishing (Sunday Eiselt, personal communication summer 2010). This sherd was then used as a comparative specimen for identifying Kapo Black sherds in the rest of the 14SC409 collection.

All of the sherds from 14SC409 were undecorated, but there was a high frequency of slipped and polished surfaces. Approximately 28 percent (n = 90) of the ceramics have at least one surface

Table 3. Sherds by Classification and Temper Type.

Classification	Rim (n = 32)	Body (n = 271)	Total (n = 303)
Red ware with quartz and caliche	4 (12%)	26 (9%)	30 (10%)
Red ware with sand	2 (6%)	14 (5%)	16 (5%)
Kapo Black with quartz and caliche	1 (3%)	1 (<1%)	2 (<1%)
Kapo Black with sand and mica	1 (3%)	0 (0%)	1 (<1%)
Kapo Black with sand	8 (25%)	9 (3%)	17 (5%)
Penasco or Tewa micaceous	0 (0%)	1 (<1%)	1 (<1%)
Indeterminate Southwest with sand	11 (34%)	96 (35%)	107 (35%)
Dismal River Gray Ware with sand	5 (16%)	101 (37%)	106 (35%)
Indeterminate damaged	0 (0%)	23 (8%)	23 (7%)

that has been slipped, leaving a very fine, smooth surface. High and low polished surfaces were also common in the collection, as 40 percent (n = 122) exhibited some level of burnishing or polishing of exterior and often interior surfaces.

Two pipe fragments recovered from 14SC409 were cross-mended. Although this stem fragment meets local expectations for paste characteristics (dark, well-fired, sand tempered) and is similar in paste and form to a stem fragment recovered at the Lovitt Site (25CH1), it may represent a local copy of a Southwest form. Kidder (1932) shows examples of square-stemmed decorated pipes from Pecos, and even though the 14SC409 pipe is undecorated, it is similar in form to those recovered from Pecos (Figure 1). Pipe fragments in general may be an undervalued line of evidence for trade and migration between the Plains and the Southwest.

The ceramics from 14SC409 confirm its Dismal River aspect affiliation but also indicate a strong connection to the Southwest, as trade wares make-up 57 percent of the collection sample. Scott County State Park has yielded other evidence of ties with the Southwest in the form of trade items and ceramics, indicating the presence of Puebloan refugees at the Scott County Pueblo site (14SC1) (Trabert and Beck 2011). The pueblo has garnered much archeological attention in the past 100 years, both in terms of excavations and publications, but it stands to reason that it was not the only multicultural occupation of the area. The excavation at 14SC409 yielded additional information regarding the protohistoric occupation of the Scott County State Park area, but it also has shown that 14SC1 is not the only site in the region where intensive interactions between Puebloan and Dismal River aspect groups took place. Future research is planned to further explore this interaction elsewhere in the Dismal River aspect culture area, thus expanding our knowledge of what role sites such as 14SC409 and 14SC1 played in the larger regional interactive sphere.

RIM/NECK	Tewa Red Sand	Kapo Black Sand	Slipped Sand Puebloan	Dismal River Gray Ware Sand	Total
Bowl					
inverted	2				2
upright			2		2
Jar					
upright				2	2
flaring		1			1
Indeterminate Form	4	9	9	3	25
Total	6	10	11	5	32
Percent	19%	31%	34%	16%	100%

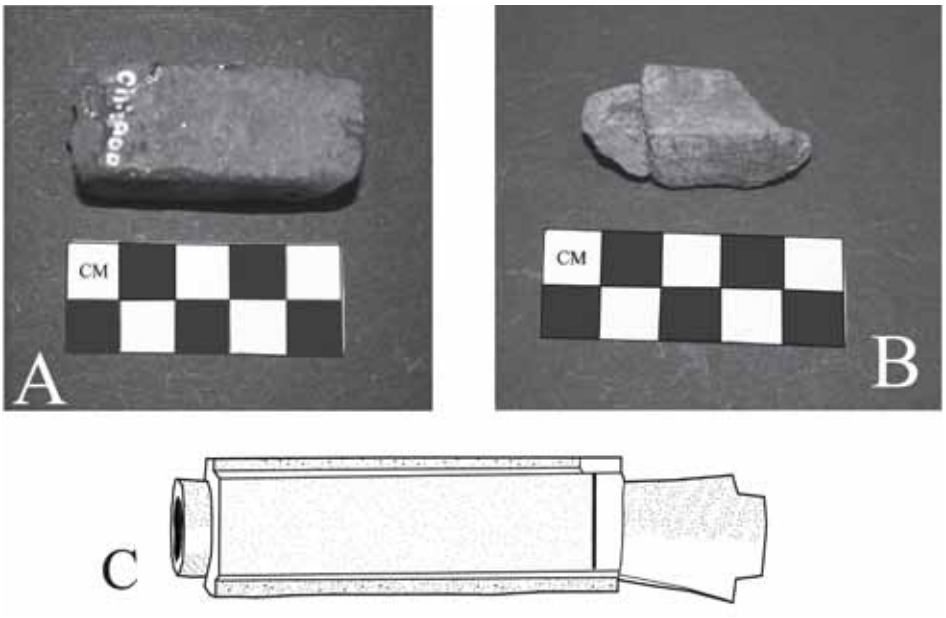

Figure 1. Ceramic pipes: (A) from Lovitt site (25CH1), curated at Nebraska State Historical Society, Archaeology Division; (B) from 14SC409, curated at Kansas Historical Society; (C) Pecos square-stemmed pipe, adapted from Kidder 1932:Figure 154a.

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PALEOINDIAN SITES IN KANSAS AND THEIR LOCATIONS

Thomas G. Wyatt
Wamego, Kansas

This paper describes the results of my research into the Paleoindian sites registered in the state of Kansas. My interest is not only in the locations but in which sites are verified Paleoindian with direct involvement of professional archeologists and which are not.

With a profound interest on my part in the locations of Paleoindian sites in Kansas, I have attempted to gather the information that was available to me to compile a current list of those sites. This may not be an all-inclusive list; those that I inadvertently missed and newly recorded sites can be added in the future. Also, it was not my intention to do an in-depth study of each site. My interest was in the locations and involvement of professional archeologists.

I have found several types of Paleoindian sites registered in the state of Kansas, which I have divided into two groups. One group (Figure 1) consists of 33 locations that are intact and well documented; the second group (Figure 2, Table 1) consists of 20 locations that provide some evidence of Paleoindian occupation. This makes a total of 53 recorded Paleoindian sites in Kansas.

The archeological record of the Paleoindian occupation of what is now Kansas is scant, relative to the records of this period that cover the Great Plains. Almost all of the sites were discovered as a result of human disturbance. Natural disturbances are those of rivers and creeks. The relatively slow rate of natural exposure helps explain the slow rate of discovery of Paleoindian sites (Mandel 2006).

CRITERIA FOR IDENTIFYING SITES

Let me suggest that the professional community views the following as the important requirements for identifying true Pleistocene-age sites: (1) investigation conducted by a professional archeologist, (2) "presence of human remains or distinctive artifacts, (3) the evidence is within an undisturbed geological deposit, (4) the age of the site must be demonstrated by association with fossils of known age or suitable radiocarbon dates, (5) investigators notified outside observers and requested visits to help validate the in situ finds while the excavation was in progress" (Hill et al. 1996:31).

Varying opinions exist among professional and avocational archeologists about the 33 sites listed in Figure 1. However, I feel that a site must satisfy the five above-mentioned requirements to be considered a true Paleoindian site. With this in mind, sites 1 through 8 are verified Paleoindian sites by achieving four and perhaps five of the requirements. Sites 9 through 33 appear to meet only one or two of the five requirements. Many of the sites do not fulfill any of the five requirements.

VERIFIED PALEOINDIAN SITES

As identified in Figure 1, the following summarize the 33 locations of recorded Paleoindian sites of formal lithic tools, cache sites, kill sites, and campsites with documentation and references resulting from professional investigations.

1. 12 Mile Creek Site (14LO1), Logan County
The 12 Mile Creek site was excavated in 1895 by Handel T. Martin and Thomas Overton. This was the first discovery in the Western Hemisphere by scientifically trained personnel of a fluted projectile point in association with extinct animals. A bison tibia was radiocarbon dated at 10,435 ± 260 years before present (B.P.), and bone gelatin fraction yielded a radiocarbon age of 10,245 ± 335 years B.P. References: Hawley 2009; Hill 1994, 1996, 2002, 2006; Hill et al. 1993; Hofman 1996:31-32, 62; Rogers and Martin 1984; Williston 1902a, 1905.

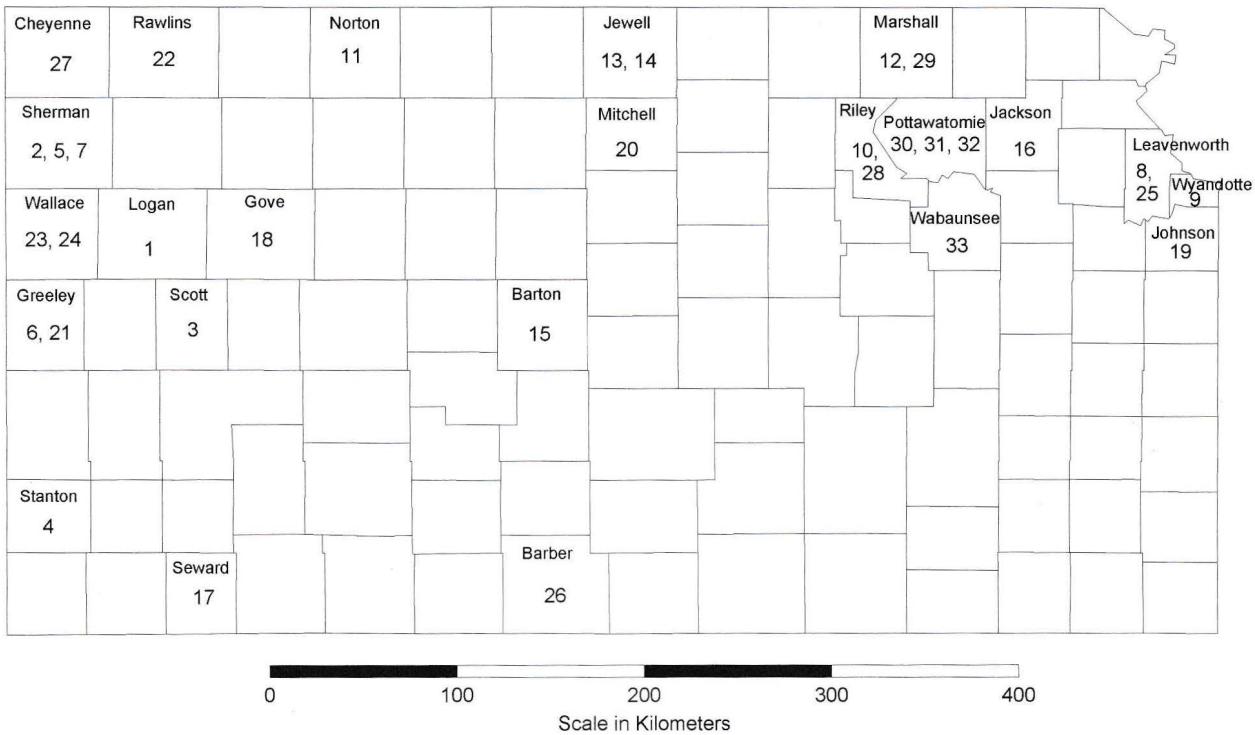

Figure 1. Thirty-three locations of verified Paleoindian sites.

2. Busse Site (14SN1), Sherman County
The Busse site, discovered in June 1968 by Dan Busse, is an example of a possible Clovis-age cache. It consists of 90 lithic artifacts. Many of the specimens are made from high quality yellow to brown Niobrara jasper. The broad flat flaking on the large bifaces is similar to that on some pieces from other Clovis-age stone tool caches. References: Hofman 1995, 1996:51-52.

3. Norton Bonebed (14SC6), Scott County
The Norton bonebed was first exposed in the mid-1970s by quarry operations. Professional excavations began in 1992 and continue by University of Kansas field crews. The site is a bison kill site with radiocarbon dates of 9,080 ± 60 B.P. and a possible Allen/Frederick complex. Artifacts are three Allen points, a Cody point base, endscrapers, and flake tools. References: Hofman 1996:73-74, 2002, 2010:137-138; Hofman et al. 1995.

4. Winger Site (14ST401), Stanton County
The Winger site is a deeply buried Late Paleoindian bison bonebed. Avocational archeologists excavated a small portion of the exposed bonebed in the early 1970s. Limited reinvestigation by Jack Hofman in 2001 and 2002 revealed an Allen point, two Allen point basal fragments, a flake tool, a large biface thinning flake, and a few small retouch flakes, in addition to the remains of at least nine bison. More than one kill event may be represented. Collagen from bison rib-blade fragments yielded a radiocarbon age of 9,080 ± 90 B.P. References: Hofman 2010:137; Mandel and Hofman 2003.

5. Kanorado Locality (14SN101, 14SN105, and 14SN106), Sherman County
These three stratified sites are within several hundred meters of each other. In 1976 and 1981 the Denver Museum of Natural History conducted excavations. Steve Holen and Jack Hofman directed limited testing in 2002. Their findings suggested the presence of a Clovis component. Under the direction of Steve Holen and Rolfe Mandel, excavations in 2003 and 2004 revealed mammoths and a camel with radiocarbon dates of about 12,200 years ago (pre-Clovis) and artifacts diagnostic of 10,900 to 11,000 years ago (Clovis). "In sum, the Kanorado locality has great potential for shedding new light on the timing of human entry into the Western Hemisphere. It may also provide information concerning Clovis and possibly pre-Clovis

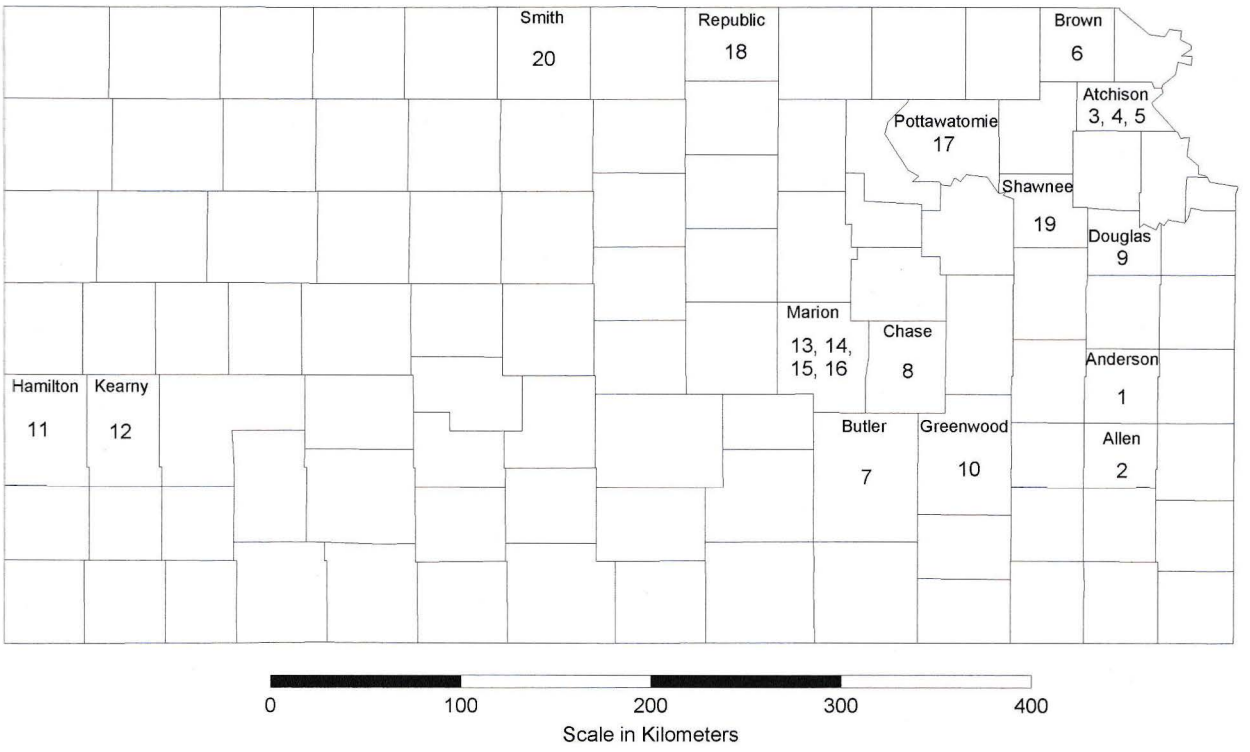

Figure 2. Twenty locations of other recorded Paleoindian sites.

subsistence and mobility strategies on the High Plains" (Mandel et al. 2004:79). References: Mandel et al. 2004, 2005; Mandel and Holen 2005; Mandel and Wulfkuhle 2005.

6. Koehn-Schneider Site (14GL496), Greeley County
In 1987 erosion exposed mammoth bones that yielded a radiocarbon date of 11,050 ± 180 B.P. Three paleosols overlie the bone deposits and have consistent radiocarbon dates of 11,170 ± 170 B.P. Possible butcher marks are present on the skull. No Paleoindian artifacts were found with the mammoth bones, but Clovis points reportedly have been found in the immediate vicinity. References: Hofman 1996:53; Johnson et al. 1990.

7. Laird Site (14SN2), Sherman County
The Laird site was discovered in 1990 by Rod Laird and Dan Busse. With the help of volunteer workers, initial test excavations were conducted in 1995, following the discovery of a Dalton-like projectile point eroding from a bison bone deposit. Radiocarbon dates derived from deposits with Dalton assemblages indicate a possible age of 10,700 to 9,700 years ago. References: Blackmar and Hofman 2006:48; Hofman 1996:75, 2010:141-143; Hofman and Blackmar 1997; Mandel et al. 2004:79-81.

8. DB Site (14LV1071), Leavenworth County
The DB site was discovered in 1995 by Brad Logan. Three Paleoindian projectile point fragments were recovered during excavations at the U.S. Disciplinary Barracks at Fort Leavenworth: one basal fragment of a Folsom point (ca. 10,800-10,200 B.P.) and two bases of Dalton points (ca. 10,500-9,700 B.P.). Cultural deposits at the DB site are in sediments developed in Brady soil, a Pleistocene-age loess. References: Hofman 1994b:2; Logan 1995, 1996, 1998, 2001; Logan et al. 1998; Logan and Johnson 1997.

RECORDED BUT UNVERIFIED PALEOINDIAN SITES

The sites in this second group, numbers 9 through 33, do not meet the criteria for verified Paleoindian sites.

9. Bonner Springs Locality, Wyandotte County
Richard Rogers, Larry Martin, and Brad Logan documented specific Paleoindian projectile point

Table 1. Other Recorded Paleoindian Sites.

Number	Site Number	County
1	14AD318	Anderson
2	14AN10	Allen
3	14AT411	Atchison
4	14AT412	Atchison
5	14AT424	Atchison
6	14BN4	Brown
7	14BU301	Butler
8	14CS16	Chase
9	14DO127	Douglas
10	14GR618	Greenwood
11	14HM314	Hamilton
12	14KY305	Kearny
13	14MN12	Marion
14	14MN15	Marion
15	14MN16	Marion
16	14MN29	Marion
17	14PO358	Pottawatomie
18	14RP8	Republic
19	14SH327	Shawnee
20	14SM408	Smith

RECORDED BUT UNVERIFIED PALEOINDIAN SITES

The sites in this second group, numbers 9 through 33, do not meet the criteria for verified Paleoindian sites.

9. Bonner Springs Locality, Wyandotte County
Richard Rogers, Larry Martin, and Brad Logan documented specific Paleoindian projectile point finds at the Bonner Springs locality. In addition, 56 Paleoindian points were made available for study from private collections recovered in the vicinity of the Bonner Springs locality. The range of identified types indicates successive utilization by Paleoindians during the period 11,300-8,000 B.P. A note of interest is that 33 of the 56 Paleoindian points were of the Dalton type, ca. 10,000-8,000 B.P. References: Logan 1987; Rogers and Martin 1983; Wetherill 1995.

10. Diskau Site (14RY303), Riley County
The Diskau site was discovered by the landowner in the 1940s. Since then, surface collecting has produced 123 formal lithic tools. Five of the eight fluted points from the site closely resemble Clovis points, suggesting that the site dates to about 11,000 B.P. Some smaller size points are similar to Folsom points, suggesting a later date. Perhaps the most remarkable feature of the assemblage is the high percentage of non-local raw materials. Preliminary results of the research indicate that the Diskau site appears to be a residential camp rather than a more specialized kill site. References: Hofman 1996:53; Hofman and Hesse 2002; Schmits 1987.

11. Tim Adrian Site (14NT604), Norton County
A lithic quarry/workshop was reported by O'Brien (1984) in 1981. The site appeared to have a limited activity type and was probably a summer campsite. The site was completely disturbed by plowing and repeatedly surface collected by the Adrian family. The identification of the site as Hell Gap was based upon a single broken point recovered from the surface and additional non-projectile point lithic materials. As a Hell Gap site, it should date around 7900 ± 200 B.C. After examining the artifacts, three other scholars agreed that the site is Paleoindian. References: Hofman 1996:67; O'Brien 1984.

12. Kasper Site (14MH75), Marshall County
Ralph S. Solecki and J. Mett Shippee of the Smithsonian Institution River Basin Surveys conducted an examination of the Tuttle Creek area during July-September 1952. During this time a Folsom point was reported in a collection in Vleits on the Black Vermillion River. Several lanceolate points were also reported. A reconnaissance was conducted of the site on which the point was found; however, the survey team did not recover any artifacts or other evidence of an occupation. The Folsom point was sketched and photographed for further study. References: Hofman 1994b:31-35; Shippee 1953; Solecki 1953:17-18, 25, Figure 6.

13. Eckles Site (14JW4), Jewell County
An artifact collector found a Clovis point in 1970, and in subsequent years picked up additional lithic specimens. Due to bank erosion at Lovewell Reservoir, all of the collected artifacts were out of place and lying on the surface. An observation study was completed, and no in situ artifacts or features were noted that would have indicated the stratigraphic

position from which the artifacts were eroding. This collection includes projectile points, scrapers, unifacial tools, and debitage. References: Hoard et al. 1992; Hoard et al. 1993:701; Hofman 1996:52; Holen 1993, 2010.

14. Lovewell Mammoth Site (14JW306), Jewell County
The discovery of mammoth bones attracted archeological attention to this location in the early 1960s (Witty 1970). Initial geological and stratigraphic assessment indicated that the mammoth remains were in deposits substantially older than Clovis, and the site was essentially discounted. Following discovery of the Eckles site, reinvestigation of the Lovewell Mammoth site was initiated. Reevaluation of the geological and stratigraphic position of the bonebed indicated that it might be Pleistocene in age. Analysis of the bone material from the original excavation revealed a modified bone, which may represent a section of a beveled base point of foreshaft. References: Hofman 1996:52-53; Holen 1993, 2006.

15. 14BT402, Barton County
Site 14BT402 was first discovered when artifact collectors discovered a Scottsbluff point and a Folsom point during construction of U.S. Highway 156. By the time a professional archeologist arrived at the site, it had been largely destroyed. 14BT402 probably contained an intact buried Paleoindian component, ca. 12,000-7,000 B.P. References: Lees 1988:119-120; Yaple 1968:3.

16. Sutter Site (14JN309), Jackson County
The Sutter site was originally discovered by an individual while surface collecting behind a grader building an earthen dam. The site most likely was a camp and processing site in the Allen/Cody/Frederick complex, dating 10,000-8,000 years ago. References: Brown and Simmons 1987:IX-15; Hofman 1996:45**;** Katz 1971; West 1991.

17. Sailor-Helton Site (14SW302), Seward County
The cache site of possible Clovis affiliation consisted of blades, cores, and flakes. Some of the very large blades and cores are made of Alibates agatized dolomite. References: Hofman 1996:53; Mallouf 1994.

18. Walsh Cache, Gove County
Fifteen jasper bifaces were discovered during plowing in the vicinity of several Smoky Hill silicified chalk outcrops. The cache may represent Hell Gap technology. References: Hofman 1996:67; Stanford 1997; Stein 2005:30-31.

19. Slough Site (14JO402), Johnson County
The Slough site is a multicomponent prehistoric site. In the backdirt of plowzone stripping, an avocational archeologist found a freshly broken Plano-like point, similar to the Dalton type. Reference: Feagins 1994:27.

20. 14ML11, Mitchell County
A Folsom tip made of Niobrara jasper was found on this site in the Solomon River drainage of western Mitchell County. References: Hofman 1994a, 1994b:31-33; Lippincott 1976:91-93.

21. Barber Site (14GL467), Greeley County
The Barber site was recorded as a campsite in the Kansas State Historical Society files. It is a possible Cody complex site. Reference: Hofman 1996:64.

22. Burntwood Creek Site (14RW2), Rawlins County
The Burntwood Creek site was recorded as a multiple animal and bison kill site. References: Hill et al. 1992; Hofman 2010:138-140.

23. Gettenger Site (14WC9), Wallace County
The Gettenger site was recorded as a campsite within the Cody complex period. References: Greiser 1985:74; Hofman 1996:64.

24. Harrison Site (14WC8), Wallace County
The Harrison site was recorded as a campsite within the Cody complex period. References: Greiser 1985:74; Hofman 1996:18.

25. Lansing Site (14LV315), Leavenworth County
Skeletal remains of two humans—an adult male and a child—were discovered beneath 20 feet of sediment along the Missouri River in 1902. The claim of antiquity for the remains was based on the age of the thick loess covering the deposit. The dating of the material or correlation of dates was the subject of heated debate from the beginning. In the

1980s a series of radiocarbon dates on the bones indicated a middle Holocene age. References: Hofman 1996:32; Hrdlicka 1903; O'Brien 1984; Wedel 1959:90-93; Williston 1902b.

26. Vincent Donovan Site (14BA308), Barber County
The Vincent Donovan site had been known by local collectors for at least 50 years, and John Vincent contacted the Kansas Historical Society after finding the base of a Folsom point on an eroding surface. The Odyssey Archaeological Research team, directed by Rolfe Mandel, carried out testing in July 2003. Reference: Ryan et al. 2003.

27. Powell Site (14CN308), Cheyenne County
The Powell site consists of a Clovis fluted point made of Niobrara jasper. This point was discovered on a stream bank by the landowner. References: Hofman and Hesse 2002:17-18; Mandel et al. 2004:82-85.

The following registered Paleoindian sites, numbers 28 through 31, were investigated during an environmental analysis of the Tuttle Creek Lake (Schmits et al. 1987).

28. 14RY351, Riley County
Scottsbluff and Dalton points were recovered from 14RY351 along the shoreline of Tuttle Creek Lake.

29. 14MH33, Marshall County
Plainview points were recovered from 14MH33, just west of the Coffey site.

30. 14PO358 and 14PO382, Pottawatomie County
Plainview points were recovered at these sites during 1985-1987 investigations and 1970 shoreline survey.

31. 14PO2, Pottawatomie County
Investigations recovered a lanceolate Plainview point from 14PO2, south of the Coffey site.
The two sites listed below are registered as Archaic sites; however, information from the site investigations indicated that they should be considered as verified Paleoindian sites.

32. Coffey Site (14PO1), Pottawatomie County
The Coffey site is generally accepted as an Archaic campsite. The site has been studied, tested, and excavated on numerous occasions. It was first recorded in 1952 by Shippee and Solecki, tested in 1957, and brought to the attention of professionals again in 1970 with preliminary investigations in 1971. Two Folsom points were reported by Ziegler. In 1980 Schmits recovered a Folsom point in a Pleistocene T-2 terrace with possible dates of 10,850-10,200 B.C. References: Hofman 1994:31; Mandel et al. 2010; Schmits 1980; Shippee (1953); Ziegler 1976:33-34.

33. Claussen Site (14WB322), Wabaunsee County
Since its discovery in 1999, the Claussen site has been periodically investigated. Surface artifacts were mapped in place and collected. Local collectors recovered Dalton-type points on the surface. One hundred-eighty-five items were mapped from the lower Paleoarchaic component, with cultural deposits dating to 8,800 B.P. References: Mandel 2003; Widga and Hofman 2003.

OTHER RECORDED PALEOINDIAN SITES

Figure 2 and Table 1 identify 20 other Paleoindian sites with data on location, topography, and soil complex (Brown and Logan 1987). They have yielded artifacts that are diagnostic but are displaced or not well documented, so they are not considered verified Paleoindian sites.

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THE PHIL SITE (14JW48) AND THE CENTRAL PLAINS TRADITION AT LOVEWELL RESERVOIR, JEWELL COUNTY, KANSAS

Brad Logan
Kansas State University

With contributions by Lauren W. Ritterbush, Tobias Blake, John R. Bozell, Carl R. Falk, and Daniel J. Keating

The Phil site is a habitation of the Central Plains tradition (CPt) at Lovewell Reservoir, Jewell County, Kansas. Lodge remains and extramural finds there, as well as cultural features and material at other CPt habitation and mortuary sites at Lovewell, are evidence of a community that thrived along White Rock Creek, a tributary of the lower Republican River, during the thirteenth century A.D. This report presents the findings at the Phil site in the light of discoveries at these other sites and synthesizes current understanding of the CPt at the locality. Data from the Phil site house give insight into architecture and spatial organization. Analyses of ceramic, lithic, and faunal remains facilitate recognition of local adaptation and regional variation. Radiocarbon dates from all late prehistoric sites at Lovewell, including those of the White Rock phase, attest to contemporaneity and, therefore, the possibility of contact between populations of the Central Plains and Oneota traditions. The implications of such interaction, including that of CPt abandonment of the locality in the face of Oneota immigration, are discussed.

INTRODUCTION

By Brad Logan

Until this millennium very little was known about the Central Plains tradition (CPt) in the Lovewell locality, that portion of White Rock Creek, a tributary of the Republican River that is included in the Lovewell Reservoir area, Jewell County, north-central Kansas (Figure 1). Previous work had recorded one camp site (Johns Creek [14JW34]; Logan and Hedden 1992), and excavations had recovered material from two mortuary sites (Begin Ossuary [14JW312]; Thies 1982 and Russell Mound [14JW207]; Neuman 1963). More was known about another Late Prehistoric (AD 1000-1500) culture at Lovewell: the White Rock phase of the Oneota tradition. While it was suggested that migration of Oneota groups to the area had affected previously established CPt populations there, without more evidence of the latter it would not be possible to determine the nature or extent of any relationship (Logan 1998a, 1998b; Ritterbush and Logan 2000). Since 2003 investigations by archeologists from Kansas State University (KSU) have significantly expanded understanding of the CPt at Lovewell Reservoir, including its time of occupation, geographic extent, and form. These investigations have included test excavations at habitations, including the Johns Creek, Bergstrom (14JW14), and Windmill Creek (14JW49) sites, and extensive excavations at the Phil site (14JW48), as well as salvage excavation of another mortuary site, Eckles Ossuary (14JW4), by the Bureau of Reclamation (BOR).

Here the authors present results of the work at the Phil site, summarize information obtained from the other sites, and discuss these findings with respect to current understanding of the relationship between populations of the Central Plains and Oneota traditions in the region. This publication updates some interpretations presented in the technical report (Logan 2008a) on which it is based, given more recent discoveries at Lovewell Reservoir (Logan 2010a, 2011), and omits some data, including that presented in three appendices (Appendix 1: Burned Wood Samples, Appendix 2: Formal Chipped Stone Tool Data, and Appendix 3:

Figure 1. Map showing major Late Prehistoric sites at Lovewell Reservoir.

Faunal Data), and some illustrations. Readers who desire this information for more detailed comparative purposes are referred to the report, copies of which are available at KSU, the BOR (Nebraska-Kansas Area Office), and the Kansas State Historic Preservation Office, Kansas Historical Society.

Test excavations at the Johns Creek site in 2003 confirmed that occupation there was of limited duration (Logan 2006); others at Windmill Creek (Logan 2007) and Bergstrom (Logan 2010a) revealed evidence of more prolonged occupations, including house remains and storage facilities. Test excavations (Phase III) at 14JW48 from September 13 to 17, 2004, revealed house remains and an associated midden, confirming its eligibility for nomination to the National Register of Historic Places (NRHP). Excavation (Phase IV) from November 15 to 24 of that year exposed the house floor, associated features, and an abundant and varied artifact assemblage. While findings of the latter investigation are presented here, it was necessary to abridge them from the more detailed coverage in the technical report (Logan 2008a) to which the reader is referred at relevant points herein.

Both phases of fieldwork at the Phil site were possible during a window of opportunity created by the need for maintenance on the gates of Lovewell Dam that kept the lake level below 1,573 feet above mean sea level (ft amsl) from September through December 2004. Both projects were funded through a cooperative agreement between the BOR and KSU. Brad Logan was Principal Investigator (PI), and fieldwork phases were subcontracted to Burns and McDonnell Engineers, Inc. of Kansas City, Missouri. Crews of that firm were directed by Mark Latham. The Phase III field team included the PI, Field Director, and excavators Tod Bevitt, Mark Darrow, and Bob Thompson. The Phase IV field crew included the PI, Field Director, and excavators Heather Applegate, Bob Brandon, Mark Darrow, Sarah McIntire, Melanie Naden, Selwyn "J" Nash, Wes Neal, Trever Murawski, Alejandro "Alex" Pineda, Jack Ryan, Kirk Smith, Craig Southern, and Dustin Walker. Bevitt, Darrow, Latham, and the PI completed work at the site on December 2-3. In late July 2005 Toby Blake, Dan Keating, Luke Bockelman, Cornelius Hugo, Eric Skov, Phillip Wellons, and the author spent seven

days water-screening about 1,100 5-gallon samples of fill from the excavation that had been stored in a secure place at Lovewell Reservoir at the end of the 2004 field season. (While 150 bags had been screened during the excavation, cold weather prevented processing the balance.) Lab work, including flotation and sorting of feature fill and assemblage analyses, was performed from winter 2005 through winter 2006-2007 by Toby Blake, Sarah Meitl, Dan Keating, Lindsey Reiners, Lauren Ritterbush, and the author. Wood identification by Regis Miller was done in June 2007; faunal analyses by Rob Bozell and Carl Falk were carried out in summer and autumn 2008.

SITE DISCOVERY AND INITIAL SURVEY

On August 17, 2002, while exploring the Montana Creek sites about 2 km west (Ritterbush and Logan 2006), Lauren Ritterbush and the author were informed by local artifact collector and amateur archeologist Dick Eckles of the site they subsequently recorded as 14JW48. The site was named for Dick's father Phil, who noticed artifacts there during times of low water while he was fishing nearby. The Phil site is on a terrace on the north side of White Rock Creek. Significant sites in its vicinity are White Rock (14JW1; ~750 m northwest), Windmill Creek (~570 m northwest), and Eckles (~400 m northeast) (Figures 1 and 2). Like Phil and Bergstrom, Windmill Creek contains evidence of a CPt house (Logan 2007); Eckles has Paleoindian (Clovis; Holen 1998) and Late Prehistoric components, the latter an ossuary whose proximity to both Phil and Windmill Creek suggests that it served a mortuary function for their occupants.

The Phil site is at an elevation of 1,573 ft amsl and is inundated at normal conservation pool. During initial survey of the site, its surface was littered

Figure 2. Aerial view of the Phil site (1), showing proximity to Windmill Creek (2) and White Rock (3) sites; Eckles was exposed on the wave-cut face at the edge of the lakebed just to the right of the photo. The dark square at the Phil site is the 2004 block excavation of the CPt house, and the associated dark soil, previously buried, was exposed by reservoir planation.

with pottery, chipped stone debris and tools, bone, burned limestone, and a limestone pipe (the latter item is similar to some found at other CPt sites, including those of the nearby Solomon River phase (Table 1 and Figure 3; Lippincott 1976; Latham 2004:44). No daub was noted at that time. Dick Eckles gave the author several sherds that he had collected during his first traverse of the site (included in Table 1). He also had collected triangular, notched arrow points. The surface soil at the site, not yet covered with growth, was conspicuously darker than the surrounding lakebed, suggesting that planation had revealed a previously buried A horizon (see section on Radiocarbon Dates and Geomorphology).

The many sherds of cordmarked, grit-tempered ware and decorated rims indicated a CPt affiliation. While the CPt is Late Prehistoric, the exact date of occupation by groups of that tradition along White Rock Creek was unknown in 2002. Because Oneota migrants also occupied the area (Logan 1995, 1998), determining the time of habitation at 14JW48 was critical to understanding relations. Given the temporal and spatial overlap of the Central Plains and Oneota traditions, sites of both affiliations at Lovewell Reservoir are potentially significant for understanding whether there was interaction (Logan 1995, 1998a; Ritterbush and Logan 2000). Analysis of the Phil site ceramic assemblage in particular (Ritterbush herein) indicates no evidence of interaction. Indeed, none of the material remains at the site point to contact between people of these traditions. Yet, as indicated by radiocarbon dates (Logan 2011), the time of CPt and Oneota occupations at Lovewell Reservoir was close in time, and 14JW48 may have been occupied by a Caddoan-speaking family shortly before Siouan-speaking migrants settled the White Rock site less than a kilometer away (Logan 2011).

Table 1. Cultural Material from 2002 Survey.

Artifact Type	Number	Mass (g)
Rim sherds	21	622.1
Body sherds	90	1213.3
Handle	1	12.2
Chipped stone tools	8	68.5
Chipped stone debris	35	87.4
Burned limestone	1	8.8
Unmodified sandstone	1	28.8
Limestone pipe	1	69.4
Bone	1	22.9
Totals	159	2,133.4

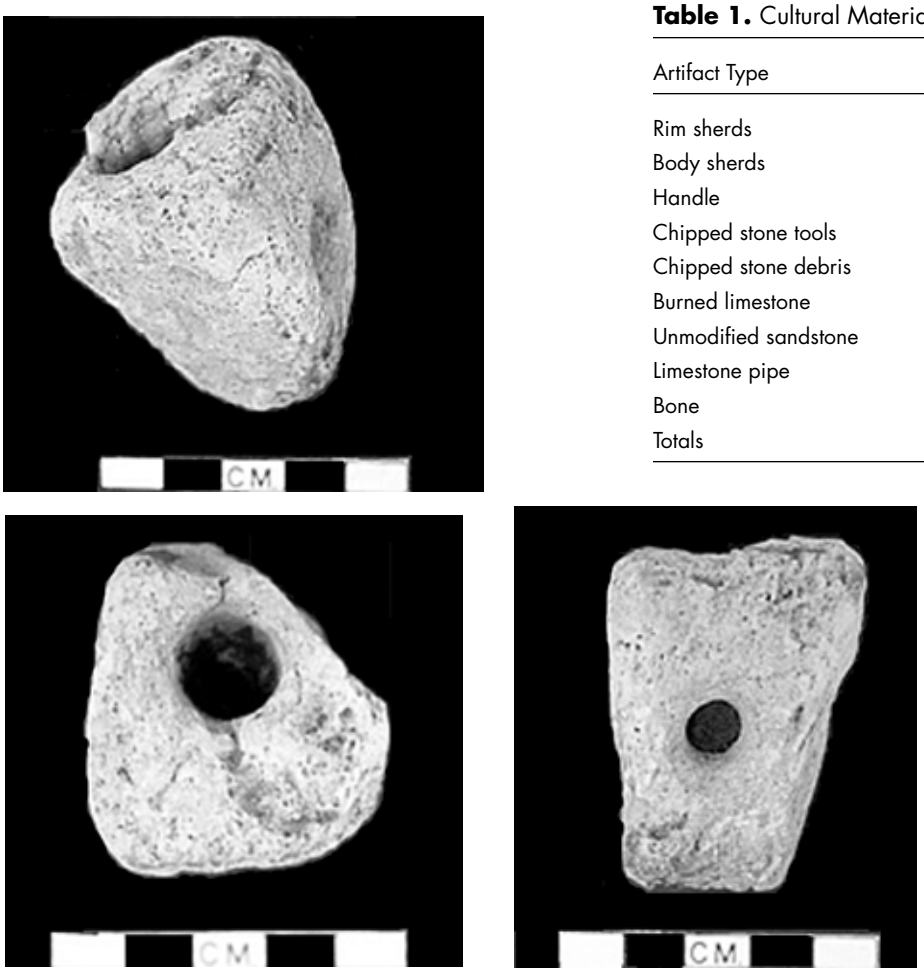

Figure 3. Three views of the limestone pipe recovered from the Phil site surface during initial survey.

In the following two sections respectively, the author outlines the physical environment of the Lovewell area and current understanding of the Late Prehistoric period in the Central Plains. Subsequent sections present the methods and results of the Phase III and IV investigations; descriptions of all features (post molds, hearth, cache pit, and burned limestone concentrations); discussion of the spatial distribution of ceramics, chipped stone debris and tools, bone, burned limestone, daub, and charcoal; interpretation of the radiocarbon dates; and a summary of the geomorphological setting of the site. These are followed by analyses of ceramics (Ritterbush), chipped stone tools (Logan, Blake, and Keating), and faunal remains (Logan, Bozell, and Falk). In the final section Logan gives a synthesis of information from 14JW48 and other CPt sites at Lovewell Reservoir and an interpretation of their significance in a regional perspective, particularly with regard to the critical period of CPt abandonment of and Oneota migration to the lower Republican River drainage around AD 1300.

ENVIRONMENTAL CONTEXT

By Brad Logan

Lovewell Reservoir inundates a central portion of White Rock Creek, a west-bank tributary of the lower Republican River a few kilometers south of the Kansas-Nebraska border. It is in the Great Plains physiographic province (Fenneman 1931), which covers most of western Kansas, and in the Smoky Hills subprovince. Bedrock in the Smoky Hills is Cretaceous age and dominated by erodible sandstone in the eastern portion and more durable interstratified limestones and shales in the western portion, also called the Blue Hills (Schoewe 1949), which include Lovewell Reservoir. The Blue Hills are distinguished by two dissected cuestas, the easternmost of which is controlled by the Greenhorn limestone and the westernmost, by outcrops of Niobrara chalk. Dissection of nonresistant shales has resulted in rolling terrain. Where limestone has controlled stream cutting, flat plateau-like surfaces with steep escarpments dominate the landscape. Relief in the Blue Hills ranges from 1,400 to 2,000 ft (427-610 m); Lovewell Reservoir and its adjacent uplands range from 1,572 to 1,740 ft (479-530 m).

The primary lithic resource for chipped stone tool manufacture in the region is the silicified chalk of the Niobrara formation, known by such names as Niobrara jasper, Smoky Hill silicified chalk, Smoky Hill jasper, Graham jasper, Republican River chert, and Niobrarite (Holen 1983; Stein 2005). This material ranges in color from white through yellowish brown and brown to dark brown. Other colors include red, green, black, and, rarely, purple. The best known prehistoric procurement sources of Niobrara jasper are in northwest Kansas counties: Decatur, Norton, Phillips, Smith, Sheridan, Graham, Rooks, Gove, Trego, Ellis, Lane, and Ness. The Niobrara formation extends to western Jewell County. While no sources of Niobrara jasper have been documented there, it is likely that the prehistoric inhabitants of the Lovewell locality procured this raw material within that area, and for this reason it is considered a near-local stone.

The second most frequent lithic material utilized by prehistoric occupants of the Lovewell Reservoir locality are cherts of several Permian-age limestone formations of the Flint Hills. These are generally characterized as banded, gray and white stones. The presence at Lovewell Reservoir sites of Niobrara jasper and Flint Hills cherts indicates procurement forays or trade relations to the south, west, and east.

The prevailing climate of Jewell County is continental with wide ranges in temperatures and seasonal extremes, characterized by warm summers and cold winters (Bark 1984). The county is on the western edge of the area that receives a flow of moisture-rich air from the Gulf of Mexico, and while precipitation generally favors crop agriculture, there have been long periods of drought or excessive wet weather. Annual precipitation averages about 25 inches (63.5 cm), and most of this occurs as rain during summer months in the form of thundershowers. Mean temperatures during the period of record range from a January minimum of 15.2° F to a July maximum of 90.9° F. The average first freeze in autumn occurs in late September to mid-October, and the average final freeze in spring occurs in late April to mid-May. Nine in 10 years have a growing season of 138 to 181 days (Hamilton 1984).

The project area is within the mixed prairie community that dominates the central part of Kansas.

The primary plants in the region are big bluestem, little bluestem, sideoats grama, and blue grama. The lower portion of the Republican River drainage is within the tall grass prairie community that dominates the eastern one-third of Kansas. Dominant plants are big bluestem, little bluestem, switch grass, and Indian grass. The boundary between the two vegetation communities is neither abrupt nor fixed. A. William Kuchler (1974) correlated the transition zone between them with the substrate of Dakota sandstone that marks the Smoky Hills subprovince. In this zone the growth forms and taxa of both prairie types are well represented, but the dominant species are comparable to those of the tall grass prairie. The change in dominant grasses from one native community to the other is gradual. The mixed prairie in particular is sensitive to climate, especially with respect to fluctuations of precipitation. Its boundaries have been dynamic, "oscillating eastward and westward with the alternating intense droughts and wet periods" (Kuchler 1974:588).

Particularly pertinent to Late Prehistoric cultural adaptations in the region with regard to drought conditions is the Medieval Warm period (~AD 800-1300), a time of notably increased aridity that may have affected farming societies. Geomorphological research in the Sand Hills of Nebraska documents a significant wind shift in the Central Plains during this regime, which was severe enough to mobilize dunes 800 to 1000 years ago (Sridhar et al. 2006). The severity of this drought might have contributed to CPt abandonment of the region and the westward migration of Oneota groups attracted by expanding herds of bison (Logan and Ritterbush 2006).

Despite the dominance of prairie grasses in the region throughout much of the Holocene, trees also occurred as the major plants wherever water was available from permanent or intermittent streams. In eastern Kansas the floodplain forest-savanna community was characterized by medium tall to tall broadleaf deciduous forests with dense undergrowth. In poorly drained areas the native forest occasionally gave way to freshwater marshes with graminoid plants. Within the floodplain forest community dominant plants were cottonwood, hackberry, peachleaved willow, black willow, and American elm. The major plant of the freshwater marsh communities was prairie cord grass (Kuchler 1974). Identified burned wood samples from the Phil site reveal use of oak (probably bur oak), American elm, slippery elm, and ash for house construction by CPt groups (Regis Miller, personal communication June 7, 2007).

Faunal remains from Late Prehistoric sites in the region reflect the varied wildlife of the mixed grass prairie. CPt people procured such a wide variety of animals, as well as plants, that their subsistence economy was characterized as diffuse (Logan 1998b) and one of low-level food production (Roper 2006:122). (The White Rock phase pattern differed in this regard; see next section.) Animals utilized were mussels, fish (e.g., gar, catfish, sunfish), turtles (e.g., snapping, mud, box, softshell), raptorial birds and wildfowl (e.g., owl, hawk, grebe, duck, goose, prairie chicken, turkey), and mammals (e.g., cottontail, squirrel, beaver, raccoon, badger, canid, pronghorn, deer, wapiti, bison) (Brown 1982; for a more comprehensive list of fauna from archeological sites in the region, see Logan and Hedden 1992:8-11).

LATE PREHISTORIC PERIOD IN THE CENTRAL PLAINS

By Brad Logan

The Late Prehistoric period (ca. A.D. 900-1500) in the Central Plains was a time of dynamic cultural development and interaction with increasing reliance on domesticated plant foods, the more consistent appearance of substantial houses at habitation sites (with the singular exception of the White Rock phase), and the development of a more varied ceramic and bone technology. Several complexes have been defined for this period, including those of the Central Plains tradition: Upper Republican, Smoky Hill, Solomon River, Itskari, Nebraska, and Steed-Kisker phases (Logan 1996; Logan and Beck 1996). Only the first two of these are relevant to the Lovewell Reservoir area, as their core areas overlapped there. The White Rock phase, the manifestation of a westward extension of the Oneota tradition, was centered along White Rock Creek, and at the present time the Lovewell area appears to have been the major locus of habitation. Other White Rock phase sites are located elsewhere in north-central Kansas and south-central Nebraska.

CENTRAL PLAINS TRADITION

The CPt phases are Nebraska, Upper Republican, and Smoky Hill (Logan 1996; Steinacher and Carlson 1998). Some archeologists have added the Steed-Kisker phase (Roper 2006). The phases traditionally have been distinguished on the basis of their geographic locations in the central Plains. The Upper Republican and Smoky Hill phases both occur within the upper Kansas River basin. As originally defined, Upper Republican, as its name implies, was centered in the Republican River drainage of northwestern Kansas and southwestern Nebraska "mainly west of the Smoky Hills and north of the Arkansas River" (Wedel 1959:562). The Smoky Hill culture was centered along the Smoky Hill River eastward to near the confluence of the Big Blue and Kansas Rivers (Wedel 1959:562-563). The Nebraska phase was centered along the lower Missouri River valley on the Iowa-Nebraska border southward to northeastern Kansas and northwestern Missouri; Steed-Kisker was along the lower Missouri River valley on the Kansas-Missouri border.

The CPt phases followed similar settlement patterns and shared many material culture traits (Krause 1969:95). In general settlements were small, unfortified farmsteads or hamlets, often situated along tributary streams. The common house form was an earth-covered or wattle and daub structure of subrectangular outline with an extended entryway, central hearth, and interior storage pits. Major support posts were arranged symmetrically about the hearth and secondary supports around the perimeter. Stone and bone tools found at CPt sites differ little among the phases. These include small triangular notched and unnotched projectile points, beveled knives, planoconvex end scrapers, scapula hoes and knives, bone shaft wrenches, sandstone abraders, and various other nonceramic tools.

Differences in CPt material culture inventories are most noticeable in ceramic attributes, such as rim form. However, these differences are not distinct and may reflect geographic variations in the relative frequency of shared ceramic types (Hedden 1992). These variations, along with the blurring of geographic boundaries between variants, challenge the taxonomic integrity of the Upper Republican and Smoky Hill complexes as originally defined (Blakeslee et al. 1982; Krause 1982; Steinacher 1976; Wedel 1986:132). In his Master's thesis, based on a typological analysis of Riley Cord-roughened rim sherds from 10 Smoky Hill sites, John G. Hedden (1992) discerned a general directional trend in the relative frequencies of the various ceramic types. His geographical seriation suggests that, rather than the discrete variants currently recognized as Upper Republican and Smoky Hill, a continuum extended between their "boundaries." Hedden's interpretation demonstrated in a preliminary way the fragile nature of the current taxonomic conception of Late Prehistoric cultures in the Central Plains.

UPPER REPUBLICAN PHASE

The Upper Republican phase was initially described by William D. Strong (1933, 1935), based on archeological excavations in 1930 of the Lost Creek site (25FR3), in Franklin County, Nebraska. Subsequent excavations at numerous habitation sites in the Medicine Creek drainage added considerably to the database of this complex (Wedel 1933, 1934). Following World War II, the River Basin Survey program of the Smithsonian Institution augmented our knowledge of this complex with extensive research at the Medicine Creek locality (Kivett 1949; Kivett and Metcalf 1997) and the Red Willow Creek area (Grange 1980) in Nebraska and in the Solomon River valley of north-central Kansas (Carlson 1971; Krause 1970; Lippincott 1976). Additional investigations in the Medicine Creek locality included excavation of the Mowry Bluff site (25FT35), undertaken in 1967 as part of a seminar offered by W. Raymond Wood (1969) of the Department of Anthropology, University of Missouri, Columbia. This project took as its research design a comparison of two sites of the Nebraska and Upper Republican cultures (compare Wedel 1970). With support from the Bureau of Reclamation, Donna C. Roper (1988, 1991, 1993) carried out more recent work in that important area, which entailed excavations of a lithic workshop area at the Marvin Colson site (25FT158) and of House 4 at 25FT22.

The Upper Republican phase is geographically extensive, with sites documented in the High Plains of southeastern Wyoming and northeastern Colorado (Irwin and Irwin 1957; Reher 1973; Wood 1971), as well as southwestern Nebraska (see

references above), northwestern Kansas (Wedel 1959:381-407), and north-central Kansas (e.g., the Solomon River locality referenced above). Temporally, it has been divided into three units, only two of which are currently in vogue. Referring to the complex as a variant (a term he applied to Nebraska and Smoky Hill as well), Richard A. Krause (1969) recognized, from oldest to youngest, the Solomon River, Classic Republican, and Loup River phases. Chronological placement of Solomon River (compare Carlson 1971) was based on radiocarbon assays by the laboratory at Gakushuin University in Japan, determinations now generally regarded as suspect. In a review based on ecological and formal archeological data, Kerry A. Lippincott (1976, 1978) was critical of the sequence developed by Krause and Gayle F. Carlson. On the basis of more recently obtained radiocarbon dates from Upper Republican sites in the Solomon River locality, located at the confluence of the North and South Forks of the Solomon River at Waconda Reservoir, Donald J. Blakeslee (1991, 1999) shows contemporaneity of sites therein with those previously regarded as Classic Upper Republican.

Upper Republican ceramics were described by Waldo R. Wedel (1936:188) as belonging to two wares, thickened (collared) and unthickened, also referred to as classes I and II (compare Champe 1936:270-272; Cooper 1936:35-38; Strong 1935:248; Wedel 1986:106-108). Vessels are small to medium-sized globular forms, generally tempered with sand. Exterior surfaces are cordmarked and without decorative treatment below the rim. Decorated rims exhibit a variety of incised lines, including opposed diagonals, parallel horizontal lines, and chevrons, as well as tool impressions and finger-pinched nodes. John S. Sigstad (1969:17-23) provided a detailed analysis of typical Upper Republican pottery from the Mowry Bluff site in the Medicine Creek locality. He defined a Typical Medicine Creek Paste, distinguished from Grog-Tempered ceramics. The former included two wares: a collared form called Frontier ware and an unthickened form called Cambridge ware. Miniature vessels are also represented.

Upper Republican lithic tools are characteristic of CPt chipped and ground stone tool assemblages. Among the former are triangular notched and unnotched arrow points, various bifacial cutting tools of which alternately beveled knives are most distinctive, and axes. Ground stone artifacts are grooved sandstone abraders, especially of the paired type, manos, metates, hammerstones, pipes, and pendants (Calabrese 1969; Champe 1936; Klippel 1969; Strong 1935; Wedel 1935, 1986:111). Exotic stone material indicative of trade is rare but includes copper (Wedel 1986:112-113), malachite, and turquoise (Roper 1988). Chipped stone raw material is predominantly Niobrara jasper and includes Flat Top chalcedony, Ogallala quartzite, Alibates agatized dolomite, and Flint Hills cherts (Roper 1994; Wedel 1986:111).

Bone, antler, and shell were shaped into a variety of usable forms (Falk 1969:39-43; Wedel 1986:108-112). Bone tools include agricultural implements, such as bison scapula hoes and knives; hide working tools, such as awls and needles; fishhooks; antler shaft straighteners; and picks. Ornamental items include beads of bone and shell and antler bow guards. An example of the latter is an artifact recovered by Strong (1935:111; Wedel 1986:112-113) from Graham ossuary in Harlan County, Nebraska, that bears an incised design reminiscent of the hand and eye motif of the Southeastern Ceremonial Complex. Exotic shell indicative of trade occurs in the form of Gulf Coast conch, freshwater snails from the Ohio and Wabash Rivers region, marine olivellas from the Gulf or Atlantic coasts, and marginella from the Florida or Gulf Coasts (Strong 1935:111-114; Wedel 1986:111).

Upper Republican subsistence patterns show dependence on agriculture, hunting, and gathering. Wedel (1986:114-121) discussed the various implications of dry farming of maize in a marginal climatic region, such as the Upper Republican River region. Problems of crop yield, seasonal variations in rainfall and frost appearance, food preparation, and storage were explored. Adair (1988) also examined the development and practice of CPt agriculture. The generalized and varied nature of Upper Republican hunting and gathering practices also were examined by Falk (1969), Linda S. Mick (1983), Bozell (1991) and S. L. Scott (1993). Wedel (1970, 1986:123-126) critically reviewed Wood's (1969) interpretation of the need for long-distance bison hunting from the Medicine Creek locality. Wood (1971) offered as support for such forays the presence of Upper Republican sites lacking

evidence for agriculture in eastern Colorado (but compare Reher 1973:119). However, in more recent evaluations of High Plains sites, Wood (1990) and Roper (1990, 2006) suggested that there might be evidence of local Upper Republican groups who lacked the houses and farming practices elsewhere characteristic of that culture and that either deserve special recognition as a distinctive CPt phase or subphase or reflect alternative subsistence practices during times when farming carried greater risk.

Upper Republican mortuary sites are bluff top pit ossuaries, such as Graham (25HN5), into which disarticulated bones of the dead were disposed (Adair et al. 1987:78-89; Strong 1935:108-114). Artifacts buried with the human remains included pottery, shell pendants and beads, arrow points, scrapers, modified bone tools, and copper ornaments.

SMOKY HILL PHASE

The Smoky Hill phase was defined by Wedel (1959:563) on the basis of its then more discrete geographic core area and its associated pottery, which he defined as Riley Cord-roughened ware. Riley Cord-roughened vessels have been defined as medium to small jars and bowls with cordmarked exterior surfaces and high, decorated rims (often thickened with a fillet or collar). They generally are tempered with stone (either crushed grit or sand), which is characteristic of all CPt ceramics, or crushed sherd/clay, which is particularly diagnostic of Smoky Hill pottery. Decorations include evenly spaced pinches or stick impressions at the base of the collar, tool impressions on the top of the lip, or diagonal incisions across the lip. Appendages, such as strap handles, also occur.

One of the best known Smoky Hill settlements is the Budenbender site (14PO4), which is located on a terrace along Spring Creek, a tributary of the Big Blue River. The remains of two to three houses were recorded, and one of these was excavated in 1957 (Johnson 1973). The house form was circular, indicating more variety in CPt architecture than the stereotypic subrectangular lodge. Four main posts, surrounding a central hearth, supported the central portion of the house. Two interior storage pits were found near the northern edge of the structure. Two more irregular pits occurred near its eastern edge. Traces of an entryway were found at the southern edge. The lodge, which was 25 ft in diameter and included about 490 ft^2 (53 m^2) of floor space, is postulated to have housed from 5 to 10 persons. Associated with the structure and its features was a variety of lithic, ceramic, and bone artifacts. Chipped stone artifacts included triangular notched and unnotched arrow points, perforators, thin and thick bifaces, spokeshaves, end scrapers, side scrapers, retouched and utilized flakes, cores, and debitage. Ground stone artifacts included celts, pipes, manos, metates, grinding stones, hammerstones, grooved and ungrooved abraders, and worked hematite. Bone tools consisted of an awl fragment, fishhooks, a bead, antler shaft straightener, and antler handle. In addition to the dominant Smoky Hill ceramic ware, a smaller but significant number of smooth, shell-tempered and incised sherds indicative of eastern contact (SteedKisker phase?) was recovered. A single radiocarbon date of 760$\pm$150 years B.P. or A.D. 1190 (uncorrected) was obtained on a post associated with the house. Subsistence practices of Smoky Hill populations have been analyzed (Brown 1982). Included in Brown's thesis is a detailed discussion of the utilization of a variety of animals from prairie, woodland, and riverine habitats as food resources and for bone tools.

Terry L. Steinacher (1976) reviewed data from six Smoky Hill sites in the Republican River drainage of Kansas, two in Geary County and the rest in Clay County. Steinacher relied entirely on descriptive analyses of those assemblages that had been done by University of Kansas undergraduate students during the 1950s. In particular he focused on the ceramics in his effort to produce a temporal seriation and, more importantly, to determine the nature of the relationship between Smoky Hill populations and "Mississippian" (i.e., Steed-Kisker) groups of the eastern margin of the Central Plains. This relationship is best indicated by shell-tempered, incised ceramic ware. Steinacher (1976:109-114) concluded that Smoky Hill populations encountered westward-moving groups of the Steed-Kisker phase in an "interface" zone, the western perimeter of which extended to the present Tuttle Creek Project Area and the confluence of the Republican and Smoky Hill Rivers near present Junction City. The interaction of these populations resulted in a readaptation of both cultures and the development of the archeological culture known as the Nebraska phase.

Steinacher's interpretation must be considered hypothetical. Indeed, what is required is a reevaluation of some of its basic assumptions, particularly the nature of the so-called Mississippian ware that shows up so frequently at Smoky Hill sites. It has yet to be demonstrated whether this pottery is of non-local or local production. If it is of local manufacture, it may not be necessary to posit the taxonomic change suggested by Steinacher. On the other hand it may be sufficient to simply recognize a certain degree of change in the ceramic inventory of Smoky Hill populations through time. At any rate this aspect of the dynamics of the Central Plains populations of the Late Prehistoric period in the project area still requires investigation.

WHITE ROCK PHASE

Most knowledge about the White Rock phase still is based on data from six sites and brief descriptive reports about them. These sites are located in three localities: Harlan County Lake on the Republican River in south-central Nebraska and the Glen Elder/Waconda and Lovewell Reservoirs in north-central Kansas. Only one White Rock phase site at Glen Elder, the Glen Elder site (14ML1), has been excavated. Two smaller sites, possibly bison hunting camps, at Harlan County Lake are Green Plum (25HN39) and Blue Stone (25HN45). Principal White Rock phase sites at Lovewell are White Rock (14JW1), Warne (14JW2, 14JW8, 14JW9, 14JW10, 14JW17, 14JW24, 14JW38, 14JW39, and 14JW42), and Intermill (14JW202) (Cummings 1953; Kivett 1947; Logan and Banks 1994; Marshall 1969; Neuman 1963; Rusco 1960). Recent investigations at Lovewell have added significant new insights and increased understanding of this complex (Logan 1995, 1998a, 1998b; Logan and Banks 1994; Logan and Hedden 1992; Logan et al. 2001; Ritterbush and Logan 2000). Assigned tentatively to this phase are two sites in the Big Blue River valley: Reany (14PO13) and Spillway (14PO12) sites, both of which were located at the Tuttle Creek emergency spillway (Cumming 1958). Construction impacted both, destroying Spillway and at least part of Reany.

Though some traces of two habitation structures were found at the White Rock site, no satisfactory data concerning their architectural form could be obtained. No such information was forthcoming from any of the other five sites of this culture; consequently this formal characteristic of White Rock remains unknown. Features such as hearths and storage pits (basin, cylindrical, and bell-shaped) are associated with the sites, as are a variety of stone, bone, and ceramic artifacts. Chipped stone and bone tools from White Rock sites are comparable to those of Plains Village sites in the same area. Unlike the generally triangular, notched arrow points found at CPt sites, those from White Rock phase sites are far more frequently unnotched and were produced with minimal retouching from flakes of Niobrara jasper and Flint Hills cherts. Blades, the preferred blank for end scrapers, and flakes were driven from tabular Niobrara jasper cores, often quite large (e.g., >25 cm long). Bison bone tools include ubiquitous scapula hoes, scapula "squash" knives, toothed metatarsal fleshers, ulna picks, hide grainers, incised ribs, and dorsal spine paddles.

The most distinctive artifacts of the culture are the ceramics (Marshall 1969; Rusco 1960). Defined as Walnut Decorated Lip, the ware consists of vessels of the same general shape and form as Plains Village pottery. The pottery is relatively thin (2-8 mm) and generally tempered with moderate amounts of medium- to coarse-grained sand. Shell temper, an Oneota attribute previously believed to occur in low frequency (2 percent of 11,627 sherds, a compiled total of assemblages described by Marshall [1969], Neuman [1963], and Rusco [1960]), has been noted in relative frequencies closer to 50 percent in a ceramic assemblage of 548 sherds from middens and features at the White Rock site (Logan and Banks 1994; Ritterbush 2001; Wininger and Logan 1995). Exterior surfaces are smoothed or simple stamped. Decorative motifs consist of trailed or incised lines on the lip, interior of the rim, or shoulder. Appendages such as strap and loop handles occur and are frequently decorated with tool impressions or incised lines.

White Rock subsistence was a combination of hunting and plant gathering-cultivation. Charred kernels of maize from some sites provide direct evidence of horticulture. Hunting was markedly more specialized than that of other Late Prehistoric complexes. Where sites of the latter often have remains of a diverse array of mammalian, avian, and aquatic species indicative of a generalized economy, White

Rock sites thus far have yielded only elements of bison, deer, canid, and turtle. The high proportion of bison to other species reflects a hunting adaptation focused on that animal. Use of bison is reflected not only by the variety of tools manufactured from their bones but the presence at the White Rock site of a feature that consisted of a dense mass of fragmented bison bones, suggesting that it was used as a boiling pit for bone grease production (Logan 1995, 1998b).

Small samples of ceramics, noted in private collections from other sites located on tributaries of the lower Republican and upper Blue Rivers, to varying degrees of certainty support an extension of the White Rock culture to these areas (Ritterbush and Logan 1991:87-94). For example lithic (a high frequency of Niobrara jasper) and ceramic artifacts from two sites (14CY5 and 14CY462) in the Five Creek drainage indicate that the White Rock culture area extended eastward in the lower Republican River basin to Clay County, Kansas. This interpretation is supported by several pipestone artifacts from 14CY5 in the Schultz Collection at the University of Kansas Museum of Anthropology, as well as others in private collections in that county; these also point to Oneota influence on White Rock. Such artifacts have also been recovered from the Glen Elder, White Rock, and Warne sites (Marshall 1969; Neuman 1963; Wedel 1959:612), and these support an Oneota affiliation of the White Rock phase, too. If the Reany and Spillway sites were indeed White Rock phase occupations, then this complex extended even farther eastward to the Blue River valley.

Precise dating of the White Rock phase remains somewhat problematic, although recent radiocarbon assays point to a Late Prehistoric temporal placement. Mary K. Rusco (1960:43, 71, 75) and Wedel (1986:134-135) suggested a date of ca. A.D. 1500-1600 for the complex, based on the Oneota-like ceramics, the low frequency of shell-tempered "Oneota" pottery, and the relative absence of Euro-American artifacts. However, radiocarbon dates from western Oneota sites (e.g., Dixon [14GE7], Leary [25RH1], and Guthrey [23SA131]), as well as other regions, indicate a broader temporal range for Oneota (ca. A.D. 900-1700), spanning both the Late Prehistoric and Protohistoric periods (Henning 1970:168-170, 1998).

Previous reliance on artifacts of Euro-American manufacture to assign the complex to the Protohistoric period was tenuous at best. James O. Marshall (1969:91) suggested that such evidence in part supported temporal placement of Lovewell Reservoir sites (White Rock, Warne, and Intermill) at ca. A.D. 1650-1700. However, only the Intermill site yielded Euro-American trade objects: a single tubular copper bead and a few pieces of worked glass. All were found in shallow, disturbed contexts (Neuman 1963). During survey of Intermill in 1991, a fragment of a historic clay pipe also was recovered (Logan and Hedden 1992:57). The small sample of historic material, its ambiguous context, and the proximity (less than 300 m) of Intermill to the nineteenth-century settlement of Ruben (14JW202) undermine Marshall's suggested temporal placement. Occupants of Ruben may have traversed Intermill and lost or discarded the few historic artifacts there, or objects may have been discarded during the transient activities of historic Native Americans in the area.

Seven radiocarbon dates (one from a small pit feature at 14JW24, another from a pit at 14JW8, two each from two pits and one from a third pit at 14JW1) place the White Rock phase within the Late Prehistoric period (Logan 1995, 1998a, 2006, 2010b). Such placement raises the issue of relations between White Rock and the CPt. A late thirteenth- to fourteenth-century White Rock occupation of the lower Republican River basin would have been contemporaneous with the CPt in the same region (Logan and Ritterbush 1994; but see Blakeslee 1994). To date, however, there is no evidence of interaction between them.

The terminal date of White Rock is unknown. That it may have extended into the Protohistoric period is suggested by the presence of Walnut Decorated Lip ceramics at the Burkett site (25NC1), a major Lower Loup occupation near Genoa, Nebraska. Of 41 Lower Loup sites whose ceramic assemblages he examined, Roger T. Grange (1968:123; Plate 33) noted that only this site yielded such material, which suggests that there may have been contact between the White Rock and Lower Loup cultures. Unfortunately, the temporal parameters of the Lower Loup phase have not been satisfactorily determined; in particular its time of origin remains unknown. It is noteworthy that, according

to Grange's chronological ceramic seriation of Lower Loup pottery, the Burkett site was occupied during the earliest period of the sequence. A single radiocarbon date, 320±100 B.P. or A.D. 1630 (M-1368), unfortunately intercepts three wiggles on the calibration curve. (The Protohistoric period as a whole suffers from its coincidence with this noisy part of the curve.) This makes interpretation of the calibrated date (one sigma range and [intercept] A.D. 1453 [1530, 1537, 1635] 1666) impossible. Grange (1968:129) believed that the uncalibrated date was a bit later than the earliest occupation of the site, inferred as A.D. 1500-1650.

Other objects may be indicative of post-A.D. 1450 presence of White Rock. Two catlinite disk pipes were found at the White Rock site. Such artifacts are considered a Classic Oneota horizon marker (Henning 1998:356), dating after A.D. 1450-1500 (Boszhardt 1994:211). Two flakes of obsidian from 14JW8 (see Chipped Stone Tool Analysis section), which traced geochemically to a New Mexico source, also may indicate post-A.D. 1450 occupation of that site (Logan et al. 2001). It has been suggested that the trade of obsidian by groups with access to obsidian sources in the Jemez Mountains of New Mexico to others in the southern Great Plains began after that time (Baugh and Nelson 1987, 1988).

Marshall (1969:76) also suggested that White Rock was contemporary with Dismal River, a protohistoric Plains Apache culture, based on the association of ceramics of both complexes at some sites in Hooker, Cherry, Lancaster, and Sioux Counties, Nebraska (Gunnerson 1960:207-208, 211, 227; 1968, 1987). However, James H. Gunnerson (1960:239), who dated Dismal River at A.D. 1675-1725, suggested that the "Glen Elder-White Rock" material pre-dates Dismal River. Both Grange (1968:122) and Wedel (1959:594) noted that no Lower Loup or Dismal River site has yielded evidence of contact between these two complexes, despite their temporal overlap during the late Lower Loup period. It is difficult to explain any association between White Rock and Dismal River, when the former appears to have had at best only marginal contact with early Lower Loup. Recently Marshall (2008) reiterated his belief that what is now called the White Rock phase was contemporary with protohistoric cultures in the central Plains and ancestral to the Kansa. This interpretation was critically reviewed by Ritterbush and Logan (2009) in a thorough examination of his purported temporal and formal evidence. At present there is no evidence in support of anything other than a Late Prehistoric Oneota intrusion into the heart of the central Plains and no connection between the White Rock phase and subsequent Historic period groups that have been linked to the Oneota tradition.

Thus, present evidence indicates the Oneota assigned to the White Rock phase arrived in the Lovewell locality sometime in the late thirteenth century A.D. and may have remained or periodically occupied it into the first half of the fifteenth century. More radiocarbon dates and ceramic cross dating are needed to test or refine this assignment. The significant implication of the temporal placement of White Rock is that it strengthens Blakeslee's (1994) reassessment of CPt radiocarbon dates, which suggested abandonment of the Republican River valley ca. A.D. 1300. The White Rock phase, then, appears to have been the result of the migration about that time of an Oneota population to the lower Republican River valley, an area that just might have been abandoned by CPt populations (Logan 1995, 1998a, 2010b; Ritterbush 2006a, 2007; Ritterbush and Logan 2000).

LATE PREHISTORIC INTERACTION

As noted above, the contemporaneity of the CPt and the White Rock phase in the lower Republican River area, which is supported by radiocarbon dates from the Warne and White Rock sites, raises questions about whether groups of these different cultures interacted and, if so, about the nature of that interaction. David W. Benn (1989) suggested that the expansion of Oneota culture in Iowa entailed the subjugation of Woodland groups and the incorporation of women and children into Oneota life as a source of labor. This aggressive aspect is reflected in Oneota pottery by decorative motifs interpreted as abstracted representations of peregrine falcons, raptors known for attacking other birds. This expansion occurred during the fourteenth century, coincident with the migration of an Oneota group or groups to the White Rock core area, suggesting that the latter may have been part of this hegemonic process. If so, there might be archeological

evidence of conflict between Oneota migrants and any indigenous CPt groups in the White Rock area that they encountered. To date, no such evidence has been found.

It is peculiar that White Rock phase sites lack evidence of CPt contact and that the major habitations do not even reflect occupations by the different groups at different times (i.e., they are not multicomponent sites). Apparently White Rock immigrants did not choose to occupy the same locales as their CPt predecessors (or contemporaries?). That the latter might have abandoned the area was suggested by Blakeslee's (1993) interpretation of CPt radiocarbon dates, indicating termination of the Smoky Hill and Upper Republican phases ca. AD 1300 due to increasingly arid conditions. Roper (1995) suggested that CPt underwent a period of northward and westward expansion through much of its duration, culminating in the fourteenth century with the Initial Coalescent period that reflected the encounter of CPt and Middle Missouri groups in the Big Bend locality of South Dakota. This was followed by a time of contraction that culminated ca. AD 1400 in the abandonment of all but the northernmost manifestations of Late Prehistoric groups (i.e., Initial Coalescent and St. Helena).

Resolving the mystery of relations, if any, between groups of the Central Plains and Oneota traditions in north-central Kansas requires scrutiny and comparison of the most geographically and temporally proximate sites in that area. Thus, sites such as Phil Creek, which is only about 750 m from the White Rock site, may yield both necessary and sufficient evidence to address this problem. For that reason the NRHP evaluation of the site was undertaken. The questions of its NRHP eligibility and its comparability to the Phil and White Rock sites with regard to both CPt activities and relations with Oneota are addressed in the following sections.

PHASE III INVESTIGATION

By Brad Logan

Five persons devoted five days to investigation of 14JW48, beginning with intensive surface survey that located artifacts including pottery sherds, chipped stone tools and debris, burned limestone, and charcoal over an area 136 m north-south and 128 m east-west (ca. 1.75 ha; Figure 4). Selected finds were mapped with a Topcon GTS 212 Electronic Distance Measure Total Station from a mapping point designated 100 m North, 100 m East, 100 m Elevation. Given vulnerability of the mapping point to long term inundation, its location was mapped with respect to a permanent BOR benchmark on Pawnee Point that also has served as the White Rock site datum. Surface mapped items consisted of 191 artifacts with a mass of 2,598.7 gm (Table 2).

Placement of test units was determined by the density or variety of surface artifacts. All units were 1 x 1-m square and dug in 10-cm levels; fill was dry-screened through ¼-inch mesh hardware cloth. All feature fill was recovered for flotation. In-situ artifacts with at least one dimension ≥2.5 cm were piece plotted, drawn on unit plan maps, assigned field numbers, and recovered separately from screened materials. Forms for surface mapped artifacts, ground shots, test unit coordinates, and piece-plotted artifacts, unit level forms, plan maps, and digital photographs are archived at the KSU Archaeology Lab. All artifacts were sorted, identified, and entered with description, map coordinates, and mass in a research database (Excel). A cultural material database (Access) also was created in accordance with BOR requirement.

Test units were dug in promising areas of artifact concentration in the southern portion of the surface scatter and in the northern area, where it was suspected that wave action had carried cultural material beyond the true extent of the site (Figure 4). Three units (T8-T10) were dug in the latter area to determine if this marked the real site boundary or reflected wave deposition of some artifacts during times of inundation. The latter proved to be the case, as only T8, the southernmost of these, contained subsurface artifacts. The northern units, T9 and T10, were dug to depths of 80 and 50 cm respectively; neither yielded any subsurface cultural material. A buried soil was found in both units, at 35 cm in T9 and at 50 cm in T10. Despite the sterile nature of these units, the presence of this soil underscores the potential for buried cultural horizons at Lovewell (see section on Radiocarbon Dates and Geomorphology for discussion of this and other buried soils in the Phil site vicinity).

Seven units were dug in the area of densest artifact concentration, an area 130 m north-south and

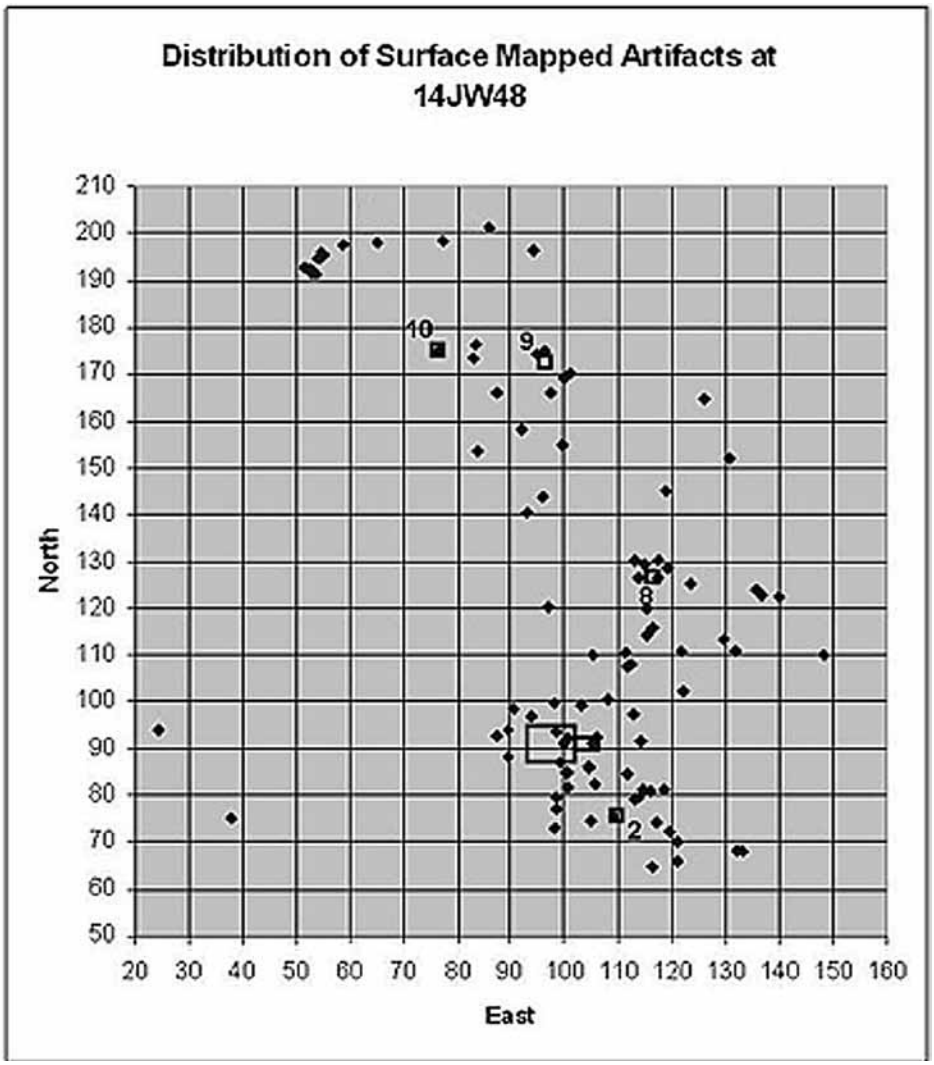

Figure 4. Distribution of surface-mapped artifacts at the Phil site, showing the location of test units 2 and 8-10. T1 and T3-7 subsequently proved to be within or adjacent to the house exposed during Phase IV investigation, shown schematically here. For locations of those units, see Figure 5.

60 m east-west (ca. 7,800 m^2) that correlates with a conspicuous area of dark grayish brown soil (see Figure 2) that was probably a buried horizon prior to reservoir inundation and subsequent planation. Indeed, such burial likely explains why the site was not discovered during previous investigations by the Nebraska State Historical Society and the Smithsonian Institution River Basin Survey. Neither had Phil or Dick Eckles found the site until quite recently despite periodic fishing forays by the former and artifact surveys of the lakebed by the latter during times of low lake elevation. Four test units (T1, T4, T5, and T7; Figures 5 and 6) were contiguous, and their upper 15 cm contained numerous pieces of pottery, two arrow point fragments, an end scraper, lithic debris of Niobrara jasper and Permian chert, burned limestone, charcoal, a bone bead, an antler awl fragment, burned and unburned bones, shell, and daub. T7 contained two burned vertical posts (F1 and F2; see feature descriptions in Phase IV section), the bases of which were surprisingly shallow (7 cm below surface [bs]). Below them the soil was noticeably softer in texture than that around them, though unchanged in color. The post molds were both 16 cm in diameter and extended to depths of 24 and 40 cm. These proved to be remnants of two eastern wall supports of a house that was completely excavated during Phase IV investigation.

Two contiguous units (T3 and T6) were dug 3 m northwest of those just described. T3, dug at an exposure of burned limestone, yielded a variety of materials to 20 cm, including part of a burned wood post, a large body sherd, and a bison scapula that

Table 2. Surface Mapped Artifacts.*

Artifact Type	Number	Mass (g)
Rim sherd	29	472.8
Body sherd	105	1,110.8
Arrow point	1	0.7
Arrow point (less base)	1	1.5
Biface	2	169.8
Biface fragment	2	13.2
Endscraper	2	30.9
Sidescraper	1	13.8
Retouched flake/blade	3	25.1
Chipped stone debris	31	243.5
Core and tested piece	2	193.7
Burned limestone	7	127.3
Fire-cracked rock	1	55.2
Unmodified quartzite	2	128.1
Bone	1	12.3
Charcoal	1	In foil
Totals	191	2,598.7*

These include 12 artifacts near block and 14 in northwestern corner of site mapped on September 3, 2006.

extended slightly into T6 (Figure 7). The burned limestone proved to be one of two massive concentrations within the house. T3 eventually was found to be just inside the northern wall of the house; most of T6 with much less debris was beyond it. No features were found in either unit. However, an extensive krotovina was found at 40-60 cm north and 25-78 cm east in T6 where one would expect, from hindsight of Phase IV excavations, north wall post molds. Rodent disturbance may have obscured them. Tables 3 and 4 present summary totals of artifact counts and mass for test units.

SUMMARY

Test excavations revealed that the heart of the site was within the southern portion of the surface artifact scatter. Moreover, within that area the clearest indications of a house were exposed in T3 and T7 where most cultural material was within 7-17 cm of the surface. What was not clear then was whether a second house might be indicated by the greater artifact numbers exposed on the surface east of those units. The paucity of cultural material recovered

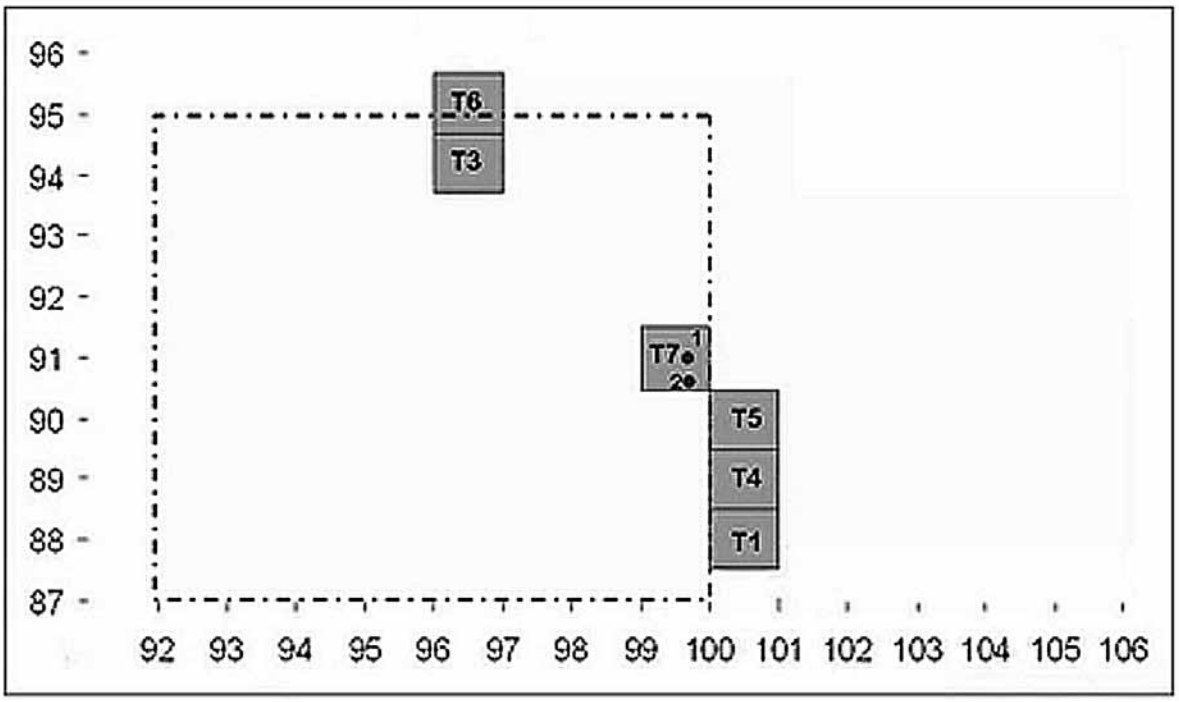

Figure 5. Locations of test units and Features 1 and 2 (both post molds) in T7 in the area of subsequent house block excavation, indicated by a dashed line.

Figure 6. View northwest to Pawnee Point (White Rock site), showing excavation in areas of T1/4/5/7 (two persons at left) and T3/6 (two persons at right). The Windmill Creek site was found 12 days after the photo was taken beyond that intermittent stream between the excavators and the Point (Figure 2). Pin flags mark surface-mapped artifacts of the sheet midden and activity areas beyond the house excavated during Phase IV.

Figure 7. Burned limestone, sherd, burned wood, and bone in T3 (20 cm below surface) at the north-central edge of the house (see Figure 5 for location with respect to subsequent house block excavation).

Table 3. Total Number and Mass of Cultural Materials Recovered from Test Units.

	Screened		Piece-Plotted (numbers assigned)		Depth of Unit/Depth of Cultural Horizon
Test Unit	Number	Mass (g)	Number	Mass (g)	(cm)
1	61	62.2	7 (4)	33.8	20/15
2	44	41.1	0	0	20/13
3	145	154.7	253 (11)	6,870.7	20/17
4	211	287.9	25 (8)	424.1	20/15
5	25	32.8	8 (7)	115.2	20/18*
6	61	65.5	0	0	20/13*
7	167	318.2	11 (6)	138.6	10/7
8	12	13.3	7 (3)	74.5	30/10*
9	0	0	0	0	80/0
10	0	0	0	0	50/0
Totals	726	975.7	311	7,656.9	

*Few artifacts recovered below cultural horizon from areas of disturbance, e.g., krotovina.

Table 4. Cultural Materials Recovered from Test Units.

	Screened		Piece-Plotted (numbers assigned)	
	Number	Mass (g)	Number	Mass (g)
Ceramic	210	366.7	29	435.6
Chipped stone debris	323	104.7	8	78.6
Chipped stone tools	9	24.4	3	14.7
Burned limestone	31	146.5	144	6,798.4
Unmodified stone	8	8.1	0	0
Bone	116	59.4	121	248.8
Charcoal	16	52.7	2	Unknown*
Daub/burned earth	12	212.8	4	80.8
Historic metal (buckshot)	1	0.4	0	0
Totals	726	975.7	311	7,656.9

* Burned posts not weighed because of adhering soil matrix.

from T2 and T8 and their lack of any structural features suggested that no house lay in that area. However, more extensive excavation was needed both east and west of T7 to determine not only in which direction the house indicated by the posts lay, but also if remains of more than one house were represented by the surface debris. The abundance of cultural debris on the surface, the redeposition of several artifacts northward from their original location through wave action, and the shallow depth of the cultural horizon all demonstrated the extreme vulnerability of the site to further erosion. Mitigation was recommended as soon as possible in order to take advantage of the current low lake level. Fortunately, funding was quickly acquired for Phase IV excavation.

PHASE IV INVESTIGATION

By Brad Logan

METHODS

As for Phase III, Phase IV fieldwork at 14JW48 was subcontracted by KSU to Burns and McDonnell Engineers, Inc. Continuity was provided by the PI, Field Director Mark Latham, and Phase III crew members Mark Darrow and Bob Thompson. Tod Bevitt, another Phase III member, joined Phase IV work during the final two days of excavation. Twelve other people participated in the excavation (Figure 8). Fieldwork occurred from November 15 to 24, with the loss of one day to rain, and December 2-3. It entailed excavation of an approximate 8 x 10-m block that embraced Phase III test units 1 and 3-7. The block fully exposed the floor of a structure ca. 7.5 m (north-south) by 7.5 m (east-west) in area (Figure 9).

The block consisted of 1 x 1-m units, but because of time constraints, only the eastern portions (varying from one-half to two-thirds) of those along the western perimeter were dug to expose perimeter post molds. Partial units also were excavated to complete gaps between block and test units and to expose entryway post molds. Unit fill was shovel skimmed, troweled, and saved for water screening; all feature fill was retained for flotation. Artifacts with at least one dimension ≥2.5 cm were piece-plotted (northing, easting, elevation) and documented on plan maps and unit level forms. Fifty-two features were drawn in plan view, cross sectioned, profiled, and recorded with digital camera and video camcorder. All unit forms and plan maps, feature forms (including plan maps and cross sections), field-number forms (for piece-plotted artifacts), sample field number log (for water screen and feature fill), and digital images (still and video) are curated at the KSU Archaeology Lab.

Figure 8. View southwest across block excavation of the Phil site house on November 20, 2004. ATV with cart was used to haul fill (plastic bags nearby) to higher ground for water screening. Builder's level on the tripod is at mapping point (100N 100E).

Unit fill was screened through 1/8-inch mesh hardware cloth with water from the reservoir, using a transfer pump with a 3.5-horsepower Briggs & Stratton motor and 1-inch hoses. Due to the onset of cold weather, only 150 bags of house fill were water screened at the station, established on the lake about 200 m west of the excavation. The balance of around 1,100 bags was transported to a secure area near the dam superintendent's house, set on a platform of pallets, and covered with heavy tarps until the following summer. During a six-day period in August 2005, a seven-person crew, including the PI, completed water screening with the same apparatus at a station a short distance above the spillway on the south side of the reservoir.

All feature fill and a standard 5-gallon sample from the southwestern quadrant of excavation units were retained for flotation, a procedure that was completed during summer 2005 at a station on the KSU campus, provided by the University Gardens. Samples were processed with a Dausman Model A Flote-Tech flotation machine. Because heavy fractions from the flotation process still retained a modest amount of clay and charcoal, they were soaked in the KSU Archaeology Lab in a solution of sodium hexametaphosphate (Soda Phos); flotation material was skimmed with a fine mesh sieve and added to the Flote-Tech light fractions.

Cultural material from water-screen and flotation samples was sorted in the KSU Archaeology Lab according to the following material types and (object classes): ceramic (rim sherd, body sherd), stone (chipped stone tool, chipped stone debris, ground stone tool, limestone, burned limestone, quartzite, fire-cracked rock, sandstone, ferrous oxide), sediment (burned earth, daub), bone (bone, antler, teeth), vegetal (charcoal, ash, burned seed/nutshell), and historic (ceramic, glass, metal). These identifications were entered in an Access database, according to specifications required by the BOR cooperative agreement with KSU. They also were entered in an Excel database with more specific provenience, morphological, attribute, or other information relevant to assemblage analyses presented in the following sections.

EXCAVATION

During the first days of Phase IV fieldwork, contiguous units were dug along the 89N line east and west from Phase III test units 4 and 5. To the east a series of seven units (89N 101E-89N 107E) formed an "exploratory trench." Included in this series were two disjunct units: 89N 109E and 88N 101E; the latter was adjacent east of T1/4 (Figure 10). Cultural material within this series was shallow (10-20 cm). Eighty-five artifacts were piece-plotted therein. They ranged in elevation from 99.75 to 99.9 m (mean = 99.83 m; σ = 3 cm), and the mean depth below the mapping point (10 m north of the trench) was 17 cm. Compared to the depth of artifacts plotted in the area west of T4-5 (see below), this was relatively shallow. No post molds or other house features were noted, and the density of cultural material, particularly daub, was low (Table 5).

Figure 9. View east across block excavation at the Phil site on November 24, 2004. Excavation of the extended entryway had not been completed at this time. Pin flags mark features. Compare with Figures 10 and 12.

While the density of prehistoric cultural material along the exploratory trench varied (primarily in the mass of pottery), it decreased notably at the eastern end (Table 6). Work in that area was terminated in order to expand excavation west of T4-5, where units being dug simultaneously revealed evidence of a house floor. Along the trench few artifacts were found at depth, and no features were discerned. Debris in that area was likely the result of house cleaning. The impact of wave action and lake deposition on the site in general was apparent along the profile of both the trench and the house block. An undulating layer of fine, generally sterile sand overlay the eroded A horizon, the upper portion of which was house fill (Figure 11). Artifacts were found at the interface of the sediment and underlying soil and within the latter.

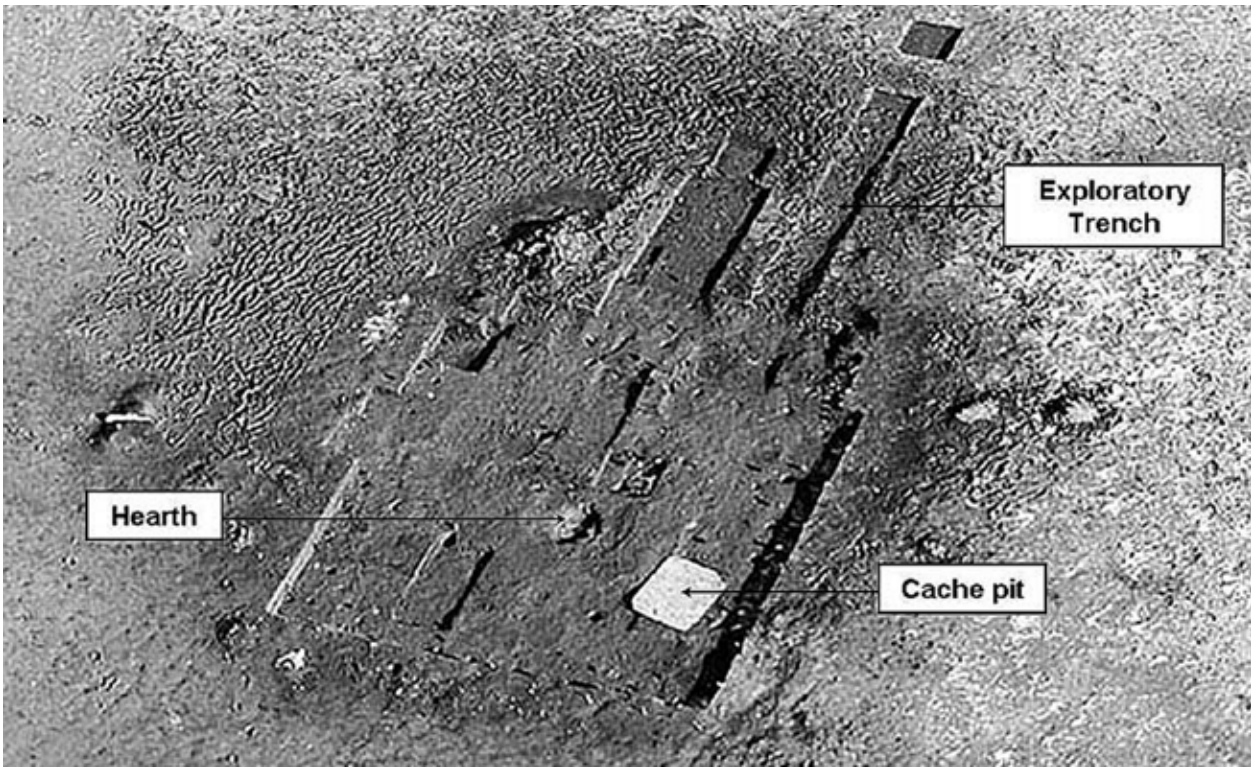

Figure 10. Aerial view of the Phil house block excavation; east is to top. Pin flags mark post molds as in Figure 9; plyboard covers Feature 14

Table 5. Cultural Material from Exploratory Trench.

	Screened/Flotation		Piece-Plotted	
Artifact	Number	Mass (g)	Number	Mass (g)
Rim sherd			7	62.9
Body sherd	937	1003.9	41	264.7
Chipped stone tool	13	24.2	10	33.7
Chipped stone debris	988	210.2	18	64.9
Burned limestone		144	7	154.5
Unmodified stone	*	36.2		
Ferrous oxide	*	0.6		
Sandstone	*	1.8		
Modified bone	1	1.6		
Burned bone		12	2	14.7
Unburned bone	*	19		
Tooth	5	0.7		
Unmodified shell	*	0.3		
Charcoal	*	21		
Daub	*	365.6		
Buckshot	*	17		
Nail/wire	4	24.5		
Totals	1,948	1,882.6	85	595.4

*uncounted

Table 6. Cultural Material by Unit in Trench.

Unit	Mass (g)	Unit	Mass (g)	Unit	Mass (g)
88N 101E	120.4	89N 103E	218.4	89N 106E	296.4
89N 101E	222.8	89N 104E	327.1	89N 107E	170
89N 102E	199.5	89N 105E	206.5	89N 109E	78.3

Figure 11. Profile along exploratory trench, showing the impact of lake on the site. Note the sandy fill, essentially sterile, within the irregular surface of the A horizon that contained cultural material.

Units west of T4-5 yielded many more artifacts, particularly larger plotable pieces. This was somewhat surprising because during Phase III only three sherds and a piece of charcoal (the latter proved to be part of Feature 1) were mapped within the 64 m^2 area where the house floor (less extended entryway) eventually was uncovered. Thus, nearly all artifacts associated with the house were buried, although the adjacent sheet midden was apparent. This suggests that the floor was semi-subterranean, perhaps the result of the builders removing the sod to a depth of about 25 cm. Supporting this inference are the relative elevations of plotted artifacts from the house block compared to those from the surface of the adjacent area (i.e., 87-100N, to account for differences in the slope of the lakebed north and south of the block). Thus, the mean depth of piece-plotted artifacts in the block with respect to the mapping point (~4 m northeast of the block) was 23cm (range of elevations: 99.57-99.91, σ = 5.9 cm), whereas that of surface-mapped artifacts west and east of it was 1 cm (range: 99.86-100.1, σ = 5.6 cm).

The house fill, excavated as a single level in all units, yielded a rich assemblage of pottery, chipped stone tools (arrow points, preforms, knives, drills, graver, scrapers, and retouched/utilized flakes), debitage, ground stone implements, burned limestone, burned and unburned bone, bone tools, and daub. The range of elevations of piece-plotted items (99.57-99.91 m), most of which are assumed to have come to rest on or near the house floor, provides a gross estimate of the maximum thickness of the house fill: 34 cm. A more accurate estimate, given evidence of rodent activity that likely moved some artifacts, is provided by the tighter range of elevations of the plotted burned posts (see below), from 99.68 to 99.87 m, which has a mean of 99.753 m. The mean elevation of all plotted material (n = 571) is 99.755 m, essentially that of the burned posts, both suggesting a floor depth of about 25 cm. The range of depth below mapping point of unit bases is 16 to 30 cm with a mean of 23.3cm, the latter approximating the floor depth.

Figure 12 shows the final configuration of the house block with a portion of the exploratory trench for reference (compare Figure 10) and all features (post molds are not to scale). The relationship of the block to the Phase III test units is shown. Figure 13 displays representative sherd clusters and large vessel fragments found in the house fill. One illustrates the effect that burning of the structure had on associated material, with heat so intense that it warped several sherds and left most bones calcined and fragmented.

Forty charcoal samples, including F1-2 from Phase III, most of which are likely portions of house supports, were plotted and wrapped in foil. (Given adhering soil, these are not included in the total mass of charcoal in the database. Provenience and taxonomic data for these can be found in Logan 2008a:Appendix 1.) Their narrow range of elevations (99.68-99.87 cm), mean (99.75 cm), and standard deviation (5.7 cm) suggest that most came to rest on the same surface, presumably the floor. They are from 2 to 64 cm long and from 3 to 14 cm wide. Orientation was recorded on 28 samples. Twelve are north-south to northeast-southwest (0-48°); others are east-west to northwest-southeast (77-143°) (mean and standard deviation = 75° ± 19°). Given the square outline of the structure, longer timbers that deviate from east-west and north-south orientations may have been radial stringers.

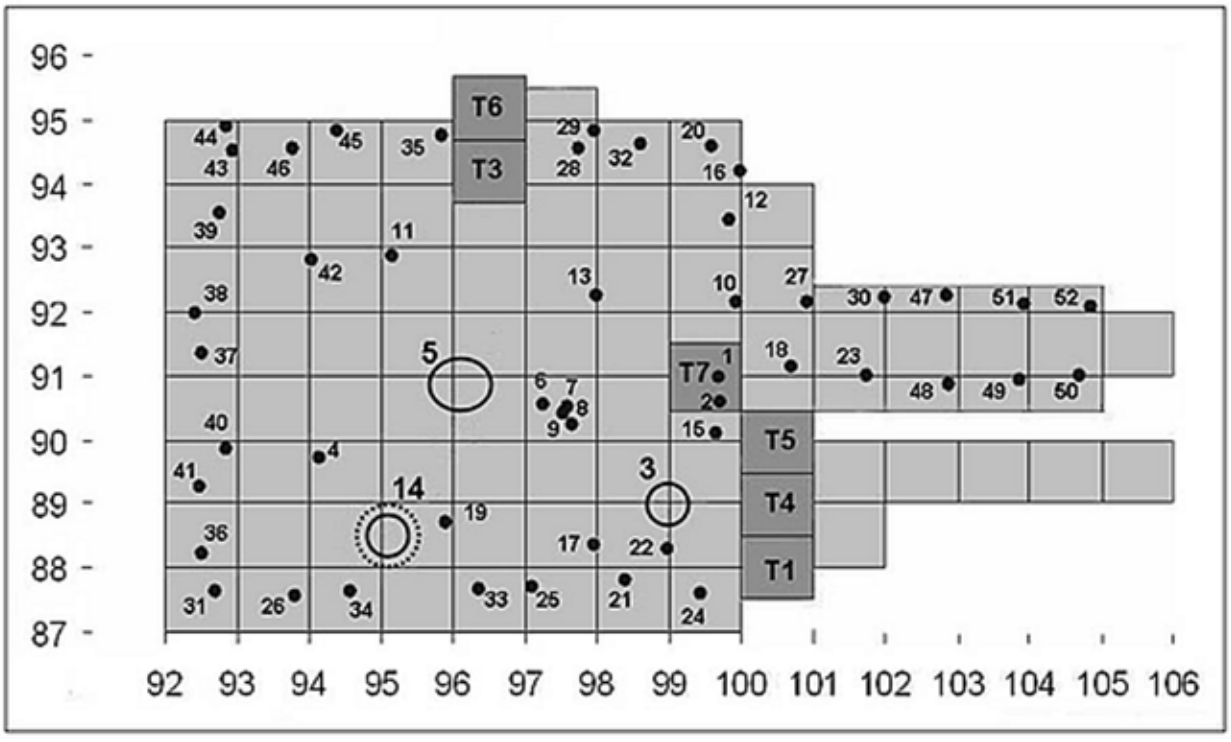

Figure 12. Phil house block showing features, Phase III test units, and western part of the exploratory trench. Perimeter units on the southern and western sides of the block were dug only far enough to reveal post molds.

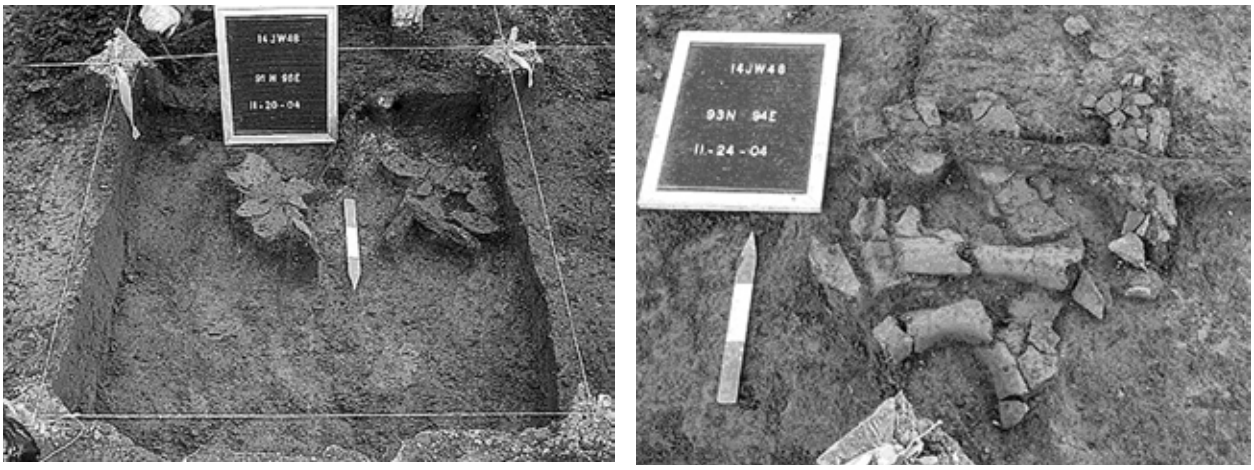

Figure 13. left. Concentration of pottery sherds at southwestern edge of the hearth (F5). right. Charred timber lies across a calcined, fragmented bison scapula and fragments of warped pottery (vessel 393; Figures 35-36), reflecting the effect of the intense heat generated during the burning of the house.

Eleven samples were identified by Dr. Regis B. Miller, retired from the USDA Forestry Lab and now Information Specialist in Wood Identification and Tropical Woods, Madison, Wisconsin. Figure 14 shows the distribution of plotted charcoal, including 10 of those identified (Miller, personal communications June 7, 2007, and June 22, 2009). The sample in 90N 97E was "mostly mud with very small pieces of charcoal; perhaps elm (Ulmus)" (Miller, personal communication June 7, 2007). For internal and perimeter posts, Phil site house builders selected a variety of hardwoods, including those of the white oak group (Quercus; bur oak is the only native member in the region; Pool 1984:173), ash (Fraxinus; both red and green ash occur regionally; Pool 1984:176), slippery elm (Ulmus rubra), and American elm (Ulmus americana). The woods of all these durable trees are used today for posts (Pool 1984:95, 101-103, 161-163), so it not surprising that the CPt people along White Rock Creek chose them as house supports.

FEATURES

Fifty-two features were found: 49 post molds, a hearth, a storage pit, and a mass of burned limestone and associated artifacts. All but a few post molds recorded during Phase IV were discerned in the same manner, by probing the thick A horizon with a wire pin flag and spooning out the noticeably softer fill that distinguished them from the surrounding more compact soil. In a few cases rodents had disturbed the post molds; possibly others were so thoroughly disturbed that they were not found. In several cases molds contained charcoal, probably derived from posts that had burned to floor level. In addition to F1-2, found during Phase III, burned portions of another pair of adjacent posts (F16, 20) were exposed in the northeastern corner of the block. Another post mold was outlined by the burned exterior of the post.

Nine features are molds of interior posts, and four of them (F4, F6, F13, and F42) have diameters that are notably greater than all but two on the perimeter (Table 7). These are suggested to mark main supports of the structure. In plan view they do not have the classic square post pattern of CPt lodges; rather they form a trapezoid, tapered toward the extended entryway. Of course, it is possible that the excavation missed one or more major post molds that would have rendered a more symmetrical pattern.

Adjacent to F6 was a cluster of shallow depressions (F7-F9) with a krotovina oriented northwest/southeast through them. (A krotovina also penetrated the base of F6). It was unclear to field personnel whether F7, F8, and F9 were themselves the result of rodent burrowing or were disturbed post molds that marked props ancillary to F6. All had identical diameters (13 cm) and shallow depths. F11 lay just beyond the outline of the main supports, though close enough that it also may have

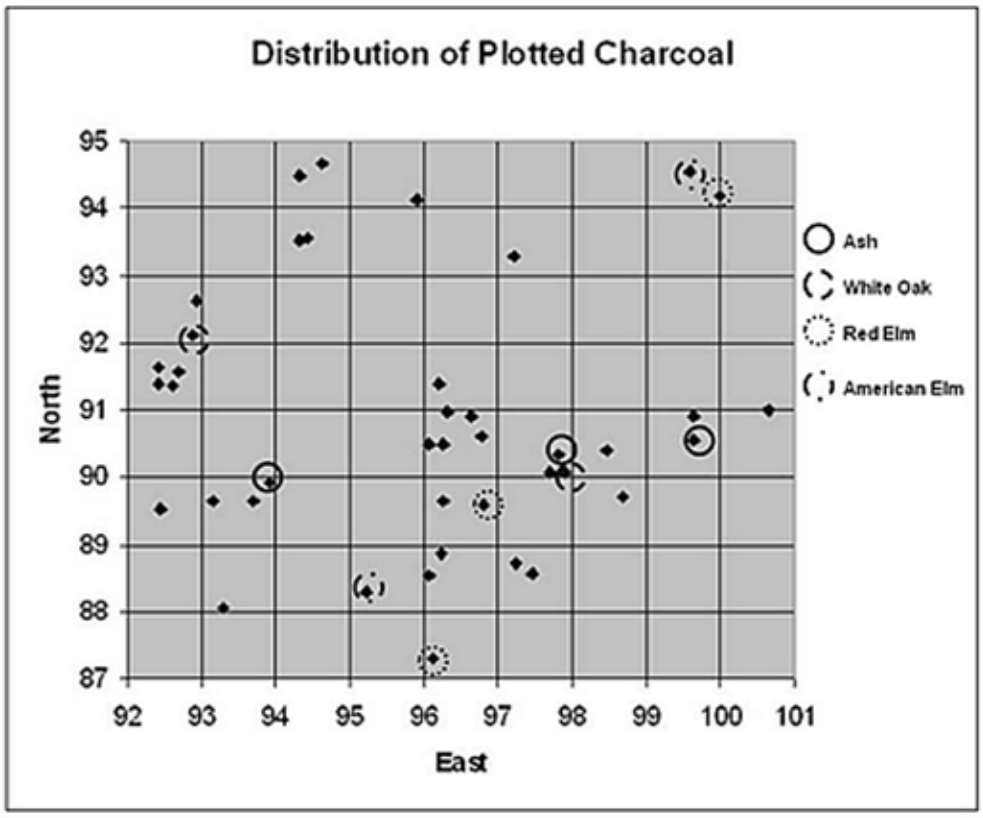

Figure 14. Map of the house block (less entryway), showing distribution (centroids) of plotted and identified charcoal. (For coordinates and other sample data see Logan 2008a:Appendix 1.)

Table 7. Attributes of Interior Post Molds.

Feature No.	Diameter (cm)	Depth* (cm)	Profile	Inclination	Orientation	Comment/Fill Contents
4	25	56	straight	vertical	none	flakes, bone, daub, limestone, charcoal
6	23	20	tapers	vertical	unknown**	flakes, daub, sherds, bone, charcoal; krotovina at base
7	13	4	rounded	unknown	unknown	krotovina noted
8	13	6	rounded	unknown	unknown	krotovina noted
9	13	6	rounded	unknown	unknown	krotovina noted
11	14	5	rounded	unknown	unknown	burned ring around mold/ charcoal
13	20	15	straight	vertical	none	charcoal at surface/ sherd, flakes, bone, charcoal, daub
19	11	10	rounded	unknown	unknown	charcoal, daub, flakes
42	24	50	straight	vertical	none	main support/sherd, flakes, modified flakes, bone, daub, charcoal

*Depths are difference between upper and lower elevations of features.

**Profile too shallow to determine.

held a prop for a sagging beam. Alternatively, it and the more distant F19 could have held free-standing posts for hanging gear, as depicted in the Karl Bodmer painting "Interior of a Hut of a Mandan Chief." A larger post mold (F4) was the only one with a sandy matrix that was easily discerned by color contrast (Figure 15). A 50-cm-long burned beam, found just south of this feature, is identified as ash, as is another adjacent to the cluster of post molds designated F6-F9 (compare Figure 14). This does not indicate preference for this particular hardwood for main supports. Indeed, a second sample of charcoal from the latter cluster is of the white oak family (bur oak), and another of ash was more clearly associated with a perimeter post (F2).

Perimeter posts varied in diameter (5-20 cm; mean = 13.2 cm) and depth (11-54cm; mean = 24.6 cm); entryway posts varied less in diameter (10-13 cm; mean = 10.8 cm) and depth (20-31 cm; 23.5 cm) (Tables 8 and 9). Perimeter post molds were aligned irregularly in cardinal directions along each wall with displacement up to 22 cm (see Figure 16 for a view of such alignment). The greatest off-set was in the southeastern corner where F17 and F22 may have marked gear or bed posts rather than wall supports. Burned wood samples, associated directly with molds (F1, F16, F20) or found very close to them, are identified as ash, slippery elm, American elm, and white oak family (bur oak), indicating an eclectic selection of various hardwoods (Figure 14).

The entryway extended 5 m eastward from F1 and F10 and was outlined by five pairs of post molds about 1 m apart and slightly north of the centerline of the house (Figure 12). Charcoal was plotted near only one entryway post mold (F18) and was not submitted for taxonomic identification. Charcoal was notably sparse in these features, suggesting that most entryway posts decayed naturally rather than burned. Judging from recorded mold profiles (32 of 40; 80 percent), the subsurface portions of 26 perimeter and entryway posts were set vertically. Three at the western end of the entryway were inclined slightly, two to the east and one, opposite one of the latter, to the west. Four on the north wall inclined slightly east, and another in the northeastern corner leaned slightly north. Most post molds tapered downward,

Figure 15. Plan view of F4, a main support post mold. The fill was so soft it took little pressure to probe with an Oakfield tool (note hole). It was the only mold whose fill contrasted in color from surrounding soil.

Table 8. Attributes of Perimeter Post Molds. (Note: Numbers proceed clockwise from northeastern corner of block.)

Feature No.	Diameter (cm)	Depth (cm)	Profile	Inclination	Orient.	Comment/Fill Contents
16	12-14	26	straight	unclear	slightly north	burned post *in situ*; subsoil inconsistent v. other molds
12	12	31	tapered	unknown	unknown	limestone, charcoal
10	12-13	33	straight	unknown	unknown	charcoal
1	16	24	tapered	vertical	none	charcoal at surface
2	16	40	tapered	vertical	none	charcoal at surface
15	13-14	15	tapered	vertical	none	charcoal
24	14-15	14	tapered	vertical	none	
22	18	12	tapered	vertical	none	charcoal, flakes
21	20	40	tapered	vertical	none	wood at 37-40cm
17	9	26	unknown	unknown	unknown	flakes, charcoal, burned limestone
25	11-12	27	tapered	vertical	none	body sherd, charcoal, daub
33	18	26	tapered	vertical	none	flakes, bone, charcoal
34	20	30	unknown	unknown	unknown	flakes, bone, charcoal, daub, burned limestone
26	12-14	?	unknown	unknown	unknown	feature was not cored
31	13	30	tapered	vertical	none	charcoal at surface & in fill
36	12	30	tapered	vertical	none	charcoal; cored to groundwater
41	13	28	tapered	vertical	none	flakes, bone, charcoal, daub
40	5	18	tapered	vertical	none	
37	16	21	straight	vertical	none	flakes, bone, charcoal, daub
38	15	14	straight	vertical	none	flat base; charcoal
39	9-10	16	straight	vertical	none	base slopes to east; sherds, flakes, bone, daub, charcoal
43	12	11	tapered	30°	east	
44	12	14	straight	vertical	none	base slopes to east; flakes, burned limestone, charcoal
46	11-13	30	tapered	vertical	none	flakes, bone, charcoal, daub
45	12	54	straight	vertical	none	below groundwater; flakes, bone, charcoal, daub
35	16	44	straight	7-9°	east	biface, modified flake, flakes, charcoal, bone
28	7-8	22	tapered	25°	east	charcoal
29	6-7	13	tapered	22°	east	flake, charcoal
32	16-17	34	tapered	vertical	none	flakes, charcoal
20	10-15	15	unknown	unknown	unknown	charred post; charcoal

some to flat bases, others sloped, and a few narrowed to a point; 18 on the perimeter tapered, 8 had straight sides, and others were unclear or not documented. Fill from all except F26 was floated and in nearly all cases contained some cultural material, predominantly charcoal but also small amounts of daub, bone, burned limestone, debitage, a few modified flakes, and one biface.

Three other features that deserve more extensive description are a concentration of burned limestone (F3), a central hearth (F5), and a bell-shaped cache pit (F14).

Table 9. Attributes of Entryway Post Molds.

Feature No.	Diameter (cm)	Depth (cm)	Profile	Inclination	Orientation	Comment/Fill Contents
18	13	31	straight	23°	east	modified flake, flakes, daub, charcoal
23	10	24	tapered	17°	east	charcoal, flakes
48	12	24	tapered	vertical	none	
49	11	22	tapered	vertical	none	daub
50	10	25	tapered	vertical	none	
52	10	20	tapered	vertical	none	
51	10	20	tapered	vertical	none	krotovina throughout top 10 cm
47	10	20	tapered	vertical	none	burned limestone
30	13	25	unknown	unknown	west	burned limestone at 5 cm, sherd at 9 cm, sandstone at 12 cm
27	9	24	tapered	vertical	none	charcoal

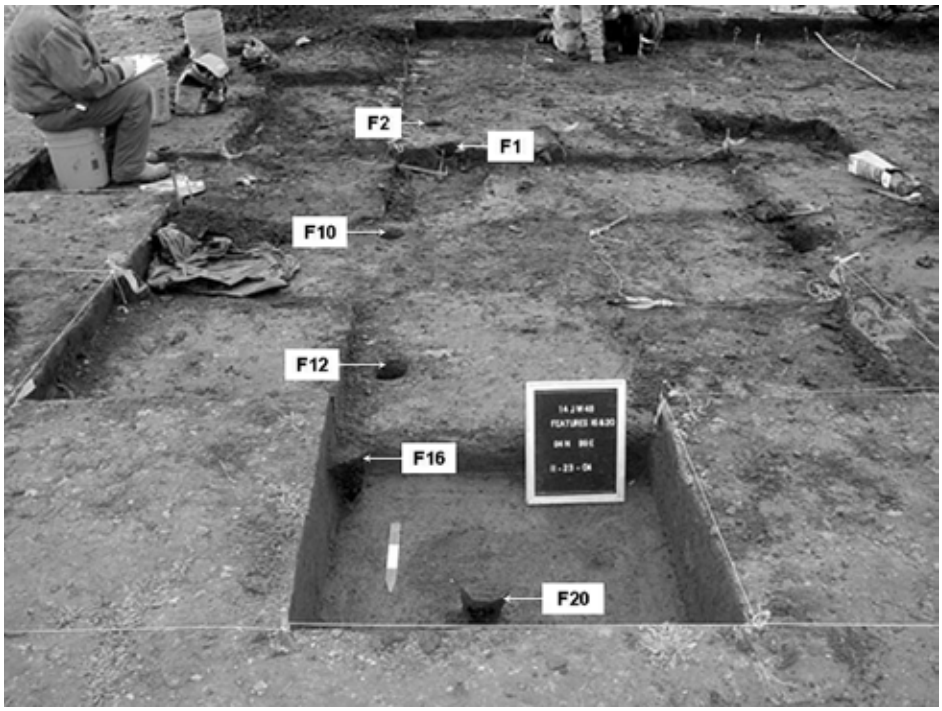

Figure 16. Postmolds F1, F2, F10, F12, F16, and F20 along what would have been the east house wall, viewed south.

Feature 3: This concentration of burned limestone covered an area ~40 x 40 cm in the southeastern corner of the house (Figures 12 and 17). Associated directly with the stones were a chert core, rim sherd, bison mandibular molar, metal fence staple (atop the stones and evidence of historic intrusion), and part of the cut beam of a deer antler. The presence of the last is intriguing because it cross mends to a worked tine (awl) found ~1.6 m southeast in T4, which was just outside the lodge (see Faunal Analysis section). How these two pieces came to be on opposite sides of the eastern wall is unknown, but it was probably due to post-depositional disturbance. Separation of the pieces occurred after the house burned since fire-blackening extends across the break.

Within 10-20 cm of the stones, but mapped as part of the feature, lay a few displaced pieces of burned limestone, three body sherds, a modified flake, a piece of debitage, a burned bone, an abrader, and a piece of daub. All of this material lay within an 80-cm-diameter area. The concentrated limestone was only 5 cm in thickness. While

Figure 17. Feature 3, concentration of burned limestone and associated artifacts. Note vessel 102 in the lower left corner (see Figure 40).

charcoal appeared on the floor immediately northwest of the stones, no burned wood or ash was directly associated with them, and no discolored or oxidized soil lay beneath. Thus, it does not appear to have served as a hearth. Fill associated with the feature was floated, and the material recovered is shown in Table 10.

Feature 5: This was the hearth at the center of the lodge, 2 m west and 75 cm north of F3 (Figures 12 and 18). While ashy soil associated with the fire pit was smeared over an irregular, somewhat circular area (1.2 m east-west, 1 m north-south), the fire pit itself appeared within the eastern half of the feature, which contained three smaller areas of dense ash. Five burned timbers, the two largest of which are 32 cm and 36 cm long, were mapped at the eastern edge of the pit and just beyond it. None is identified taxonomically. Other than a retouched flake near one of the dense ash areas and a body sherd at the northern edge, no large artifacts were directly associated with the hearth.

The southern half of F5 was removed to obtain a cross section (Figure 18), which revealed a concave-based fire pit, measuring 94 cm east-west. The upper 15 cm contained light gray (10YR7/1) ash. Below that was intensely oxidized loam that graded

Table 10. Cultural Material from Feature 3 (floated from fill unless otherwise noted).

Cultural Material	Number	Mass (gm)	Field Number
Rim sherd	1	21.6	213
Body sherd	28	99.3	
Knife	1	12.7	
Retouched/utilized flake	1	0.9	
Chipped stone debris	123	21.6	
Burned limestone (F3 plotted)	*	549.1	
Burned limestone (flotation)	*	13.9	
Abrader	1	17.3	
Unmodified stone	*	4.1	
Beam portion of deer antler awl	1	2.3	165
Bison tooth (lower third molar)	1	43.3	166
Burned bone	*	1.4	
Unburned bone	*	3.5	
Unmodified shell	*	<0.1	
Charcoal	*	11.5	
Daub	*	85.1	
Historic metal (fence staple)	1	3.7	
Historic metal (buckshot)	2	0.2	
Totals	160	891.5	

Figure 18. left. Hearth in plan view. right. In cross section. Note krotovina in western portion of both views.

from strong brown (10YR4/6) to dark brown (10YR4/3). A vertical krotovina penetrated the western side of the hearth. The entire fill (~45 gallons) was collected for flotation, which yielded the material shown in Table 11. Note that the burned limestone (3,367.7 g) was passed through nested geological sieves and is presented according to size grades (inches).

Feature 14: A single cache pit was found just west and 1.5 m south of the hearth (Figures 12 and 19). Its orifice was 60 cm in diameter from which its shaft descended 30 cm before belling to a maximum diameter of 1.13 m north-south by 1.08 m east-west at its base 1.02 m below the house floor. Most of the feature fill lay below the water table. This was anticipated because Professor Bill Johnson found groundwater at a depth of 75 cm in a core hole for geomorphic inspection about 20 m north of the block. (A measure of the surface of the water in the pit from the mapping point and correlation with the elevation of the lake that day [data provided online by the BOR] made it possible to determine the elevation of the house as 1,573 amsl.) The upper 42-45 cm of the pit, most of which was the cylindrical access shaft, was above the water line. It yielded a few artifacts and, just at the water line, pieces of burned wood and limestone. Pieces of daub and wood were found near the surface of the feature but disappeared below 50 cm, suggesting that the pit was open to a depth of 45-50 cm when the house burned. Below the waterline the mucky fill yielded several potsherds, pieces of burned limestone, debitage, an arrow point, an end scraper, and the best preserved unburned bones recovered from the block excavation. The latter include elements of canid, bird, and fish. Despite the muddy nature of the fill, a black (10YR2/1) silt, it easily could be distinguished from the more compact soil around it (B horizon 10YR3/1-2). Most of the pit fill

Table 11. Cultural Material from Feature 5 Flotation.

Cultural Material	Number	Mass (g)
Body sherd	19	29.2
Retouched/utilized flake	2	8.1
Chipped stone debris	348	53
Fire-cracked rock	1	1.7
Burned limestone (<.065in)	*	588.6
Burned limestone (.065in)	*	818.4
Burned limestone (.131in)	*	398.9
Burned limestone (.185in)	*	267.6
Burned limestone (.263in)	*	295.8
Burned limestone (>.371in)	*	1,266
Burned bone	*	13.7
Unburned bone	*	1.8
Unmodified shell	*	0.2
Charcoal	*	8
Burned seed	*	<0.1
Daub	*	16.3
Burned earth	*	~16,448
Totals	370	20,215.3
		*uncounted

Figure 19. Feature 14, a cache pit, at completion. The belled portion was below groundwater, which here is seeping back after quick bailing and documentation.

Table 12. Cultural Material from Feature 14 Flotation.

Cultural Material	Number	Mass (g)
Daub	*	16.3
Rim sherd	5	143.6
Body sherd	153	961.6
Preform	1	2.3
Biface	1	4.3
Biface fragment	1	12.8
Endscraper	1	13.8
Retouched/modified flake	6	27.7
Chipped stone debris	349	72.6
Fire-cracked rock	*	111.4
Burned limestone	*	1,289.1
Burned bone	*	24.7
Unburned bone	*	4.7
Unmodified shell	*	9.6
Charcoal	*	171.3
Daub	1	3.2
Totals	518	2,852.7
		*uncounted

below the water table was recovered, drained, and saved for flotation, a process that yielded the material shown in Table 12. In order to complete that task and photograph the feature at its watery base (Figure 19), the excavator and a "bucket brigade" bailed the pit as quickly as possible before it again filled with water.

DISTRIBUTION OF CULTURAL MATERIAL

In this section the distribution of various material types is discussed and illustrated to discern patterns interpretable with respect to household activities. Inferences about tool storage, debris discard, activity areas, and other forms of spatial behavior might be made from the non-random location of these artifacts. In order to delimit activities that may have been focused around features, such as the hearth or cache pit, most contour maps here exclude material recovered within them. They show the distribution (quantities and/or mass) in the house fill of ceramics, chipped stone tools, chipped stone debris, burned limestone, bone, daub, and charcoal. The distribution of formal stone tools in general and functional classes including projectile points, bifaces and biface fragments, and scrapers in particular are also discussed. These items are plotted regardless of feature or non-feature provenience. Only six formal tools were associated with features, and these do not significantly distort distributional patterns. Reference to distributions with respect to ordinal quadrants, though of no known relevance to the prehistoric occupants, is made when non-random dispersal at that scale is evident. In combination the distributions point to the unplanned abandonment of the Phil site house.

Ceramics: Although pottery sherds were found in all units across the block, they were clearly concentrated in two areas, one considerably more extensive than the other (Figure 20). In general pottery was sparse in the entryway and perimeter of the house. A small but discrete concentration in the northwestern quadrant was strongly influenced by the cluster of heat-warped pottery shown in Figure 13. Most of the larger concentration, particularly that part marked by the 200-400-gm line, fell within an area defined by the interior support posts of the house and was centered just southeast of the hearth. Within the southern part of this area was a distinct peak at 88N 98E that was most strongly influenced by the large vessel fragment near F3, shown in

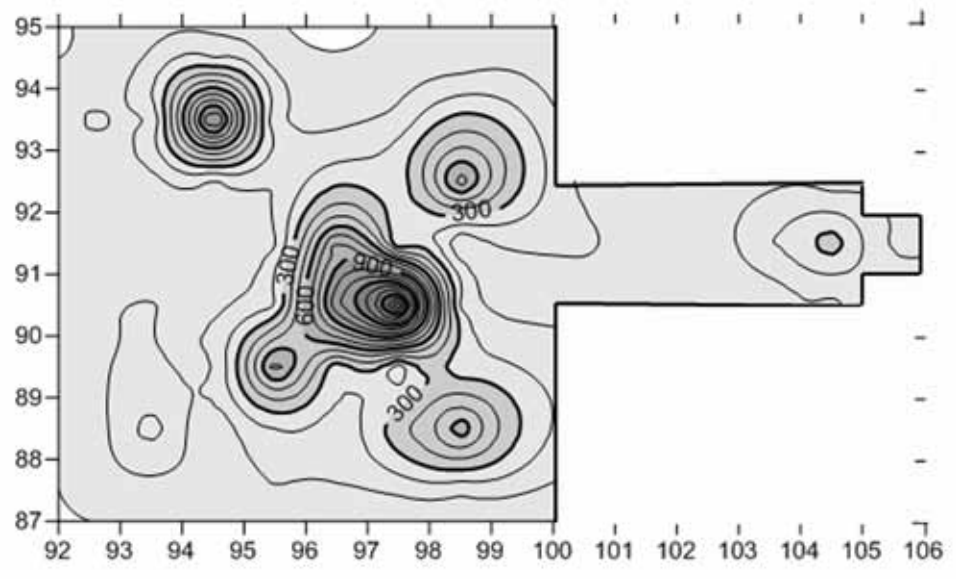

Figure 20. Contour map showing the distribution of pottery by mass (g) across the house block.

Figure 17. This larger concentration reflects several vessel fragments found in relatively close proximity to the fire pit, a relationship compatible with use for cooking. The presence of a reconstructed vessel and of large portions of four others suggests that usable pots were stored near the hearth; alternatively the warping of some of these vessels that occurred when the house burned might indicate that they had been set there to be dehydrated prior to firing (see Ceramic Analysis section).

Chipped Stone Tools: The distribution of chipped stone tools, both formal and informal (i.e., retouched/utilized flakes) by number (Figure 21) suggests that most were in the southern half of the block with fewest in the northeastern quadrant. In order to mitigate subjective inferences based on visually perceived patterns and to discern patterns in their distribution, statistical analysis focused on formal tools in general and functionally specific classes: projectile points, bifaces and biface fragments, and scrapers. This analysis uses the index of dispersion (ID), which is the ratio of the mean number of tools per unit and the variance. For a random distribution the variance/mean ratio meets the Poisson distribution of 1.0, in a uniform distribution <1.0, and in a clustered distribution >1.0 (Hodder and Orton 1976:34). Such tests of randomness are affected by unit size. Because excavation units were 1 m^2, initial tests used that size. As it is unlikely that

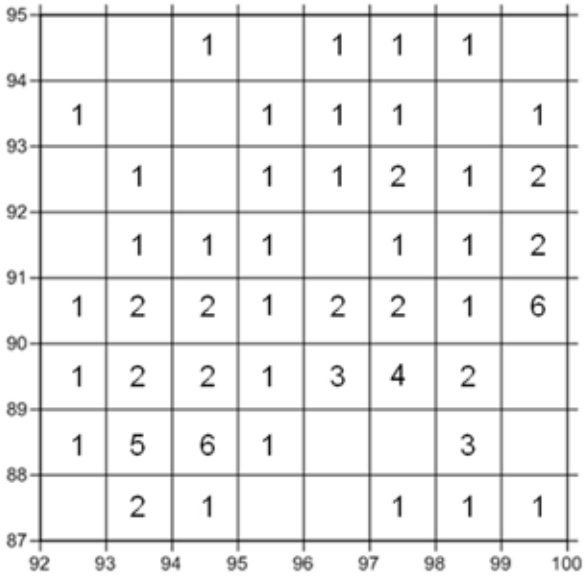

Figure 21. Distribution of chipped stone tools per excavation unit across the house block, entryway excluded.

the house occupants carried out tool-related activities, other than storage, at that scale, tests were also made of 4 m^2 and 16 m^2 quadrats (grouping contiguous units from the southwestern corner of the block, excluding entryway and test trench units). These better approximate activity or use-disposal areas. Tests for significant departures of ID from the theoretical Poisson ratio of 1.0 relied on the chi-square

value: ID(N-1) where N is the total number of grid units. If the value falls between the chi-square table values for N-1 degrees of freedom at the 0.975 and 0.025 probability levels, then a random distribution is accepted; if it is less than the 0.975 level, then a dispersed pattern is indicated; if it exceeds the 0.025 level then clustering is indicated (Ludwig and Reynolds 1988:27). These tests are applied to each formal tool class and to all combined.

Figure 22 shows the distribution of 30 of 46 projectile points (complete, fragments, and preforms) within the house proper. Eight others came from the exploratory trench, one from the entryway, another from the excavation unit just beyond the entryway, and six were found beyond the block excavation or have unknown provenience within it. Of intramural points 21 were in the southern half, and nine were in the northern. The index of dispersion for the 30 points within the 64 excavation units of the house block proper (m = 0.47; V = 0.51) shows clustering, though one approaching random. Comparison at both the 4 m^2 (m = 1.88; V = 2.38) and 16 m^2 (block quadrant; m = 7.5; V = 17.67) levels indicates clustering as well. However, the chi-square value for both of these more meaningful units shows no significant departure from randomness (18.99 for 4-m^2 units and 7.07 for 16-m^2 quadrants; critical values of chi-square at 0.975 and 0.025 critical levels of probability are 6.262 and 27.5 for the former and 0.216 and 9.348 for the latter).

The pattern with regard to bifaces, most of which probably served as cutting tools (this class includes three drills and a graver) seems more apparent (Figure 23). Of 38 such artifacts in the block, three were in the northwestern quadrant, six in the northeastern quadrant, and 22 in the southern quadrants (three were in the entryway and four lay beyond the house). The index of dispersion suggests their distribution is clustered at all levels: excavation unit (m = 0.48; V = 0.60), 4m^2 (m = 1.94; V = 2.33), and quadrant (m = 7.75; V = 18.25), reflecting their near absence from the northwestern quadrant. However, the chi-square values of the last two levels (18.02 and 7.06 respectively) again fall within the 0.975 and 0.025 critical values (see page 38), indicating no significant departure from a random pattern. Interestingly, the dispersion of bifaces is very much like that of arrow points. Certainly the sample sizes are essentially the same, but that is no reason to expect the indices of dispersion for all unit levels (1.09-1.25 for 1 m^2; 1.27-1.20 for 4m^2; 2.36-2.35 for 16m^2) to be so close. One reason, discussed in more detail below, is that they were treated the same way within the lodge.

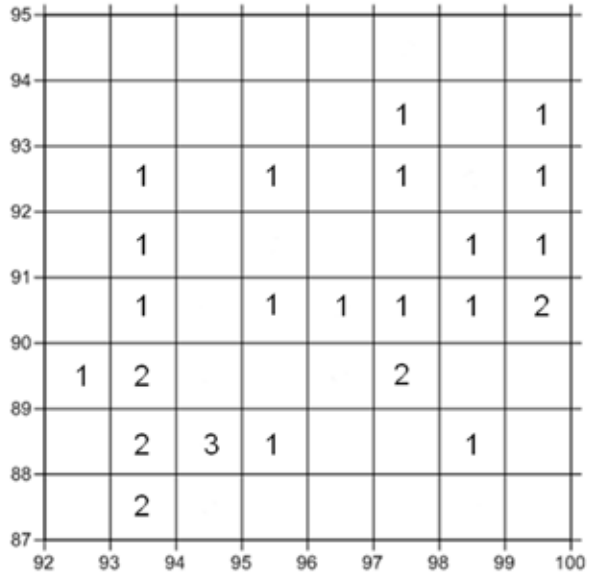

Figure 22. Distribution of projectile points per excavation unit across the house block, entryway excluded.

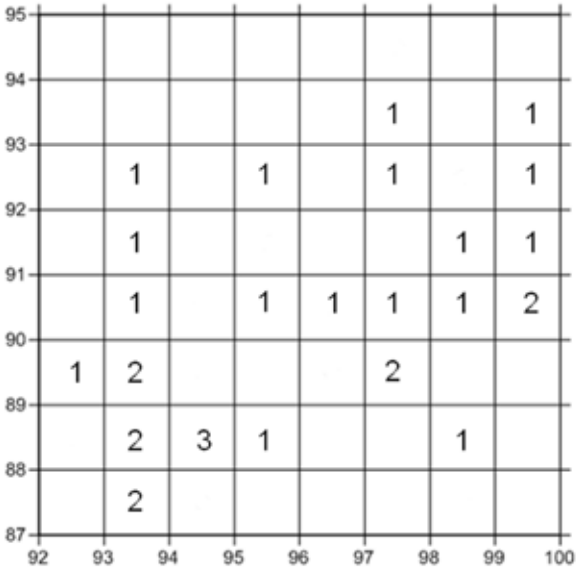

Figure 23. Distribution of bifaces/fragments per excavation unit across the house block, entryway excluded.

The Phil site assemblage includes 25 scrapers, three from the general surface beyond the block, four extramural plots, and one from the eastern end of the entryway. Of 17 with house provenience, 11 came from the southern half of the lodge and three from each of the northern quadrants (Figure 24). All from the northwestern quadrant lay within ~1 m of the hearth. Unlike other stone tools, scrapers were clustered at both excavation unit (Table 3) and 4-m^2 levels, but uniform at the quadrant level, probably due to small sample size. Here, too, chi-square values of the 4-m^2 and 16-m^2 levels are within critical values that indicate no significant departure from randomness.

Combining classes yields a larger sample (n = 78), though one that masks any differential treatment of functional classes. But in this case distribution at the 1 m^2 (m = 1.22; V = 1.76), 4 m^2 (m = 4.88; V = 10.11), and quadrant (m = 19.5; V = 81.67) levels is consistently clustered. Moreover, comparison of chi-square values for all unit scales, 1 m^2 (90.9), 4 m^2 (31.1), and 16 m^2 (12.6), to critical values of chi-square at the 0.975 and 0.025 levels of probability also indicates clustering. In all cases they exceed the .975 values (86.8 for 1 m^2, 6.262 for 4 m^2, 0.216 for 16 m^2).

Discussion: The index of dispersion of formal tools indicates that, despite traffic (e.g., scuffage and trampling), their distribution regardless of class or, with few exceptions, unit size, is clustered. Departures from randomness are not significant, probably due to small sample sizes. When classes are combined, clustering is indicated by the index of dispersion, and a chi-square test confirms that underlying pattern. When house quadrants are paired, fewer tools were in the northern part (n = 24), more than twice as many as in the southern part (n = 54). There is little difference between east and west halves, 41 and 37 respectively. The difference between southeastern and southwestern quadrants is relatively small, 26 and 28 respectively. There were fewer in the northeastern quadrant (15) and only nine in the northwestern. Four of these, including three scrapers, were within 2 m of the hearth.

This distribution suggests that the northwestern quadrant was treated differently with regard to formal chipped stone tools. Clustering in other quadrants is the common pattern for two of the functional classes and, given a larger sample of scrapers, may have applied to that class also. Because these tools were generally used in extramural contexts, their presence in the lodge is likely related to maintenance, i.e., sharpening, rehafting, and discard (see next section). Given that most are broken (14 points, 26 bifaces, 6 scrapers) and others (preforms) were in line for notching and hafting, this inference is reasonable. The paucity of stone tools in the northwestern quadrant may be explained by the distribution of some bone tools.

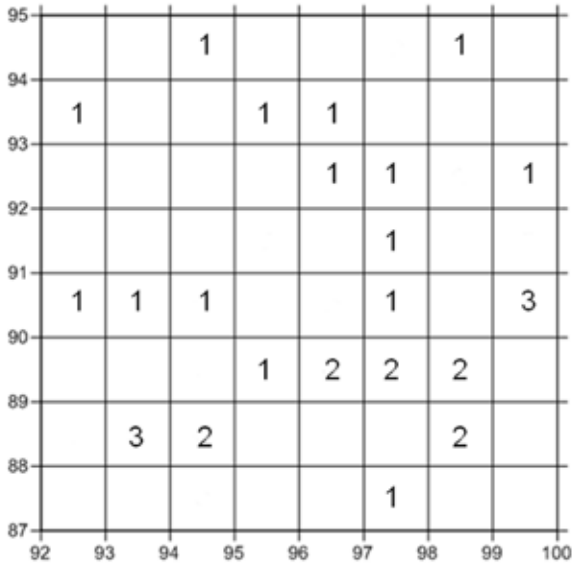

Figure 24. Distribution of scrapers in the house block and extramural units, entryway excluded.

Chipped Stone Debris: The locus of lithic maintenance activity is more apparent in the distribution of debitage, generated during tool resharpening and hafting/rehafting. Figures 25 and 26 show this material by mass and number, respectively. In both there are three distinct peaks in each of the three quadrants that held the greatest number of formal chipped stone tools. The amount of debris in the northwestern quadrant is conspicuously lower. The peaks may be drop and displacement zones that approximate hearth-centered loci of preparation and maintenance activities (compare Stevenson 1991:278 for size grading of debris within such zones around extramural hearths). A closer look at selected units that comprise the three peaks shows that each contained debitage in high numbers but low mass, a reflection of the small size of the

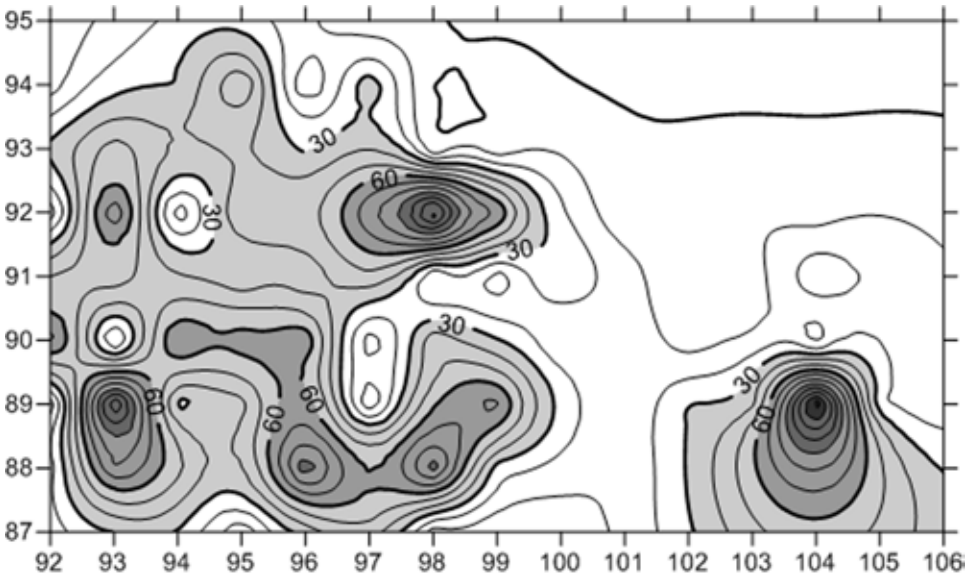

Figure 25. Distribution of chipped stone debris by mass (g) across the house block (total mass = 3,895.1g).

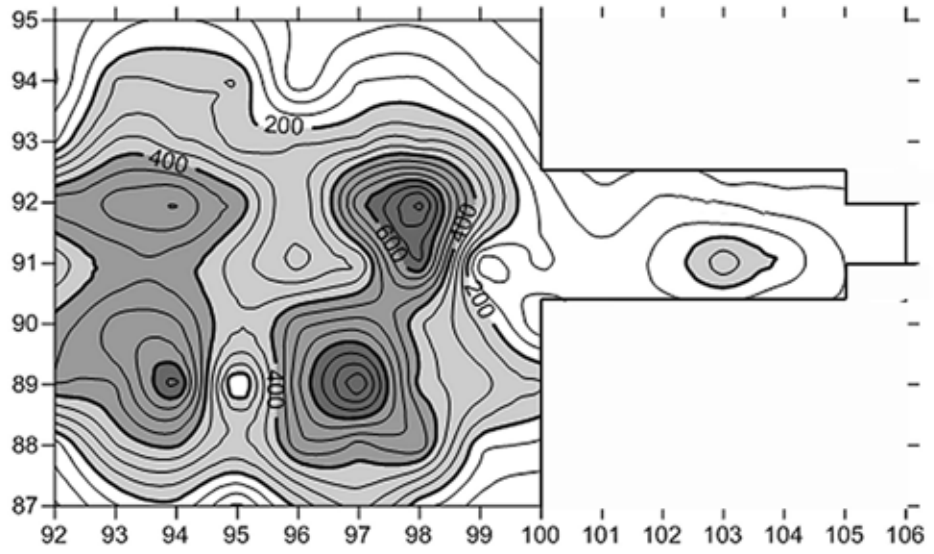

Figure 26. Distribution of chipped stone debris by number across the house block (n = 24,454).

predominately tertiary flakes. Thus, the chipped stone debris from 89N 94E consists of 562 flakes with a mass of 104.9 g, debitage from 89N 97E consists of 629 flakes with a mass of 101 g, and debitage from 92N 98E totals 587 flakes and 129 g. The average mass of a flake for these units ranges from .16 g to .22 g, indicating very small size. This debris likely escaped periodic house cleaning. The McKellar Principle holds that items ~2 cm (i.e., smaller than those piece-plotted at 14JW48) are either too small to be seen or considered obtrusive and so are missed or ignored during cleaning (Stevenson 1991:273-274). From this it can be inferred that these areas of small debitage concentration approximate those where tool maintenance occurred. They correspond in general with the pattern of formal stone tool distribution. Because the tools are larger than the tertiary debris, they became more dispersed through traffic around the house. Thus, the debitage better approximates the loci of tool maintenance. As each concentration is ~2 m from the hearth and was likely moved farther from it by displacement

and intentional cleaning, the inference is that tool maintenance was hearth-centered.

Bone: What accounts for less chert debris and fewer tools in the northwestern part of the house? The distribution of bone, shown by mass in Figure 27 (given fragmentation, plotting by number is unhelpful), is intriguing in this regard. There is a fairly clear area within a radius of ~1.5 m around the hearth. Beyond it are three peaks of bone; the greatest is in the northwestern quadrant near the corner and the others at the southwestern and south-central perimeters. These reflect large bison bone tools: two scapulae in 93-94N 94E (see Figure 13, right, for one; the mass of bone would be even greater on the northern perimeter if the distribution included another scapula found in T3), a scapula and the dorsal spine of a thoracic vertebra (pottery paddle?) in 89N 93E, and a scapula blade in 87N 97E. This last item, the only unburned scapula in or near the structure, was found on its edge in a krotovina below an essentially sterile floor just beyond the house perimeter. (See Faunal Analysis section for more discussion of bones and bone tools.)

What behavior is indicated by the presence of these tools, particularly the scapulae, used for gardening? Acknowledging the risk of projecting onto a prehistoric culture an activity documented ethnographically, it is yet provocative that the occupants of nineteenth-century Pawnee and Hidatsa earthlodges stored goods on the perimeter. Among the Pawnee platforms for storage were made among the beds that ringed part of the lodge (Weltfish 1965:62-63). Among the Hidatsa insight is found in the well-documented lodge of Small-Ankle, the father of Buffalobird-woman, an informant of Gilbert L. Wilson. There, farming tools, including scapula hoes, were placed at the lodge perimeter (Wilson 1934:394, Figure 27). From this it may be inferred, albeit with caution, that the bone tools found in the Phil site house had been stored similarly.

Even though most of the 14JW48 farming tools were stored in the northwestern quadrant, chipped stone tool maintenance could have taken place in that area as well. Indeed, the complementary distribution of bone and chipped stone tools/debris seen there does not hold for the southwestern quadrant, where peaks of both appear (though bone is nearer the western wall). It can be surmised that the northwestern part of the lodge was reserved for storage. The presence of most of the bison scapulae and the association of one with a pottery jar suggest that part of the lodge was used by a woman. This speculation is based on the well-documented tradition of women among Plains farming cultures as makers and users of pottery and as those responsible for farming activities.

Burned Limestone: The distribution of this material is skewed by the concentration associated with the cache pit (F14). In addition a small concentration of a few large pieces along the north-central wall was found in T3 during Phase III, and the greater concentration (F3) was exposed in the southeastern

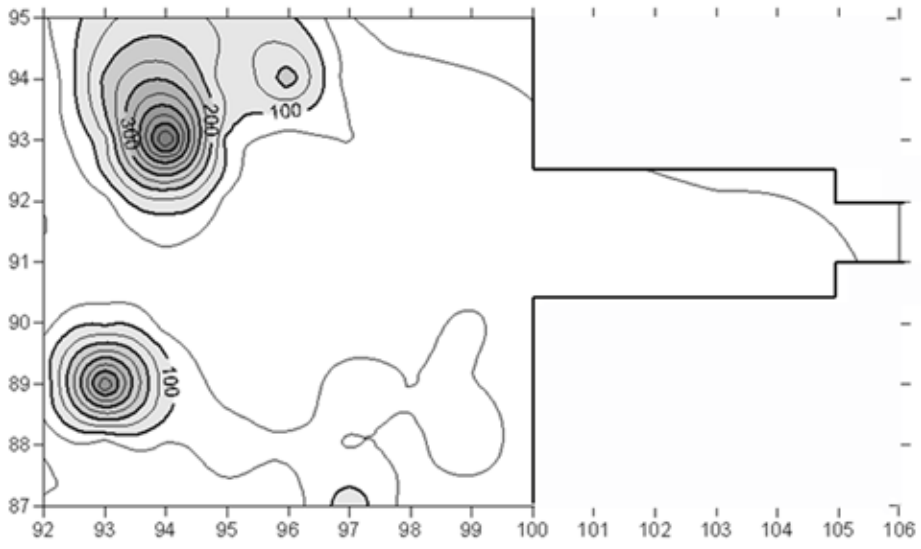

Figure 27. Distribution of bone by mass (g) across the house block.

corner of the house. The latter are by far the greatest masses of hearthstones. A more diffuse area of discard was in and around the cache pit, and a smaller one was between the hearth and entryway. It is provocative that while some hearthstones had been dumped in the pit, more were kept in the house, albeit near the walls. These might have been stored for later use or perhaps some factor, such as weather, precluded removing them from the lodge before it burned.

Daub: The distribution of daub records factors about lodge construction and destruction. Some of this clay, applied as plaster to the exterior of the structure, would have been sun-dried. That around the smoke hole, presumed to have been in the roof above the hearth, would have been baked to harder consistency. It is assumed that much of the wall plaster would have become fire-hardened only when the lodge burned. Thus, its formation likely depended on the point of origin, direction, intensity, and duration of the fire. Its distribution would have depended on how the structure collapsed and its preservation affected by a variety of post-depositional processes. In Figure 28 a clear concentration of daub is evident in the center and more so in the southwestern quadrant. The central mass may have been daub that collapsed downward from the smoke hole. (This peak does not include burned earth from the hearth, which was easily distinguished from the softer, oxidized soil of the fire-pit.) The more massive amount of daub to the southwest may reflect application of more plaster to that part of the house, or that the fire that destroyed the structure burned longer or more intensely there.

While the distribution of daub may mark the position of a house, this conclusion should be drawn cautiously in the absence of other structural evidence, particularly post molds. In northeastern Kansas, for example, it was necessary to rely on such material for that purpose at the DB (14LV1071) and Caenen (14LV1083) sites with regard to Steed-Kisker phase (Hill 1998; Logan and Hill 2000) and Pomona variant components (Logan 2010c), respectively. The assumption in both cases was that daub centered the house locations, that is, was not off-set from them. Support for such interpretation is provided by the pattern noted in two houses at another Steed-Kisker site, Friend and Foe (23CL113), where Calabrese (1969:38) noted that most of the daub was "near the center of the structures" and thought to be roof fall. This was decidedly the case with daub recovered in the more recently excavated Scott site house (14LV1082) (Steed-Kisker phase) in Leavenworth County (Logan 2008b; Figure 29). But the pattern at the Phil site indicates that, lacking other structural evidence, archeologists can infer the presence of a house, but they may not accurately infer its configuration from daub alone. Inferences about houses and activity areas at the DB and Caenen sites also relied on the distribution of other cultural material, such as bone, pottery, and chipped stone tools/debris. Doing so provides a critical check on the delineation of structures.

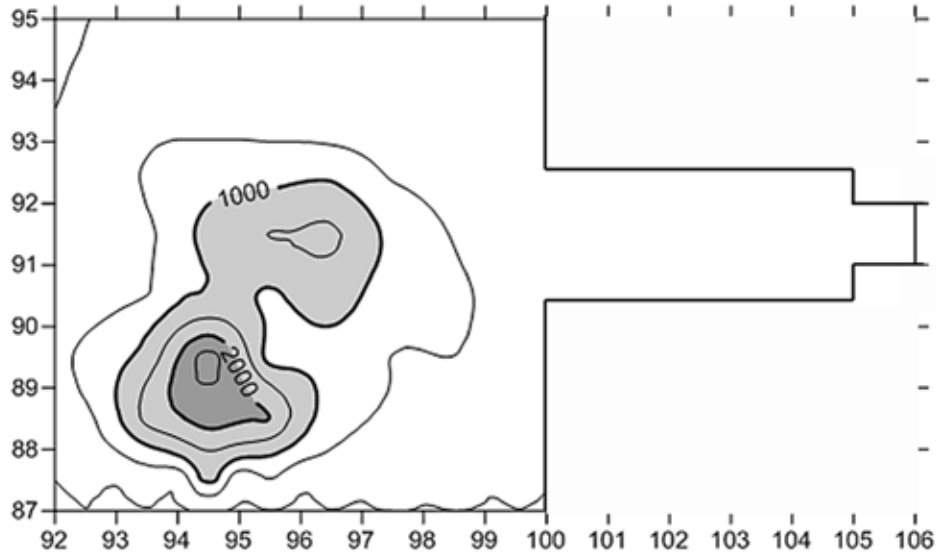

Figure 28. Distribution of daub (g) across the Phil house block (total = 38.55 kg). Note the two centers of mass, one at the hearth and a heavier one to its southwest.

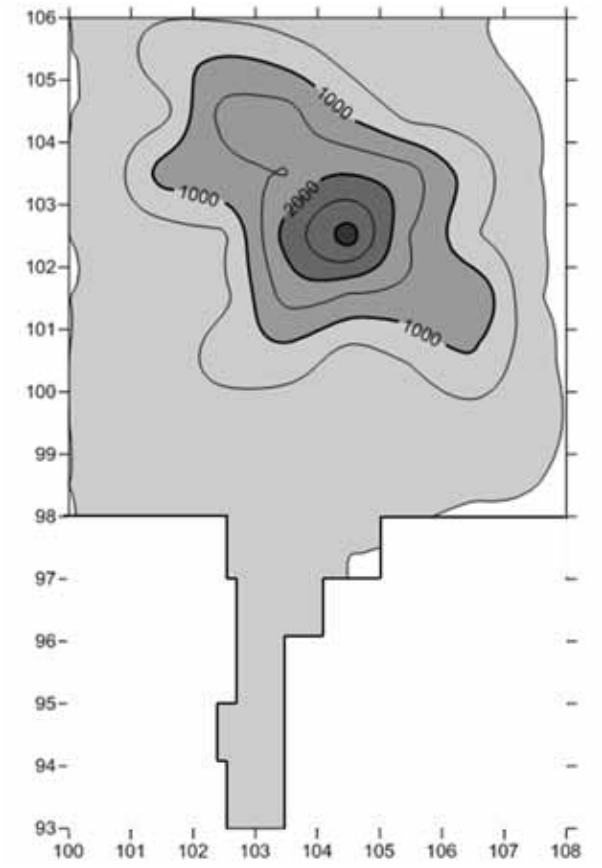

Figure 29. Distribution of daub in the Scott house (left), of comparable size and area as Phil (right) but with a southward extended entryway. Here daub (total mass = 36.23 kg) is centered near the hearth.

Charcoal: The distribution of charcoal from water-screened fill (excluding the piece-plotted samples, shown in Figure 14, which could not be weighed accurately given adhering soil and the foil wrapping that was a necessary attempt to preserve their integrity) shows concentrations centered at 90N 97E (just south of the hearth), in the southwestern corner of the house at 89N 92E, and in the northwestern quadrant (this last with two disparate peaks at 92N 93 and 94E), as well as a scarcity of charcoal in the northeastern quadrant. However, comparison to the distribution of piece-plotted timbers shows a similar distribution, with more plotted samples (five) in 90N 96E than any other unit, a cluster of three samples in 89N 93E, and more disparate samples in 91-92N 92E (six) and 93N 94E (two). Only four samples were plotted in the northeastern quadrant, one of which is very near the hearth, another in 93N 97E, and the others the burned posts associated with F16 and F20. From this similarity in distribution we may assume that the water screened charcoal consists of pieces that had been associated (perhaps part of) the burned timbers from the same or adjacent units.

Comparison of the distribution of charcoal and daub, both materials created during the burning of the structure, reveals similar patterns. Perhaps the fire that consumed the house was more intense along the west side of the structure than in the northeastern portion. Alternatively, post-fire erosion may have more effectively removed much of the daub and charred wood from the latter area.

Several lines of evidence suggest that abandonment of the Phil site house was not planned. These include the presence of restorable jars, severely burned bison scapula tools, a limestone concentration, and lithic work areas that are not as obscured as expected in a well-cleaned home. This is intriguing in light of radiocarbon dates from the house and their significance with regard to the time of occupation of the nearby White Rock site by Oneota migrants.

RADIOCARBON DATES AND GEOMORPHOLOGY

A 12.6 g sample of Feature 2, the base of a burned post near the house entryway, was submitted to the Illinois State Geological Survey for radiocarbon dating. The date returned is 770±70 rcybp (δ13C = -24.7; ISGS-5877), which calibrates (Calib 6.0.1) to a two-sigma range (95.4 percent probability) of AD 1047-1089, 1122-1139, 1149-1317, 1353-1390. Of those intercepts, AD 1149-1317 includes 88.3 percent of the relative area under the probability distribution. A 400-mg sample of charcoal selected for radiocarbon dating was part of the annular ring of a 3-4-cm diameter post (FN 289, identified as Ulmus sp, probably slippery elm; Regis Miller, personal communication June 22, 2009), perhaps a stringer, that was mapped on the south-central perimeter of the house block (87N 96E; see Figure 14). Submitted to the National Ocean Sciences AMS facility (NOSAMS), Woods Hole Oceanographic Institution, it returned a date of 575±30 rcybp (δ13C = -24.04; OS-74375), which calibrates (Calib 6.0.1) to a two-sigma range of AD 1302-1366, 1383-1420,

with the older range accounting for 63.7 percent of relative area under the probability distribution.

These dates (pooled mean age of 605.3±27.6) are statistically different (test statistic T = 6.556; X^2 [.05] = 3.84). Given the difference, they are difficult to interpret, particularly as the younger date falls within the range of the White Rock phase, represented at the nearby White Rock site. Moreover, the older date is statistically the same as that of 760±30 from the closer Windmill Creek site (pooled mean age = 761.5517±27.57435; test statistic T = 0.0172414; X^2 [.05] = 3.84), suggesting general contemporaneity of these CPt house sites. To resolve the discrepancy between these two dates, a 900-mg sample of charcoal (Fraxinus sp.; Regis Miller, personal communication June 7, 2007), an outer sliver of a burned timber near the southeastern interior post mold (FN 239), was submitted to NOSAMS. This assay is 915±30 (δ13C = -24.49; OS-77199), which calibrates (Calib 6.0.1) to a two-sigma range of 1031-1186, 1199-1206), with the older range accounting for 98.7 percent of the relative area under the probability distribution.

The pooled mean of all three dates (747±20.3) is statistically different (T = 64.33904; X^2 [.05] = 5.99). However, the pooled mean of the first (ISGS-5877) and third (OS-77199) assays (892.5±27.6) is statistically the same (T = 3.625; X^2 [.05] = 3.84). The calibrated two-sigma range of their pooled mean is AD 1042-1107, 1117-1215, with the younger range accounting for 61.5 percent of the area under the probability distribution. Thus, at present it appears that the 14JW48 house was occupied sometime between AD 1117 and 1215. The picture is clouded with regard to the relationship between the Phil and Windmill Creek sites, however, in that the pooled mean (832±20.3) of the assay from Windmill Creek and the two statistically similar dates from the Phil site is different (T = 14.2; X^2 [.05] = 5.99). Nonetheless, most of the calibrated range of the two statistically similar dates from the 14JW48 house overlap the older portion of the calibrated range of the single assay from Windmill Creek (two sigma calibrated 1148-1328; 81.9 percent of the relative area of the probability distribution; Logan 2010b). Pending additional radiocarbon dates from both sites, the hypothesis is tendered that their lodges were occupied sometime during the latter half of the twelfth century or early decades of the thirteenth century—before immigration of Oneota people to the Lovewell locality (Logan 2010b).

In order to understand development of the Phil site landscape, Professor William C. Johnson, Department of Geography, University of Kansas and the author collected bulk humate samples from a series of soil horizons at the site and in its vicinity. The soil horizon that contained the house and nearby artifacts, assumed to be part of a sheet midden, was sampled post-excavation at 87.5N 100E, 20-25 cm below surface. The assay returned is 2030±70 (δ13C = -14.7 percent; ISGS-5857), which calibrates to a two-sigma range of BC 339-329, BC 203-AD 126, the latter portion of which accounts for 99.4 percent of the area under the probability distribution. Thus, soil formation began well before the CPt occupation and continued during that time as well.

Another paleosol of as yet unknown relationship to that containing 14JW48, is exposed on the wave-cut face a few hundred meters to its north. Johnson and the author sampled that horizon at two locations, one north of the Phil site and the other a short distance west of Eckles Ossuary. Assays from these are 910±70 (ISGS-5720) and 830±70 (ISGS-5715), respectively. They calibrate to two-sigma ranges of AD 1016-1259 and AD 1040-1112, 1115-1281, respectively, with the more recent portion of the latter accounting for 80.6 percent of the area under the probability distribution. Statistically the same (T = 0.6530612; X^2 = 3.84 [.05%]), these assays average 870±49.5 (two-sigma range = AD 1040-1111 and 1115-1257, with the latter accounting for 71.6 percent of the area under the probability distribution). Thus, the upper portion of that horizon, now at a depth of 75-90 cm, formed about the same time as the occupation of both the Phil and Windmill Creek sites (Logan 2007). It is not surprising, then, that the Eckles Ossuary is also within that soil, a horizon worth inspecting for more evidence of CPt activity.

Another soil at the base of the wave-cut face, discovered during an earlier visit to 14JW48 (September 16, 2002), was sampled at a depth of 215-220 cm. It dated to 17,770±120 rcybp (ISGS-5461; δ13C = -18.9) and is additional evidence from paleosols along the northern shore of Lovewell Reservoir of a late Pleistocene period of surface stability

(compare Mandel 2002). Finally, the buried soil discovered in T9 and T10 during Phase III excavation was re-exposed in the former on September 8, 2006, and sampled at a depth of 52 cm. The AMS assay from that sample is 3940±30 rcybp (δ13C = -14.86; OS-57441), with a two-sigma range of 2565-2309 BC (90 percent of the probability distribution falls between 2496 and 2309 BC). These horizons warrant further investigation for any evidence of Paleoindian and Late Archaic occupations, respectively. At their present depths it is unlikely that wave action will expose them in the near future, so such research will require more extensive excavation.

SUMMARY

The Phil site is the best evidence to date of long-term occupation by CPt people in the Lovewell locality. Heretofore, there have been hints of such from two mortuary sites (Russell Mound and Begin Ossuary) and one short-term camp (Jones Creek), but no house sites were known. As the previous sections detail, a CPt family invested considerable effort in building a square lodge of wattle and daub with extended entryway and occupied it long enough to leave a substantial record of their intramural and extramural activities. From this one can discern the pattern of house support placement, identify the hardwoods preferred, and surmise where some activities occurred and items were stored. Moreover, from the distribution and relative frequency of various material classes (ceramics, chipped stone tools, debitage, bone, and burned limestone), it is possible to infer that abandonment of the lodge was not planned. Two statistically similar radiocarbon dates from the house suggest occupation ca. AD 1117-1215, before late thirteenth-century immigration of a Siouan-speaking group of the White Rock phase, an affiliate of the Oneota tradition (Logan 2010b).

Despite the seeming gap between the occupation of the Phil site house and those at sites of the White Rock phase, analysis of 15 radiocarbon assays from 8 sites of both the CPt and Oneota traditions in and near the Lovewell locality point to greater temporal proximity with what is suggested to have been displacement of CPt indigenes by Oneota migrants sometime during the late thirteenth century (Logan 2010b). This raises questions about the nature of any relations between the people of these two archeological cultures. If they did not meet in the Lovewell locality, what underlies the departure of people of the Central Plains tradition and the arrival and settlement of people of the Oneota tradition? In what ways did their adaptations differ in an environment that was likely similar, or could environmental change, social factors, or some combination of both account for the dynamics so evident in this locality? With this in mind, the following sections look more closely at the pottery, formal chipped stone tools, and bones from 14JW48.

CERAMIC ANALYSIS

By Lauren W. Ritterbush

The Phil site assemblage includes 6,802 potsherds (~18 kg). Many of these were deemed too small to analyze (no dimension greater than 2 cm), and others cross mend to form larger vessel fragments. An arbitrary sample of 958 sherds was studied for this analysis. The sample consisted of all the rim sherds, all the body sherds collected from the surface, and a sample of body sherds from two-thirds of the excavation units. As indicated in Table 13, more than 87 percent of the sample is body sherds, with the remainder rims and rims attached to large vessel fragments (including a nearly complete pot), one handle, and one unidentified ceramic object. The 118 rim sherds, including those that form part of large vessel fragments, represent approximately 90 vessels. This approximation is based not only on cross mends, but also on close similarities between rim sherds that do not cross mend. These similarities are noted in the discussions below. Rim statistics are based on the full sample of 118 rim sherds.

Limited variability is exhibited in temper and surface treatment. Temper is commonly sand (Table 14). No aplastics were observed in 5 percent of

Table 13. Frequency of Different Kinds of Ceramics in the Analyzed Sample.

Vessel Fragments	Rim Sherds	Handle	Body Sherds	Unidentifiable
5	113	1	838	1
0.5%	11.8%	0.1%	87.5%	0.1%

Table 14. Frequency of Temper Types.

Temper Type	Sand	Sand & Grog	None Visible
	94%	< 1%	5%

the sample. The surfaces of most vessels are cordmarked, although there is much variability in the extent of smoothing. Cord marks are clearly visible on certain vessels, while on others or on portions of a single vessel these marks have been smoothed over to various extents. In some cases they have been nearly or completely obliterated. Those sherds not exhibiting any remnant cord marks were classified as smooth. Rim exteriors are more commonly smooth than the neck or body of a vessel (Table 15). Cord marks on rims and necks are typically oriented vertically. The orientation of body sherds and the cord marks on them are more difficult to determine, but both unidirectional and multidirectional orientations were noted.

Interior and exterior colors are generally brown and gray (e.g., pale brown, light brown, very dark gray, black). There are some distinctive variations, the most obvious being a reddened vessel fragment reconstructed from 21 body sherds. Like most ceramics in the assemblage, this piece was formed of clay tempered with sand of various sizes. It has thicknesses between 4.1 mm and 5.9 mm. The interior surface is smooth with occasional striations. Exterior cord marks have been smoothed over extensively, but the more deeply impressed cords are not fully obliterated. This surface is mottled with colors from dark gray to brown to reddish yellow. Reddish hues are more evident on the interior where colors grade evenly from reddish yellow to red (Ritterbush 2008:Figure 6.1). The core grades imperceptibly between the exterior and interior colors. The distinctive reddening of this vessel suggests that it was used to process pigments rich in iron oxide and may have been fired or refired after pigments had accumulated on the interior surface. The cross mended sherds were not recovered from a discrete cluster, rather from four different excavation units in the southwestern quadrant of the lodge (88N 93E, 87N 92E, 89N 93E, 90N 94E).

Common vessel form is globular, as shown by a partially reconstructed vessel and parts of others (Figure 30). These jars presumably served mostly as cooking and storage vessels. The reddened vessel fragment described may have been from a globular vessel used as a paint pot. Two bowls, likely individual serving containers, and a half dozen or more miniature vessels also are represented in this assemblage. Rim heights, measured on rim sherd interior, range from 9.5 mm to 44.6 mm (mean = 21.8 mm). Only two rims exceed 32 mm in height. Rim diameters range from 5 to 32 cm (mean = 15.5 cm). Diameters below 10 cm are generally associated with miniatures and bowls; only one rim diameter exceeded 24 cm. Measurement of vessel diameters was possible for only some of the largest rim-body sherds and four partially reconstructed vessels. As discussed below, two bowls appear to have a maximum diameter of 12-14 cm. One large sherd suggests a vessel diameter of ~18 cm. The

Table 15. Frequency of Different Forms of Surface Treatment. (Note: "Cordmarked" refers to clearly identifiable cord marks, smoothed-over cord marks, and nearly obliterated cord marks.

	Cordmarked	Smooth	Indeterminate
Rim	58.5%	38.7%	2.8%
Neck	83.9%	11.5%	4.6%
Body	90.1%	7.9%	2.0%

Figure 30. Partially reconstructed vessel 240 from the Phil site excavation.

four partially reconstructed vessels range between 27 cm and 32 cm in diameter. Maximum thickness of body sherds ranges from 2.7 to 13.9 mm with a mean of 6.2 mm. Rims are not commonly thickened (Table 16), although a continuous range of variability is evident among the nearly 14 percent that appear to have some thickening. These range from clearly collared to those with slight rounded thickening; some grade into to a wedge-shaped lip (Figures 31 and 32). Unlike others, this author chose to classify the latter as unthickened rims with beveled lips. This distinction is based in part on the form of decoration commonly associated with the beveled lips. Similar decoration is found on unthickened rims (see discussion below). Even if these rims were classified as "thickened," the frequency of thickened rims is low.

None of the partially reconstructed pots or rim sherds exhibit evidence of handles; however, one unattached strap handle was recovered. It is about 24.5 mm wide and 10.2 mm thick with a concavity on the interior surface. The exterior has been smoothed but still exhibits some evidence of cord marks, especially near the gently sloping end that is believed to have attached to the body of the pot. Although none of the rim remains, the steepness of the rounding at the opposite end suggests that it may have attached directly to the lip of the vessel.

Half of the rims, including both thickened and unthickened forms, flare outward (Table 16). Other rim shapes include small numbers of straight, out-curving, S-shaped, and incurving. The latter, represented by five sherds, are from small rounded bowls (Figure 31a and 31b). Although none directly cross mend, they appear to be from two thick-walled bowls. Three rims are similar in that they are tempered with coarse sand and exhibit smoothed-over vertical cord marks on the exterior. Their lips are smooth and rounded and range in thickness from 8 to10 mm. Interiors are roughly smoothed. Two of these rims were excavated at a depth of 17-20 cm in T8, which is approximately 30 m northeast of the block excavation (Figure 4). The other was found on the surface approximately 2.5 m northeast of this unit.

Two other incurving rims are similar enough to have formed another bowl. Neither has clearly identifiable aplastics, and both have exterior surfaces with nearly obliterated cord marks. The interior of each is reddish yellow to yellowish red in contrast to the brown exterior (Ritterbush 2008:Figure 6.5d, e). The largest of these indicates that the bowl was more than 86 mm tall with orifice and vessel diameters estimated at 8-10 cm and 12-14 cm, respectively. The lips form a rounded point, beveled inward and range between 6.1 and 9.1 mm thick. Maximum thickness of these sherds is 10.7 mm. The smaller rim was found at a depth of 18 cm in T5, which lies immediately outside the lodge just south of the entryway (Figure 12). The other was found on the surface 10.35 m northwest of T5, placing it about 2 m north of the west end of the lodge. No identifiable bowl sherds were recovered from inside the lodge.

Neither of the bowls is decorated. They are part of the nearly 45 percent of rim sherds that are undecorated (Table 17). No clear evidence of decoration was observed on the body sherds. Plain rims are commonly unthickened and include flaring, as well as few straight, out-curving, and S-shaped forms. Approximately half of the plain rims exhibit some remnants of cord marks on their exterior surfaces.

Table 16. Frequency of Rim Forms and Shapes.

	Flaring	Straight	Out-curving	S-shaped	Incurving (bowls)	Unknown	
Unthickened	51	5	6	5	5	22	94
	43.2%	4.2%	5.1%	4.2%	4.2%	18.6%	79.7%
Thickened	8	3	1	-	-	4	16
	6.8%	2.5%	0.8%			3.4%	13.6%
Unknown	-	-	-	-	-	8	8
						6.8%	6.8%
	59	8	7	5	5	34	118
	50.0%	6.8%	5.9%	4.2%	4.2%	28.8%	

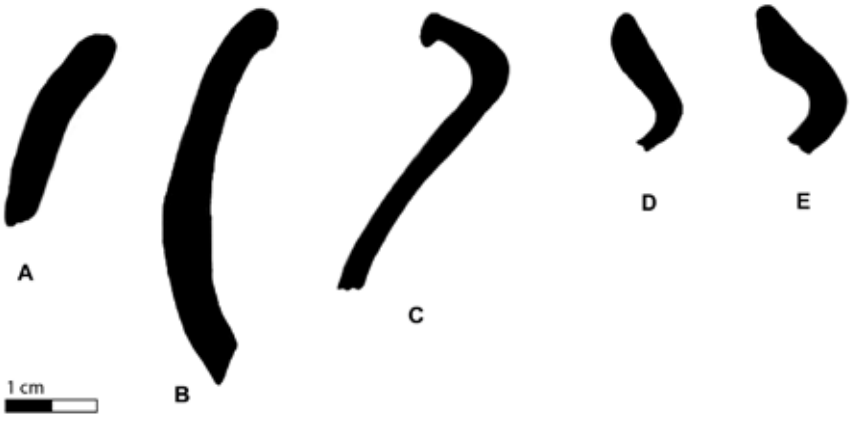

Figure 31. Sample rim profiles; a-e: bowls 1 and 2, rims 28, 10, and 68.

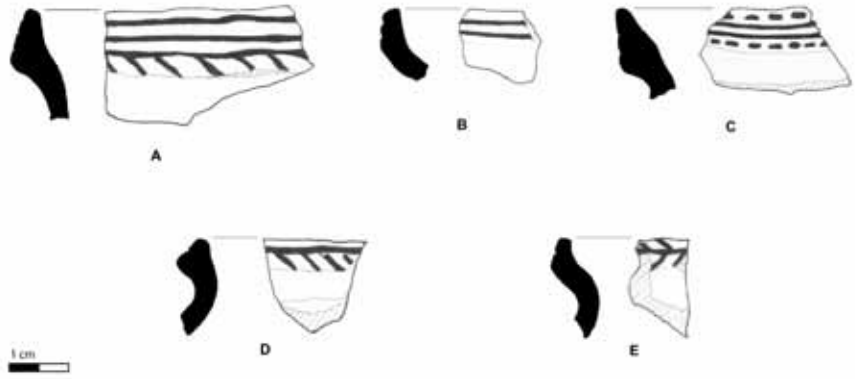

Figure 32. Sample of decorated rim sherds; a-e: rims 79, 3, 37, 21, and 80.

Table 17. Frequency of Decoration on Thickened and Unthickened Rims.

	Thickened	Unthickened	Unknown	
Undecorated	8	39	6	53
	6.8%	33.0%	5.1%	44.9%
Decorated	8	55	2	65
	6.8%	46.6%	1.7%	55.1%
	16	94	8	118
	13.6%	79.7%	6.8%	

Typically these are continuous from the vertical cord marks on the neck. On one rim (rim 11) vertical cord marks are present at the neck. The middle portion of the rim above this was smoothed with horizontal scraping, nearly or completely obliterating the cord marks. The upper one-third of the rim exterior shows various amounts of smoothing but maintains a slightly roughened surface. The lip of this rim has been smoothed, as is the case for the majority of the plain rims. The lips of two rims exhibit roughening. The first (rim 65) has a variably roughened rim exterior and lip. The lip is a rounded extension of the rim exterior but exhibits an abrupt inflection onto the well-smoothed interior. The lip of rim 50 has been flattened and thickened, likely by forming excess clay from the lip down toward the rim exterior. Although difficult to discern, this broad, slightly rounded lip appears roughened. The rim exterior is clearly cordmarked and the exterior lip slightly serrated, potentially from the use of a cord-wrapped paddle against the rim and lip exterior. The form of this rim and lip is reminiscent of the sherds comprising rim 25 (described below), which exhibits exterior lip pinching in addition to the broad roughened lip. The lip has a maximum thickness of 10.4 mm. This vessel and the relatively thick bowls have the greatest lip thicknesses of the plain rims. The others range between 3.1 and 9.0 mm with a mean of 5.2 mm.

Of the eight thickened, undecorated rims only rim 14 has a distinctive wedge shape. The panel of this collar is smooth and 22-24.7 mm high. Thicknesses range from 4.8 mm at the lip to a maximum collar thickness of 11.5 mm near mid-rim. The lip is smooth and flat to round. Horizontal striations at the collar base define a roughly smoothed zone above the vertically cordmarked neck. The other thickened rims generally exhibit their maximum thickness (6.6-12.2 mm) within the upper third and have smooth to nearly obliterated cord marks.

Several of the plain rim sherds may be from undecorated miniature vessels. No large segments are present, so little can be said about them. The largest miniature sherd (rim 2) consists of a small segment of the rim, neck, and shoulder of a roughly shaped and smoothed vessel made from soft untempered clay. Unlike most of the other sherds, the interior and exterior surfaces are pale brown, rather than gray, although the core is gray. The rim stands about 9.7 mm high and is relatively straight with a gentle curve toward the broadly rounded shoulder. Rim and neck diameters are 7 and 6 cm, respectively. Sherd thickness increases from the lip at about 5.3 mm to a maximum shoulder thickness of 9.8 mm. Another small rim (rim 71), likely from a miniature, has rim and neck diameters of 5 mm and 4 mm, respectively, which are the smallest of all the rim and neck diameters. A shallow channel just below the lip on the interior gives this rim a slightly S-shaped form. The rim stands about 13.2 mm tall and has a smoothed exterior surface and well-smoothed beveled lip. Thickness measurements range from 4.9 mm at the lip to 5.3 mm at mid-rim to 7.1 mm at the upper portion of the shoulder.

More than 55 percent of the vessels exhibit some form of decoration, specifically on the rim or lip. Unthickened sherds are more commonly decorated than the thickened rims (Table 17). Decorative elements include trailed lines, tool or fingernail impressions, and pinching. These are sometimes combined to form a horizontal-oblique motif encircling the upper portion or collar of the rim or a horizontal "ladder" motif. Repetitive oblique tool impressions and lip pinching are also common. During this analysis adornment on the rim face was distinguished from decoration on the top or exterior lip. Although the distinction seems clear, different approaches can be taken to distinguish the lip and rim, especially when decorative motifs overlap the two. This is best exemplified by one of the most distinctive motifs in this assemblage.

This motif is formed by a combination of one or two horizontal incised lines and one or two series of oblique tool impressions. How these elements are presented varies slightly, as does their placement on lip or rim. Placement variation seems to suggest that the horizontal-oblique motif may have been more significant to the artisan than the details of its placement. Most commonly this motif is associated with a well-defined thickening of the lip or upper rim (Figure 30 and 32d). Because this thickening proceeds from the lip onto the uppermost portion of the rim, but leaves most of the rim unaffected, this form is described as a thickened lip rather than thickened rim. The resultant form is a broadly beveled lip 9.4-13.6 mm wide (top to bottom or interior to exterior edge). The different elements of this particular decoration can be found on any portion of the lip, including at or near the top of the lip, on the beveled face, and along the lower or exterior edge of the thickening. In other instances the horizontal-oblique motif is not associated with a thickened lip, rather adorns a smaller unthickened but beveled lip or uppermost portion of the rim exterior (Figure 32e). Yet another variation is a similar motif with parallel horizontal lines on a thickened or collared rim (Figure 32a). Following is a brief description of each of the examples of the combined horizontal-oblique motif. These descriptions illustrate the variation associated with this design.

Vessel 240 (Figure 30): This nearly complete vessel has a flaring rim 24.8 mm high on the interior. Excess clay appears to have been rolled forward to form a beveled lip approximately 12 mm long from lip top to lower or exterior edge of the bevel. This comprises roughly the uppermost one-third of the exterior portion of the rim. The resultant thickening is as much as 10.8 mm, while the rim below the bevel is 6.2 mm thick. A single horizontal line was trailed roughly 4 mm below the lip top. Oblique parallel lines or slashes, extending from upper left to lower right, were below the horizontal line to the exterior edge of the thickening. The interior surface of the vessel, including the rim, is very finely smoothed, with a well-defined angle marking the transition between interior and exterior surfaces at the lip top. Below the thickened lip

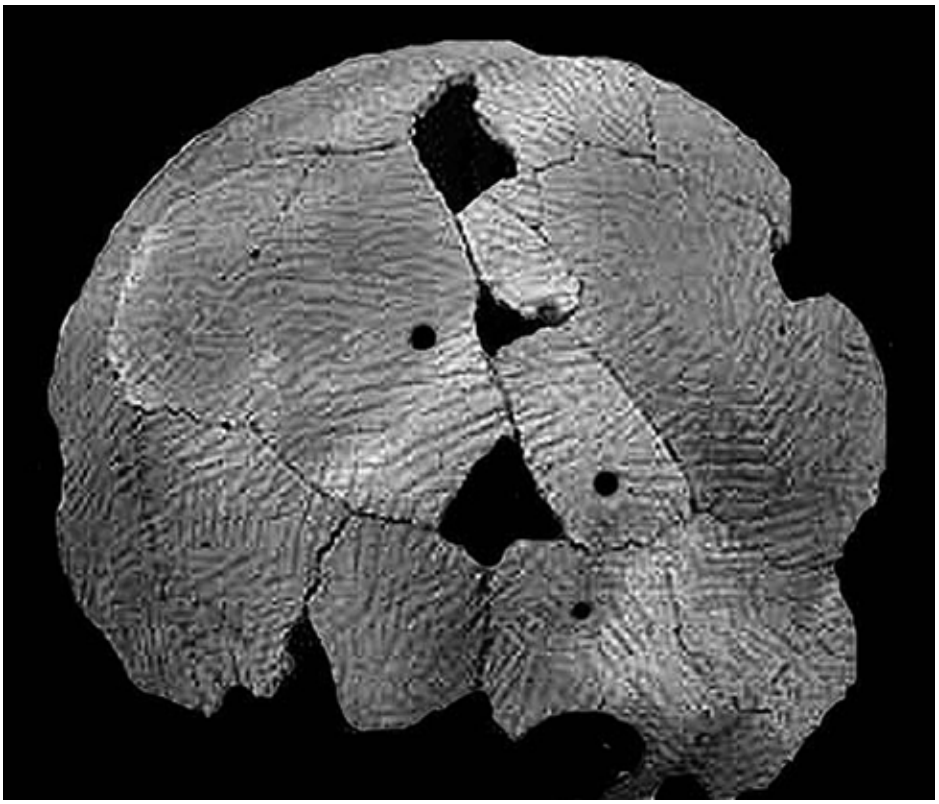

Figure 33. Base of vessel 240, showing four repair holes and light gray scorching of several sherds.

the rim and neck are corrugated with two to three rows of cord marks, likely formed by the edge of a cord-wrapped paddle or stick. On the shoulder cord marks are horizontal, but grading into oblique impressions on the remainder of the body. These have been smoothed slightly. At least four repair holes were drilled near the base (Figure 33). Various portions of this pot were exposed to secondary heating, including one heavily burned rim and shoulder segment (Figure 34). (See below for further discussion of burning.) Segments of this pot were uncovered southeast, northeast, and immediately east of the central fireplace.

Vessel 393: This vessel is similarly decorated with a single trailed line encircling the pot and left to right oblique lines or impressions between the horizontal line and the exterior edge of a slightly thickened, beveled lip (Figure 35). Again, the rim stands about 24.8 mm tall, and excess clay from shaping the lip was rolled outward to form a bevel about 11.4 mm long. The craftsmanship of this rim and its decoration compares less favorably to that of the previously described vessel as evident by the

Figure 34. Portion of rim from vessel 240, illustrating the crazing and warping caused by secondary heating. (Compare Figure 30, which illustrates the unburned portion of this same vessel.)

unevenness of the lip, variation in the bevel angle, and evidence of handling after the decoration was applied. The lip top is rounded, rather than pointed, and the bevel less angular. Unlike the previous vessel the oblique lines or impressions appear to have been applied prior to forming the trailed horizontal line. The rim exterior has been extensively smoothed with no evidence of cord marks above the neck, where vertical cord marks are crisp and clear. These extend onto the body of the pot. Warping, crazing, and expansion have intensively misshapen parts of this vessel (see discussion below) (Figure 36).

Rims 21 and 77: Two small rims, which could not be matched to either of the above vessels, also have slightly thickened, beveled lips (11.8 and 13.6 mm, respectively) (Figure 32d). They, too, are decorated with left-to-right obliques below a trailed line encircling the orifice. Rim 21 is slightly shorter (20.9 mm interior rim height), and the rim exterior shows evidence of smoothed-over cord marks. Shaping of rim 77, of which only a small fragment remains, resulted in a broad channel on the rim interior. The rim exterior below the beveled lip is smooth.

Rim 43: Like the previously described vessels, rim 43 is decorated with a horizontal trailed line above left-to-right diagonals. The latter appear to have been formed by impressing with a narrow tool, but differing from those above in a number of ways. First, the lip has not been thickened. Technically, the decoration can be described as being placed on the upper portion (roughly one-third) of the rim exterior. This portion of the rim is still somewhat beveled from a lip thickness of 2.0 mm just below the pointed lip top to a mid-rim thickness below the decoration of 4.6 mm. The exterior surface of the rim is smooth. As the above measurements illustrate, this tiny rim fragment is also from a very small vessel, likely a miniature.

Rim 82: Although not a miniature, rim 82 is similar in that it lacks clear thickening of the lip but has the horizontal-oblique motif. The lip top is rounded with a measurement of 2.4 mm. Decoration consists of a horizontal line with left-to-right oblique tool impressions below. The pressure of the decorating tool caused some bulging of the clay, resulting in a maximum thickness of 6.3 mm. Similar thickness measurements occur below the decoration.

Figure 35. Least warped section of vessel 393, illustrating body, neck, and rim surface treatment and horizontal-oblique lip decoration.

Although somewhat eroded, it appears that the rim exterior was cordmarked, then smoothed.

Rims 83, 80, and 23: These small rim sherds share a number of attributes but are clearly from different vessels. Each has a finely finished interior that includes a channel, above which is a flat smooth lip 4-5 mm broad (Figure 32e). In each case the upper portion of the rim has been variously thickened. Rim 83 has been thickened only slightly to 6.7 mm in comparison with the mid-rim thickness of about 6.2 mm. The other two have the beveled lip form with maximum thicknesses of 8.4 and 9.5 mm in comparison with their mid-rim thicknesses of 7.2 and 8.6 mm, respectively. The beveled surfaces of these rims are similar in size at 13 and 13.5 mm broad. Decorations on these thickened portions include an encircling trailed line and diagonal tool marks. In each case, however, diagonals are present both below and above the horizontal trailed line (Figure 32e). On rims 83 and 80 the diagonals below the line extend from the upper right by the line to the lower left at the lower or exterior edge of the slightly thickened rim. While above the line, they extend the opposite direction (Figure 32e). The trailed diagonals on rim 23 also extend in different directions above and below the line but are opposite of those on rims 83 and 80. (One small rim sherd described from the Coal Oil Canyon site [14LO1] in western Kansas may be similar with diagonals both above and below the encircling line [Bowman

Figure 36. Two views of a portion of vessel 393, showing warping caused by burning.

1960:46-47].) The surfaces below the decorated portions of these rims are vertically cordmarked. Rim 83 is from a small vessel with an interior rim height of 14.3 mm and rim diameter of 12 cm. Rim 80 has a rim height of 16 mm.

Rim 81: Other variations of the horizontal-oblique motif display the horizontal and oblique lines or impressions on the top of a flat lip. One example is rim 81, on which the decoration is atop the relatively broad (8.7-mm wide) lip. Despite damage of this small sherd, it appears that the oblique lines may have crossed the horizontal line.

Rim 36: An encircling trailed line adorns the 10.6-mm wide lip top with left-to-right oblique tool impressions on its exterior portion and partially overlapping the line. An additional decorative element was added by pinching the exterior edge of the rim between the lip-top oblique tool impressions, resulting in slight protrusions. The rim exterior is vertically cordmarked. The interior is well smoothed and has a relatively narrow but noticeable channel that may have been formed in part while pinching the exterior. Mid-rim and shoulder thicknesses are 6.3 mm and 7.4 mm; the rim measures 21.1 mm high. Rim and neck diameters are estimated at 20 cm and 16 cm, respectively.

A variation of the horizontal-oblique line motif is also present on two collared vessels, represented by the partially reconstructed rim of Vessel 241 (Figure 37) and the single sherd of rim 79 (Figure 32a). Rims of these vessels are generally straight with interior heights of 38.2 mm and 25.6 mm, respectively. Both were thickened to form a wedge-shaped collar. Thicknesses from the lip to the collar base range from 4.8 mm to 13.4 mm on vessel 241 and from 4.8 mm to 12.7 mm on rim 79. The collar panels are 28.5 mm and 22.7 mm tall, respectively. In each case this panel is decorated with parallel trailed lines encircling the rim and a series of oblique tool impressions marking the space from the lowest line to the base of the collar. The tool impressions extend from upper left to lower right. Vessel 241 has four parallel horizontal lines, while rim 79 has only three. On rim 79 the area immediately below the collar has been smoothed and displays fingerprints. The neck has vertical cord marks. Vertical cord marks are present below the collar and elsewhere on vessel 241, although various directions are represented on the body (Figure 37). Body thicknesses range between 5.1 mm and 9.1 mm. The rounded shoulder measures 8.4 mm thick. Although only about half of this vessel could be reconstructed, it appears to have had a rim diameter of 19 cm, neck diameter of 16 cm, and maximum vessel diameter of about 32 cm. Most of the cross-mending sherds from this vessel were scattered over a broad area east of the hearth. One somewhat warped body fragment was recovered from south of the hearth.

Figure 37. Vessel 241 has a collared rim, decorated with four parallel trailed lines above a series of oblique tool impressions.

Trailed lines or diagonals are found in different forms on several other thickened rim sherds. These are described briefly below to illustrate variation in the use of these decorative elements alone or in combination with others.

Rim 3 (Figure 32b): This relatively small rim is straight with a wedge-shaped collar 4.7 mm thick at its rounded lip to 10.3 mm near the base of the collar. Two parallel horizontal lines are shallowly trailed into the collar panel, which has a height of 18.9 mm. The entire rim surface is smooth.

Rim 37 (Figure 32c): This rim is similar to rim 3 with thickness ranging from 5.7 mm to 13.1 mm and a panel height of 22 mm. In this example the center portion of the panel is decorated with two parallel horizontal trailed lines. A single series of horizontal punctates is present both above and below this set of lines. Smoothing striations are present below the collar, and the neck displays vertical cord marks. This rim stands 24.1 mm high and has a diameter of 22 cm.

Rim 26: Two small rim fragments are interpreted to be from a single vessel, although they do not cross mend and have different maximum collar thicknesses (10.3 mm and 8.1 mm) and panel heights (14 mm and12.3 mm). However, both sherds have rounded thickening of the lip or upper rim. The panel of this thickened area is decorated with left-to-right tool impressions.

A combination of horizontal and oblique lines is also used to form what is referred to elsewhere as the "ladder" motif (Ritterbush 2006b, 2008:64). This motif is found on the upper portion of the rim exterior. It is formed by parallel trailed lines approximately 6-8 mm apart that are linked by slightly oblique tool trails. Six rim sherds from 14JW48 display this decorative motif (Figure 38). Two of these cross mend to form rim 17, which stands 31.4 mm high and has rim and neck diameters estimated at 20 and 17 cm, respectively (Figure 38e). Together these sherds illustrate some of the variation that can exist on a portion of a single vessel. For example, one segment of the rim appears unthickened, while another has a rounded thickening of the upper rim. Some parts of the rim below the decorated band have been poorly smoothed, while

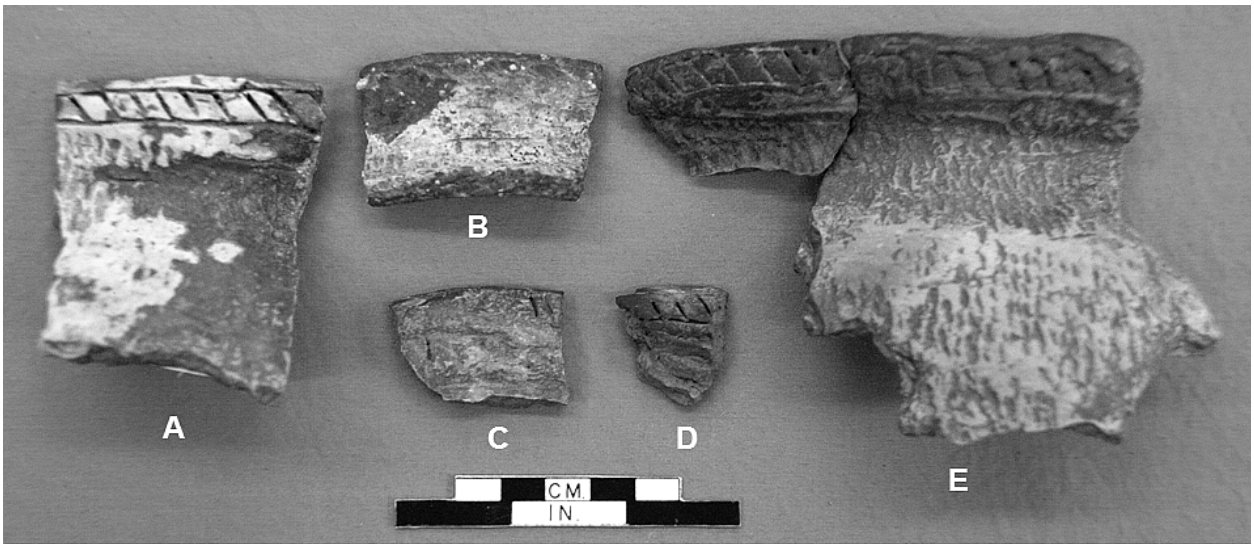

Figure 38. "Ladder" motif adorning the upper portion of six rims.

in other portions this area is clearly cordmarked, as is the neck. All elements of the decorative motif are visible on one portion of this rim, while on another portion they appear to have been carelessly applied and possibly smoothed over by subsequent work with the pot. Where clearly visible, the lines forming the motif are thin but of variable depths. Given the variability visible on part of a single vessel, it is unclear whether the four other sherds with the horizontal ladder motif are from this same vessel or others similarly decorated. Some of these rims are thickened, while others are not. The rim height and diameter measurements of the two more complete ladder-decorated sherds (Figure 38a and 38b) are smaller than those for rim 17 at 20.3 mm and 21.8 mm (rim height), 18 cm and 16 cm (rim diameter), and 17 cm and 14 cm (neck diameter), respectively. The decoration on one rim is formed by narrow, but deeply trailed lines, leaving a very crisp ladder design (Figure 38a). On the third largest rim (Figure 38b), part of the decorated surface has broken and been eroded, yet it appears to have had a carefully formed horizontal ladder motif. Its "crossbar" elements form more oblique angles than on the other rims. The inner surface of the latter rim is also slightly channeled. Finally, the sand temper in this sherd is more visible, suggesting that this vessel was made of a more densely tempered paste.

Oblique tool impressions occur not only on many of the above-described rims, but commonly as a series of parallel diagonals encircling the upper edge of the vessel. Specifically these are applied to a narrow band at the very top of the rim exterior or exterior edge of the lip or to the top of the lip, commonly overlapping onto the exterior edge of the lip (Figures 39 and 40). Eighteen rims exhibiting this form of decoration from possibly as few as 11 different vessels have been identified among the Phil site ceramics. Although the orientation of the diagonals is consistent on individual vessels, some obliques are oriented from upper left to lower right as viewed from the outside of the rim (ten sherds from as few as six pots), while others are oriented in the opposite direction, upper right to lower left (eight sherds from as few as five pots). Rim 34 and especially rim 39, which fall in the latter category, appear to be from miniature vessels. They have consistently thin rims at 4.4 mm and 4.2 mm, respectively, and small rim diameters (rim 34 diameter = 8cm). On rim 34 the diagonals are very narrow and extend across the entire rounded lip. The decoration on rim 39 is clearly formed by impressing the tip of a narrow pointed tool across the front but top portion of the more broadly rounded lip. On rim 8 oblique tool impressions were formed on a smooth, flat beveled lip.

Only one sherd in this assemblage has trailed lines without obliques or punctates. Rim 42 is 8.3 mm thick, has a rounded lip, and two trailed lines that encircle the orifice. The uppermost line appears

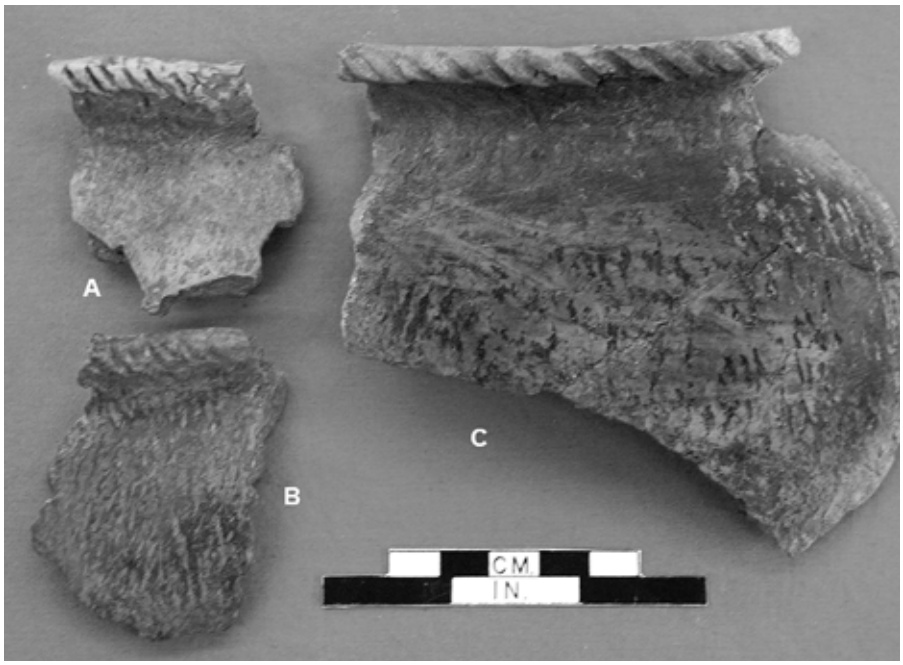

Figure 39. Oblique lip decoration, exterior and lip top.

Figure 40. Portion of vessel 102, illustrating exterior lip pinching and cord marking on the body.

to have been formed first and the more exterior line next. Spacing between these lines is not uniform, with the second line nearly trailing into the first on one portion of this small sherd.

One of the most common forms of decoration in this assemblage is repetitive pinching or fingernail or tool impressions on the exterior edge of the lip, rarely in combination with other elements. Some of the variation between these vessels is evident in the descriptions that follow.

Rims 48 and 49: Both of these rims exhibit very shallow indentations on the exterior lip edges that appear to have been formed by pinching very small portions of the lips. Rim 49 consists of a very small fragment of the upper rim, about which little can be said. It appears that the lip top was once roughened, perhaps before it was flattened and pinched. The flattening appears to have caused the lip to thicken slightly, resulting in a thickness of about 9.2 mm versus 6.6 mm for the rim. A somewhat larger portion of rim 48 is present, allowing measurement of its height of 31.2 mm, rim diameter of 22 cm, and neck diameter of 18 cm. Its lip, 7.7 mm thick, is smooth and flat. The rim and neck exterior display smoothed-over cord marks, although the smoothing and shaping of the neck was more extensive, resulting in a horizontally striated and relatively thin neck Because of the shaping and thinning of the neck, 22.2 mm of the rim has the appearance of being thick. Mid-rim thickness is 11.1 mm.

Rims 27 and 74: Three small sherds potentially from a single vessel (rim 27) display shallowly pinched nodes on the exterior edge of the lip, spaced 5-8 mm apart. Minor amounts of excess clay appear to have been pushed toward the rim, while the flat lip top has been unevenly smoothed. The exterior portion of the rim is smooth. The tiny sherd from rim 74 is similar.

Vessel 102: The fully reconstructable rim and partially reconstructed body of vessel 102 display similarities with the above rims but with a vertically cordmarked exterior surface. The rim is thin (5.0 mm) with a flattened lip measuring as much as 8.2 mm wide, including the exterior lip protrusions. The lip top appears to have been cordmarked, then smoothed or flattened. Shallow protrusions, spaced 8-11 mm apart, probably formed by pinching, mark the lip-exterior rim juncture (Figure 40). The rim stands about 31.8 mm high. It has a diameter of 18 cm and interior neck diameter of 16 cm. The maximum diameter of the body of the vessel is approximately 27 cm. Horizontal to oblique cord marks characterize most of the body exterior, and the interior of this thin-walled vessel (body thicknesses 4.8-7.3 mm) was carefully smoothed. Very little evidence of secondary heating or burning is present except along the edges of a couple of cross-mended sherds. Fragments of this vessel were recovered inside the eastern part of the lodge in several different areas with the largest portion near Feature 3 (see Figure 17).

Vessel 345: Partially reconstructed vessel 345 and five additional rim sherds (rims 25 and 35 described below) share many similarities with vessel 102. They each have a flat lip top with partially smoothed-over markings, a vertically cordmarked rim exterior, and a series of nodes along the outer edge of the lip (Figure 41). The rim of vessel 345 is thicker than others described here with a mid-rim thickness of 12.0 mm and lip 7.9 mm wide. On part of this rim, excess clay from the lip top was pushed or folded forward onto the upper portion of the rim. The nodes along this edge are spaced roughly 8-11 mm apart. They were presumably formed by pinching, although a few fingernail impressions are visible. The rim stands 23.6 mm high. Rim and neck diameters are 18 cm and 15 cm, respectively, and the maximum vessel diameter is estimated at about 32 cm. The exterior surface of this vessel is cordmarked obliquely on the shoulder and partially smoothed over (Figure 41). The fragments of this vessel were more widely scattered than other cross-mended vessels. Its sherds were recovered from the surface and excavation of the northern, northeastern, and south-central portions of the lodge. Parts of this pot were slightly warped by burning.

Rims 25 and 35: Four other rims, possibly from the same vessel (rim 25), have mid-rim thicknesses of about 6.7 mm and lip thicknesses of 8.8 mm. Fingernail impressions indicate that the nodes were formed by pinching. Small amounts of clay overlapping the top of the indentations between the nodes suggest that the lip was flattened after the exterior edge was pinched. The cord marks on the lip top are obliterated on the inner-most edge, probably as part of careful smoothing of the interior surface. Rim 35 is so similar to these four sherds that it may be from the same vessel. This is vertically cordmarked, has

a flat lip and comparable thickness measurements (6.3 mm and 8.6 mm, respectively). Likewise the interior-most portion of the flat lip top and rim interior are smooth. The remainder of the lip top is either cord-roughened or was purposely decorated with oblique lines extending left to right from the front edge of the lip.

Rim 76: This rim is thicker and more crudely decorated than the above but somewhat similar to the rim of vessel 345. The lip and rim thicknesses are 12.6 mm and 12.4 mm, respectively. Much of the interior portion of this sherd has exfoliated, so it is difficult to estimate rim height, but it may be as much as 40.1 mm. Rim and neck diameters are estimated at 16 cm and 13 cm, respectively. The upper shoulder and neck are vertically cordmarked, while the rim exterior is smooth. The broad lip has been smoothed, and the exterior portion of the lip has unevenly spaced nodes. Upon first glance, these nodes appear to have been formed by pinching, but a closer inspection reveals no fingernail impressions; instead, vertical impressions were formed by a blunt-end tool.

Rim 52: This rim measures about 14 cm in diameter and 23.8 mm high. The lip has a maximum thickness of 10.6 mm, which is only slightly thicker than the rim near its midpoint at 10.3 mm. The rim has been smoothed and faint cord marks are visible on the shoulder, which is about 6.2 mm thick. The lip had been roughened, then smoothed and flattened to form a slightly beveled surface 10.8 mm wide. Shallow indentations, spaced about 8.5-10 mm, mark the exterior. These appear to have been formed by vertical impression of a tool into the exterior lip edge.

Rims 45 and 46: These two rims have flat lips with exterior edges marked by fingernail impressions. The concave nail impressions are vertically oriented and were formed in different directions for each vessel. No excess clay appears to have overlapped onto the exterior portion of rim 46, but the opposite is true of rim 45, which has at least one node-like protrusion formed by excess clay and fingernail indentations. The latter rim is 7.6 mm thick with a slightly thicker lip at 7.8 mm. The rim exterior exhibits horizontal smoothing striations. Rim 46 has mid-rim and lip thicknesses of 7.5 mm and 6.4 mm. The rim exterior exhibits smoothed-over vertical cord marks.

Figure 41. Reconstructed portion of vessel 345, illustrating exterior surface treatment and pinching of exterior edge of flattened lip.

Rim 47: Only a small portion of the lip of this rim is present. Its exterior edge is marked by a narrow indentation that may have been formed by a fingernail or narrow-edged tool. The lip is 7.3 mm thick, and the rim is 7.0 mm thick. Both the rim and the neck are cordmarked.

Rim 44: Like rim 47, the exterior edge of rim 44 is decorated with vertical impressions made by a narrow implement. This was likely a tool rather than fingernail, given that the impressions are straight, not concave, and extend quite deeply into the lip at an oblique angle. They are spaced roughly 6.5-7.0 mm apart and about 5.5-7.0 mm onto the cordmarked rim exterior from the lip. The lip was smoothed and flattened after forming the exterior edge indentations. However, prior to smoothing the lip, it was decorated with what appear to be oblique impressions. The remnants of these appear more concave than those on the exterior edge, and thus may have been formed by a fingernail. Smoothing of the interior rim surface resulted in a very slight concavity. This rim stands about 23.7 mm tall and has rim and neck diameters estimated at 16 cm and 14 cm, respectively. The lip is 6.1 mm thick, and the mid-portion of the rim 6.6mm.

The five remaining rims, most represented by small fragments, display unique decorative elements.

Rim 24: This rim, represented by two sherds, was thickened to form a clear wedge-shaped collar. The lip is pointed and 4.3 mm thick. The surface of

the rim below the lip appears to have been finely cordmarked, with most of this surface treatment being obliterated, especially on the panel of the collar. At mid-rim the collar is 9.9 mm thick. Its panel is 21.7 mm broad. This is not decorated, but the lower collar edge was marked with finger impressions. Only one impression is preserved on one of the small sherds.

Rim 41: The height of this flaring rim is estimated at 24.6 mm. Its exterior has irregular horizontal striations now visible over the once-roughened surface. At mid-rim, it is 7.4 mm thick. The lip is beveled with a maximum thickness of 7.7 mm. The surface of the beveled lip appears to have been horizontally cordmarked. Two very small and subtle tool impressions, spaced 12 mm apart, appear to have been made vertically into the top of the exterior lip edge.

Rim 38: This very small rim may be from a miniature vessel. The lip and rim are 4.6 mm and 4.8 mm thick, respectively. The lip is flat and displays three very small areas of cord markings, which appear to align in the center of the lip, as if encircling the vessel as part of a single line. However, given the small size of this sherd, it is impossible to determine if these are part of a purposely applied series of cordmarked impressions or whether they are simply remnants of cord marks that were not completely obliterated when the lip was smoothed.

Rim 40: Again this is a very small sherd with a thin rounded lip (2.1 mm) and two pointed protrusions on the exterior portion of the rim. The upper edge of one of the nodes is nearly 4 mm below the lip, and its lower edge is 10.7 mm below the lip. Each node has a base of more than 6 mm and protrudes about 4.4 mm above the rim's exterior surface.

Rim 4: This tiny sherd has a flat lip with thicknesses of 6.1 mm and 9.0 mm. The greatest thickness is formed by two small tabs of clay that protrude from the exterior lip edge. These tabs are approximately 2 mm thick.

COMPARISONS

Many of the sherds from the 14JW48 assemblage are comparable to those from other CPt sites, but discounting Steed-Kisker ceramics from northwestern Missouri and northeastern Kansas. General attributes shared with other CPt assemblages, especially from the Upper Republican, Solomon River, and Smoky Hill areas, include globular jars, sand temper, cordmarked to smooth exteriors, and unthickened and thickened rims. Flaring rims are also common, although other shapes are present. No examples of shell temper were documented in the Phil site assemblage. Bowls like the two in this assemblage are also found at many, though not all, CPt sites, but never in abundance. This author has identified only 16 rims as thickened or collared, resulting in a low frequency (13.6 percent; Table 17). A comparison of this data with Blakeslee's (1999:110) summary of the frequency of collaring in CPt assemblages from different "phases" (Table 18) emphasizes this point. The low frequency at 14JW48 may reflect, in part, how rim thickening was identified. Recall the description of several rims decorated with horizontal and oblique lines as having broad beveled lips. These were not classified as thickened or collared rims. In a couple of instances, the author chose to describe rims that exhibit a range of rim thicknesses as unthickened (see discussion of rim 17 above). Even if these few examples were included with thickened or collared rims, the frequency of thickening would remain low in comparison with Blakeslee's data for Upper Republican, Solomon River, and Smoky Hill assemblages.

Both plain and decorated vessels occur in this and many other CPt assemblages albeit in different frequencies. Decoration is confined to the lip and rim with no decorative elements on shoulder or body sherds. Common forms of embellishment include pinching or tool or fingernail impressions on the exterior lip edge or top. This form and placement of decoration is also often seen on ceramics from Smoky Hill "phase" sites (compare Beck 1998; Fosha 1994; Hedden 1992; Roper 2001; Steinacher 1976; Wedel 1935, 1959), in assemblages from the Waconda area south of Lovewell Reservoir (Blakeslee 1999; Latham 2004), and from the nearby Windmill Creek site (Ritterbush and Kobiskie 2007).

One of the most distinctive decorative motifs among the Phil site ceramics combines one or more horizontal trailed lines encircling the vessel with one or more series of parallel oblique lines or tool impressions. As described above, the latter element

is most commonly associated with the vessel lip, which sometimes has been thickened and beveled. Comparable sherds are described from two nearby sites at Lovewell, one site in Republic County, and the Coal Oil Canyon site in Logan County (Bowman 1960:46-47). Roper (personal communication, August 7, 2008) is also aware of this motif on at least one rim from the Albert Bell site (14SD305) in Sheridan County. The latter two examples extend the distribution of this motif to western Kansas. The others are more proximate to 14JW48. Two similar sherds, described as collared, from the Harris site (14RP318 [14RP5]) were reported by Hedden (1992:52) and Horr (1957:33-34). The Harris site is in Republic County east of and adjacent to Jewell County on a tributary of Mill Creek, part of the Blue River drainage system. Not surprisingly, similarly decorated rims have been found at two CPt habitation sites at Lovewell. Test excavations at the Windmill Creek site, located immediately west of the Phil site, uncovered five rims with one or two horizontal trailed lines on the lip top and a series of parallel oblique tool impressions on the exterior portion of the lip (Ritterbush and Kobiskie 2007). In two instances the exterior lip edge at the base of the oblique tool impressions is shallowly pinched in a manner similar to that found on rim 36 from 14JW48. The other reported example of the horizontal-oblique motif from Lovewell is from the Johns Creek site (14JW34). Among its small sample of sherds, the largest found during test excavations is unthickened and decorated with a trailed horizontal line above a series of oblique tool impressions (Logan 2006:11). Although documented in low numbers at a few sites outside the Lovewell locality, the apparent frequency of this horizontal-oblique motif at Lovewell CPt sites is interesting, perhaps serving as a marker of community identity.

As noted above, a variation of the horizontal-oblique motif is present at the Phil site on vessel 241 and rim 79. Both have distinct wedge-shaped collars decorated with three or four horizontal lines above a series of parallel obliques. Similar sherds exist in assemblages from the Medicine Creek locality where thickened sherds decorated with multiple horizontal lines are common (Kivett and Metcalf 1997).

A potentially unique decoration identified at 14JW48 is the horizontal "ladder" motif. No descriptions of comparable rims have been found in the available literature. Possibly several rims from Medicine Creek, described as thickened with parallel diagonal lines, may be analogous (Kivett and Metcalf 1997:98).

Table 18. Frequency of Thickening or Collaring in Assemblages from Different CPt "Phases" as Collated by Blakeslee (1999:110).

Upper Republican	68.4%
Solomon River	46.7%
Smoky Hill	26.4%
Nebraska	15.1%

Overall the Phil site ceramics compare favorably with other CPt assemblages, excluding the shell-tempered wares of Steed-Kisker and some Smoky Hill assemblages. Not surprisingly, similarities are evident between the Lovewell locality CPt habitation sites. Most intriguing are those shared with the Windmill Creek lodge located ~400 m west of 14JW48 (Logan 2007). The sample of ceramics recovered during testing there indicates that they, too, were sand tempered, commonly cordmarked (84.7 percent), of comparable thickness (maximum body thickness average of 6.0 mm and 6.2 mm for Windmill Creek and Phil sites, respectively), and from globular jars (Ritterbush and Kobiskie 2007). The rims are flaring and frequently unthickened. Rim heights are comparable with ranges between 13.6 mm and 39.5 mm (mean = 25.3 mm) for Windmill Creek and 9.5 mm and 44.6 mm (mean = 21.8 mm) for the Phil site. When present, decoration is limited to the lip or rim with many similar forms. For example, pinching of the exterior lip edge occurs on several vessels from both sites. In fact, rim 9 (as well as rims 7 and 8 to a lesser extent) from Windmill Creek is almost identical to rim 25 from the Phil site. Windmill Creek rim 17 with its oblique tool-impressed lip top compares favorably with rim 7 and others more generally from 14JW48. Most interestingly, the distinctive horizontal-oblique motif is represented at both sites. Close similarities are evident between these rims. For instance, rim 16 from the Windmill Creek site and rim 82 from the Phil site are comparable, other than the latter having a thinner lip and rim. Windmill Creek rim 10 and Phil rim 36, which both have one horizontal

trailed line, left-to right oblique tool impressions, and a shallowly pinched exterior edge, are nearly identical. Thickness, rim height, and diameter measurements are very similar, and both sherds display slight channeling of the rim interior. One of the few differences between these sherds is that the exterior surface of rim 10 is smooth, while that for rim 36 is cordmarked. Not surprisingly, these similarities suggest a close relationship between the occupants of these nearly adjacent lodges. A difference is that no bowls were identified at Windmill Creek, which has not been fully excavated. The limited sample of ceramics from the Johns Creek site on the south side of the Lovewell locality, does not allow extensive comparison. However, as noted above, the horizontal-oblique motif is represented there by one of three recovered rims. Other examples of this motif are known from the Harris site, ~56 km (34.8 mi) east of 14JW48, and the Albert Bell and Coal Oil Canyon sites in western Kansas. Based on a reading of literature pertaining to the nearby Waconda locality, it does not appear to be present there. Other differences between Lovewell CPt ceramics and those from Waconda include a higher incidence of pinched and applied nodes in the latter. These differences may be related in part to the location of sites in different drainages. Despite this, the Lovewell and Waconda localities are relatively close, perhaps explaining general similarities and shared design elements, such as parallel horizontal lines on wedge-shaped collars (also well known in the Medicine Creek locality) and fingernail impressions. It is hoped that more detailed intersite comparison of ceramics and other archeological clues will bring understanding of social identities, their distributions, and relations between households and outside groups.

BURNING OF CERAMICS

As the charred beams and other evidence from 14JW48 indicate, the lodge associated with the ceramics described in this chapter burned. Intense levels of heat undoubtedly were raised during the lodge destruction, causing damage and deformation to certain items stored inside, including ceramic vessels. This is indicated by color changes, crazing, bubbling, and warping of the ceramic artifacts. The most obvious example of this is vessel 393 (Figures 34 and 35). All of the sherds that could be identified as part of this vessel show signs of intense heat. In some areas this is visible as a light gray color. The interior surface of one portion of this pot exhibits an unusual light brown to reddish brown color. Crazing or check-cracking is also present, usually associated with increased sherd thickness. Bubbles or vesicles are sometimes visible on surfaces and in cross sections. These sherds seem light weight in proportion to their size due to their vesicular nature, even when the vesicles are obviously visible. Several large fragments of vessel 393 became warped and softened when or after they broke. In one instance the once-fired clay became so soft that it folded into itself (Figure 35).

All of the sherds identified as part of vessel 393 came from the northwestern corner of the lodge near one of the central support posts. This vessel accounts for the dense concentration of ceramic items recovered from this area as discussed elsewhere (see Distribution of Cultural Material). Most were excavated from unit 93N 94E. Five cross-mended sherds were recovered from the unit just to the west (93N 93E) and one from the unit to the south (92N 94E). This concentration of sherds is illustrated as excavated in Figure 13 (right). The argument that this vessel experienced deformation due to heat caused by incineration of the lodge is supported by its context. Part of the vessel was found directly under a charred beam. Charcoal, fired daub, and a heavily burned bison scapula were also recovered from this context (unit 93N 94E).

Vessel 240, which was recovered as several large segments scattered northeast, east, and southeast of the hearth, also exhibits varied signs of burning (Figure 32). Most of the interior and portions of the exterior are light gray with occasional blackening (fire cloud?). This may have been caused by secondary firing that resulted in loss of carbon from the clay beyond that which occurred during the pot's original firing. Nearly all segments of this vessel shown in field photographs were uncovered with their interior surfaces upward, perhaps accounting for the common discoloration of much of that surface. One segment of the rim and adjoining shoulder was exposed to intense heat, causing discoloration, crazing, and warping (Figure 33). This was recovered from the southwest quadrant of unit 90N 97E, adjacent to another rim part that was not

as heavily burned. This indicates that the vessel had broken before this small rim section was exposed to more intense heat than the remainder of the pot. Differential coloring along sherd edges that cross mend with one another also suggests that this vessel broke before the full effects of burning developed. Separated parts of the vessel reacted differently to heat, according to the microenvironment of each, while the lodge burned. Many sherds from this vessel were recovered from unit 90N 96E immediately to the west and in the northeastern quadrant of unit 91N 96E. Figure 13 (left) shows part of this vessel in situ in the upper right portion of the unit. (The fragment to its left is from a different vessel.) Burned stringers also were found near most of the vessel fragments.

One relatively large reconstructed body fragment of vessel 241 displayed light gray coloring, thickening, and warping on opposite edges. Burning appears to have been localized to the fragment edges, suggesting that the vessel also was broken before being exposed to secondary heating. This body fragment was recovered more than a meter south of the hearth, while the other reconstructed portions were widely scattered to the east. Vessel 102, which likewise was recovered from several areas of the eastern part of the lodge, shows little damage caused by intense heat. Slight warping of portions of vessel 345 make it impossible to cross mend several portions of this pot. Parts of this vessel were recovered from various parts of the lodge and from the site surface before excavation.

Judging from characteristics of many sherds in this assemblage, including these five partially reconstructed vessels, and their context (i.e., direct association with burned materials), the most parsimonious explanation of their condition is that they experienced secondary firing caused by heat produced during incineration of the lodge. These vessels may have been broken before the burning occurred or broke early during this process. Based on the extent of damage to sherds from these five pots, it appears that the most intense heat was produced in the northwest corner of the lodge. Speculation is that previously fired vessels exposed to heat while the lodge burned initially lost residual carbon in the paste, producing a light gray color. This appears to be the most common indicator of burning. In microenvironments where oxygen was available, iron was oxidized, resulting in a reddish brown color. As temperatures rose, moisture in the hardened paste expanded. The paste must have liquefied, in part allowing the sherd to expand in thickness and crack due to the pressure of internal vapor/gases. The softening of the once-hard clay caused the broken vessel walls and sherds to warp or fold. Alternate theories may explain the varied attributes of these sherds. One is that these vessels may have been in a leather-hard (unfired) state, drying in preparation for future firing when the lodge burned. If this were the case, it suggests the lodge had not been abandoned prior to burning. Another possibility that seems more unlikely, given the context and associations of the heavily burned vessels and the differences in heat-related attributes on cross-mending sherds, is that these pots were affected by unusual factors related to the original purposeful firing of these pots. None of these scenarios has been tested. Replicative experiments would be useful in gaining insight into the production of these attributes and lodge fires. Similar low-fired, sand-tempered pottery could be refired in a controlled environment where temperatures and oxygen flow could be measured. Experiments such as this may provide clues to how prehistoric lodges burned and the effects of such burning not only on ceramics, but on other material remains.

CHIPPED STONE TOOL ANALYSIS

By Brad Logan, Tobias Blake, and Daniel J. Keating

The chipped stone tool assemblage consists of 233 artifacts, almost evenly divided between formal (n = 117) and informal (n = 116). Formal tools are those that exhibit intentional retouch that is generally so invasive that the blank type is unrecognizable (scrapers being exceptions). In general the modification resulted in a bilaterally symmetrical product, the function of which is frequently apparent (i.e., projectile point, knife, scraper, etc.). Informal tools have at least 1 cm of continuous retouch along one or more edges of a recognizable blank (flake or blade) and are identified as retouched/utilized pieces. These are generally assumed to be ad hoc tools used expediently for a variety of cutting, trimming, or scraping tasks. Because of their greater extent of shaping, formal tools better capture those mental templates that follow patterns recognized as

culturally or temporally diagnostic. To verify the Late Prehistoric and, if possible, the CPt affiliation of the Phil site assemblage, here the focus is on formal chipped stone tools. Detailed data for these artifacts are presented in Logan 2008a:Appendix 2.

The assemblage is compared to that from the White Rock site, both with regard to the relative frequencies of different tool types and morphologies and raw materials. While the White Rock and Phil sites share the same environmental setting, they are assigned to distinct Late Prehistoric cultures. Thus, differences in raw material frequencies can be interpreted as reflections of different resource preferences or of participation in different exchange networks, either of which might be indicative of these cultural adaptations. For example, a contrast in the relative frequency of tool types with regard to function might indicate that the two cultural groups utilized the resources of the region in different ways. Differences in the proportions of stone types used in tool production may reflect variation in relative mobility that affected raw material procurement or, alternatively, contrasts in the trade relations with other groups.

To fulfill the goals of this comparison, formal chipped-stone tools were identified according to type and raw material. Identification of type followed the definitions used in the analysis of the White Rock site (Padilla and Ritterbush 2005). Identification of raw material was based on comparison with samples from the KSU Archaeology Lab comparative lithics collection. Figure 42 shows the relative proportion of general types (excluding one missing scraper), some of which are functional (e.g., arrow point, preform, knife, graver) and others morphological (e.g., biface). It is apparent that bifaces far outnumber unifaces (scrapers) and that within the former, arrow points (including fragments) and point preforms are most numerous.

Projectile points are triangular bifaces that are either notched or unnotched and relatively thin (thickness range = 1.7-3.9 mm) (Figure 43). If unnotched, they must show evidence of use (e.g., lacking tips). One projectile point that may not have served as an arrow tip has a blade reworked for use as a scraper and exceeds the thickness range of all others at 5.15 mm. It is discussed below. The assemblage includes side-notched (17), side-and-basal notched (2), and unnotched (2) points.

Distinguished from projectile points are preforms, which are complete, unnotched bifaces that exceed 20 mm in length and lack any evidence of use, such as a tip impact fracture. Nine specimens are slightly thicker (2.24-4.94 mm) than projectile points (Figure 44, left). A tenth (0404-1414), while classed as a preform on the basis of morphology and length, is notably thicker at 6.81 mm. Because that suggests it served another purpose, such as for cutting, it is not among those graphed (Figure 42).

The few other bifacial tools in the assemblage are elongate, unnotched forms that served as light-duty cutting tools (Figure 44, right), the aforementioned side-notched point with reworked blade (Figure 45, left), a few drills or fragments thereof,

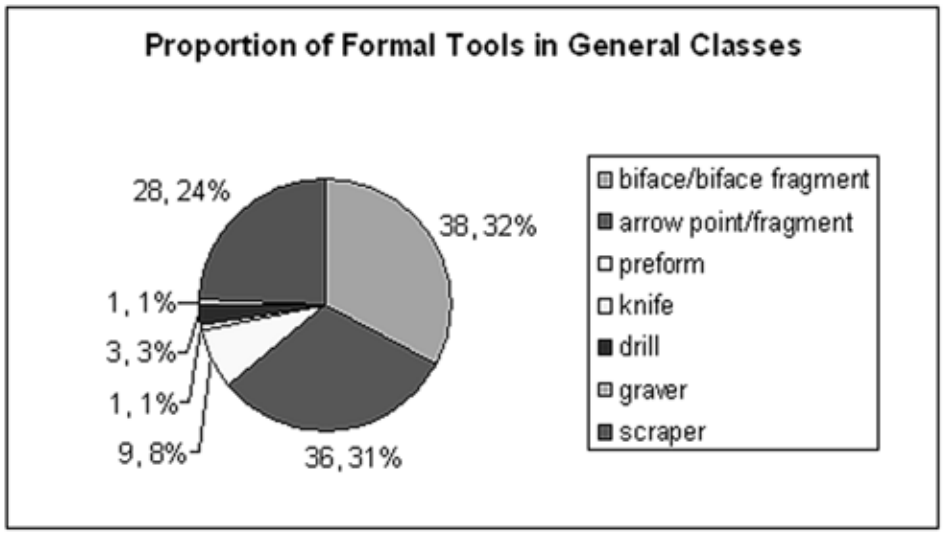

Figure 42. Relative frequency of formal chipped stone tools from the Phil site.

Figure 43. left. Arrow points of Niobrara jasper. right. Arrow points of Permian chert.

Figure 44. left. Arrow point preforms of Niobrara jasper. right. Thin bifaces (preforms?) of non-local chert.

and a graver (Figure 45, right). The assemblage includes no heavy-duty chipped stone tools, such as hoes. Indeed, the only large bifaces are five pieces, one identified as a biface and the others as tested, bifacially retouched tabular pieces of Niobrara jasper. All were found outside the house block. The absence of heavy-duty bifaces from the house is comparable to the pattern seen in the Scott house, a CPt site in Leavenworth County that is dated to the same time (Logan 2008b; 2010c). As in the case at the Scott site, house-centered tool production, maintenance, and use activities apparently were limited to smaller tools at the Phil site.

Of 28 scrapers in the assemblage, 17 are complete, 5 are proximal ends, and 5 are distal portions (artifact 0404-0817, identified in the field as a scraper, is missing from the curated assemblage). Nineteen have the tear-drop form and unifacial retouch with steep working edges on the distal portion that are typical of end scrapers (Figure 46); seven have that general appearance but were made on thinner flakes; and three are side scrapers (compare Honea 1965).

Comparison of the 14JW48 formal chipped stone tool assemblage to that from the White Rock site, as described by Matthew J. Padilla and Lauren W.

Figure 45. left. Reworked side-notched arrow point; right. Drill base (a), graver (b) and drill tips (c-d).

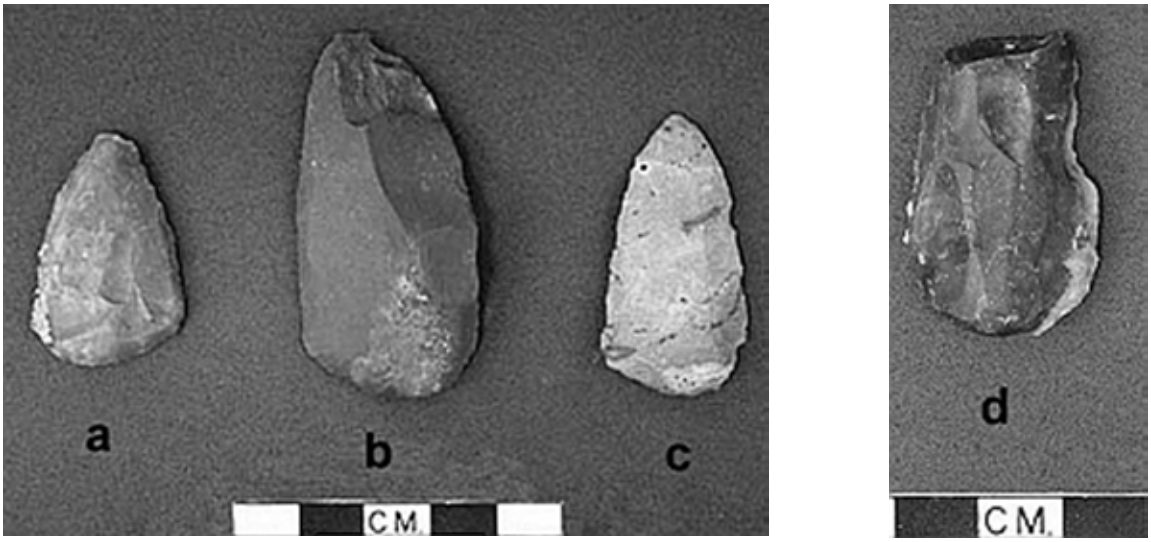

Figure 46. End scrapers of a. Alibates agatized dolomite, b-c. Niobrara jasper, and d. Permian chert.

Ritterbush (2005), confirms the contrast between the Central Plains and Oneota traditions, to which both respectively are assigned (compare Logan 1998a, Ritterbush and Logan 2000). The sample of formal chipped-stone tools at the Phil site totals 117; that from the White Rock site, limited to assemblages collected by the Nebraska State Historical Society during excavations in the 1930s, totals 527. The latter number is derived from a larger assemblage of 963 artifacts and excludes cores, debitage, retouched and utilized pieces (Padilla and Ritterbush 2005:Table 1). The difference in sample size is only one of several contrasts between the assemblages. With regard to the White Rock site, the contrast in the number of stone tools reflects longer-term use, more frequent reuse, occupation by a larger group, or some combination of these factors. The Phil site likely was occupied by an extended family for a few years.

There is a distinct difference in the relative frequency of arrow point types. Almost all of those from 14JW48 are notched (19 of 21, or 90 percent; preforms are excluded), whereas the great majority from the White Rock site are unnotched (29 of 33, or 88 percent; note: one of the notched points is not an arrow point but a larger tool). Most points in the Phil site assemblage exhibit shallow notches with relatively straight, symmetrical bases; a few have deep notches and slightly concave bases. These points, like those from most CPt sites, are

well-made bifacial tools. The more numerous unnotched arrow points from the White Rock site, like those at Oneota tradition sites in general (Padilla and Ritterbush 2005:289), are often little more than flakes that had been marginally, and sometimes unifacially, retouched into a triangular shape.

As noted above, large bifacial tools are nearly absent from 14JW48. In the 1930s White Rock assemblage, not only are bifaces more numerous (n = 221, or 42 percent of formal chipped stone tools), but they are quite varied in size, "with weights ranging from 12.2-1126.0 g" (Padilla and Ritterbush 2005:271). As those authors note, it was difficult to determine the function of many White Rock bifaces. Some larger ones are tabular pieces that retain cortex, but with retouched edges that suggest they served as cutting implements. Three wasted pieces apparently served as heavy-duty tools for cutting, chopping, and scraping. Others exhibit alternately beveled edges, indicating use as multiedged cutting tools. So-called Harahey knives are tools common to many Late Prehistoric cultures and are present in the Phil site assemblage.

Scrapers are significantly more numerous at the White Rock site, where they account for 47 percent (n = 248) of formal chipped stone tools. Padilla and Ritterbush (2005: 277) attribute them primarily to hide scraping, particularly of bison, remains of which are plentiful at the site. The greater surface area of bison hides, compared to other animals, certainly would require more tools of this kind for preparation, and the focus on bison that is characteristic of the White Rock phase (Logan 1998b) would further increase such demand. CPt subsistence did not emphasize bison, and the near absence of their remains, other than scapulae used for hoes (see next section), at 14JW48 is consistent with this pattern. Thus, the lower frequency of scrapers with respect to other formal stone tools (24 percent; Figure 42) also reflects the contrast in this aspect of the subsistence economy vis-à-vis White Rock.

Comparison of the lithic raw material types and their relative frequencies in the two site assemblages also offers insights. Two major cryptocrystalline stones are predominant in both: Niobrara jasper and Permian-aged cherts. The former is found in northwestern Kansas and south-central Nebraska and may outcrop south of the Lovewell Reservoir area (Stein 2005); the latter are found among several limestone members in the Flint Hills of eastern Kansas. Not surprisingly, both sources were exploited by occupants of the two sites, although it is not clear whether both applied the same procurement strategy (e.g., trade versus embedded acquisition).

The relative frequency of both of these materials at the Phil site indicates slightly greater utilization of Niobrara jasper, which accounts for 50.4 percent of formal chipped stone tools and a slightly greater proportion (53.4 percent) of informal tools (Table 19). Permian cherts account for 40.9 percent of formal tools and a slightly lower frequency (34.5 percent) of informal tools. The White Rock assemblage, here referring to the combined tool and debris material, has a significantly higher frequency of Niobrara jasper (70 percent) and a correspondingly lower frequency (21 percent) of Permian cherts.

Some contrast between the two assemblages is notable with regard to exotic lithic raw materials. Both formal and informal tools made of Alibates agatized dolomite appear in low frequency (n = 11; 4.8 percent) at 14JW48. Others of chalcedony occur with nearly the same frequency (n = 8; 3.5

Table 19. Raw Material Frequencies of Formal and Informal Chipped Stone Tools.

Informal Chipped Stone Tools			Formal Chipped Stone Tools		
Raw Material	Count	%	Raw Material	Count	%
Alibates	3	2.6	Alibates	8	6.9
Chalcedony	7	6.0	Chalcedony	1	0.9
Niobrara Jasper	62	53.4	Niobrara Jasper	58	50.4
Permian Chert	40	34.5	Permian Chert	47	40.9
Unidentified	4	3.4	Quartzite	1	0.9
Totals	116	100	Totals	115	100

percent). There are no Alibates tools or debris in the White Rock assemblage, and those of chalcedony are rare (n = 45; 4.8 percent; Lauren Ritterbush personal communication, April 10, 2008). No obsidian artifacts occur in the Phil site assemblage, and, while none has been found at White Rock, a few obsidian flakes have been recovered at the nearby Warne sites, assigned to the White Rock phase (Logan et al. 2001). Those have been sourced to the Malad, Idaho, and Obsidian Ridge, New Mexico, areas. Apparently both White Rock and CPt groups in the Lovewell area participated in some exchange network with groups to the west, given the chalcedony tools at the Phil site and artifacts of that material, as well as obsidian, at the White Rock and Warne sites. Interestingly, while both had exchange relations with groups to the south, these appear to have differed somewhat; i.e., obsidian artifacts from New Mexico present at Warne but absent from Phil, and Alibates artifacts from the Texas panhandle present at Phil but absent from White Rock.

FAUNAL ANALYSIS

By Brad Logan, John R. Bozell, and Carl R. Falk

In this section the faunal remains from the Phase III and IV investigations are described. The senior author identified large mammals (bison, deer, and canid), Bozell identified all other mammals, birds, and reptiles, and Falk identified fish remains. For detailed taxonomic identifications, element, part, and other data, see Logan et al. 2008. In the final section the significance of the species diversity represented at the site, typical of the CPt, is discussed as it contrasts with the narrower range of animals represented at sites of the White Rock phase of the Oneota tradition.

The total mass of bones and teeth in the assemblage is 3,690.6 g. The great majority of these, many of which are burned and quite small, are unidentifiable. Eighty bone and teeth fragments are those of large mammals, and their distribution is shown in Figure 47. Note how they are nearly absent from the area defined in general by the internal posts, suggesting that they were either stored beyond or more likely cleared from that area. Since bison are more numerous, they warrant more detailed discussion.

LARGE MAMMAL REMAINS

By Brad Logan

Fifty-four pieces are identified as bison. The great majority (n = 39) are scapular fragments (Figures

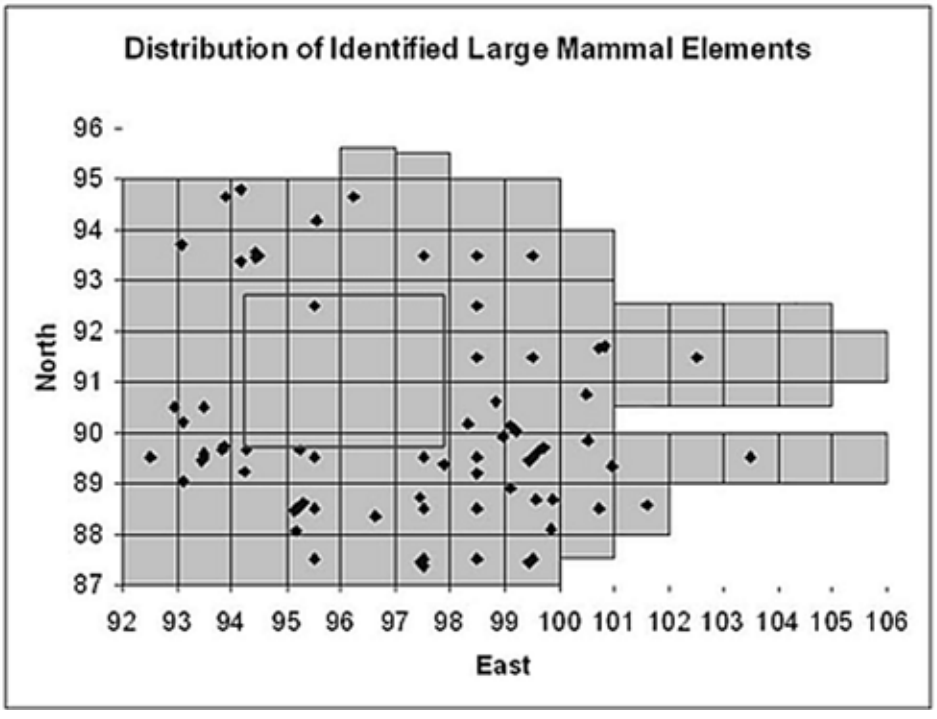

Figure 47. Distribution of identified large mammal elements in the Phil house block excavation. Note how only one fragment falls within the rectangular area that generalizes the pattern of the interior posts, indicative of cleaning of the hearth-centered activity area.

48 and 49). Non-scapular pieces are a mandibular molar, four scraps of tooth enamel, three vertebral fragments, and half dozen sesamoids. Though few, the axial and appendicular pieces indicate that the 14JW48 house occupants relied on bison for more than scapulae; they were a food source as well. One of the vertebral fragments, a thoracic dorsal spine, was probably a tool—perhaps a pottery paddle. Five pieces are glenoids, and of those only two are complete: one from the right side and the other from

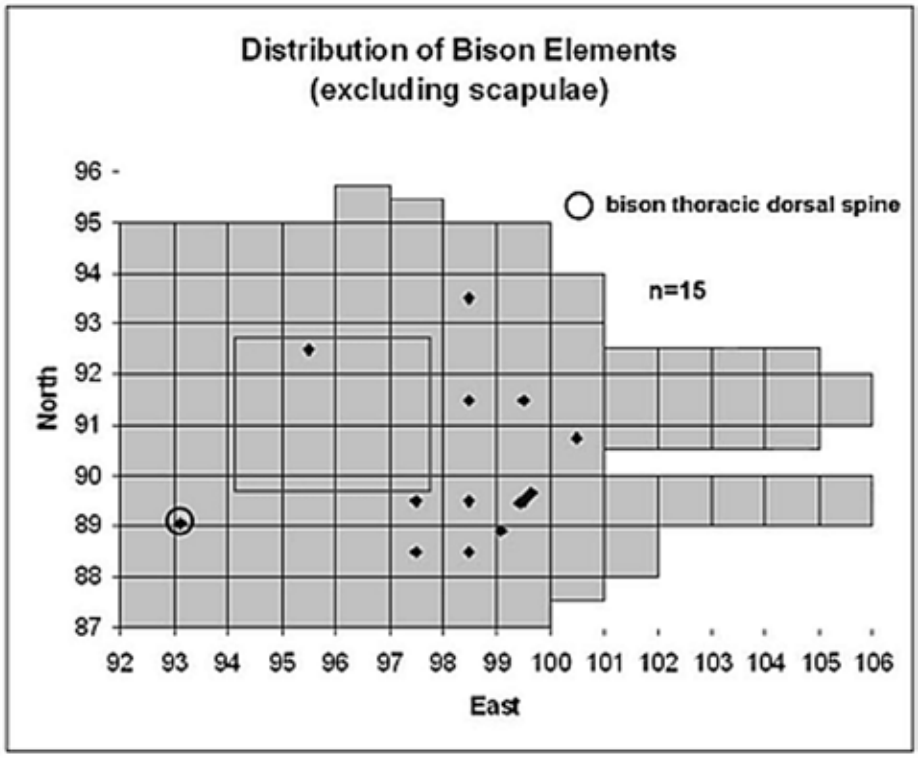

Figure 48. Distribution of bison elements, exclusive of scapulae. Note that most are in the eastern half of the house, and only one falls within the internal post area.

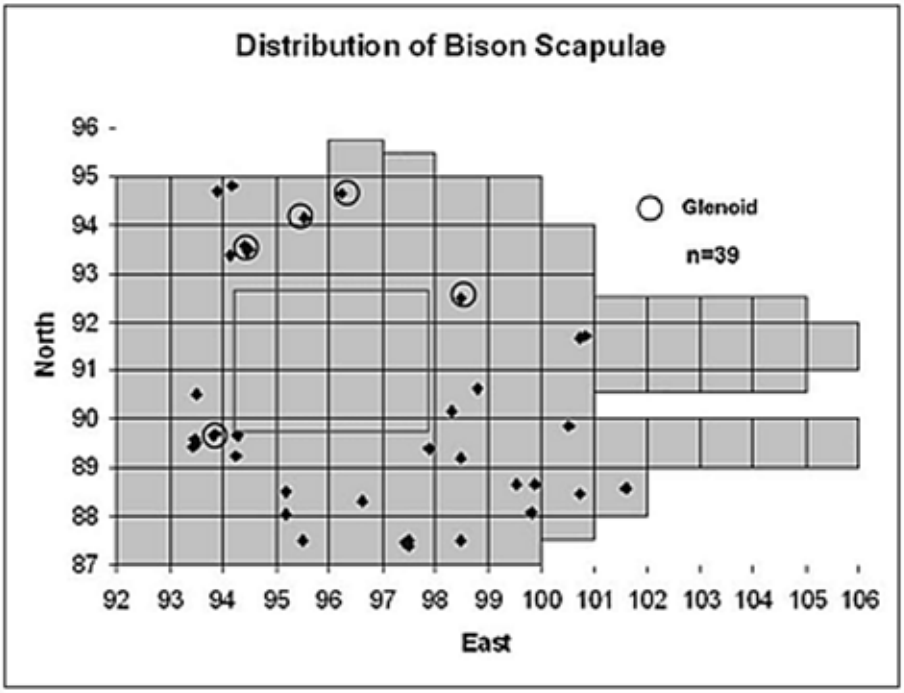

Figure 49. Distribution of bison scapular fragments with glenoids indicated.

the left. Others from both sides give a minimum number of individuals (MNI) of two. Most fragments are badly burn ed, and as shown in Figure 13 (right) by a nearly complete scapula found below a burned timber (stringer?), this occurred during incineration of the house. Unfortunately, fragmentation of that scapula and most others was so advanced that reconstruction was precluded (Figures 50 and 51). Thus, the inference that all bison scapulae were tools for cutting, digging, or gardening is based on their high frequency in conjunction with the ubiquity of identifiable scapula tools at other CPt sites. The cluster of three glenoids and associated pieces near the northern wall and of the other glenoids and associated pieces near internal posts suggest that they may have been stored in those areas (compare discussion of mass in Distribution of Cultural Material).

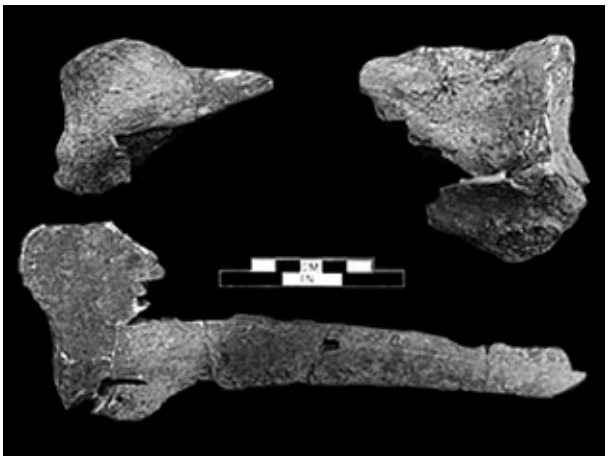

Figure 50. Glenoid portions of the three bison scapulae found along the northern wall. Note severe burning and fragmentation. Clockwise from upper left, these are catalog numbers 0404-0409, 0404-0427, and 0403-3665. Respectively, these are 39.2 g, 93.6 g, and 81.2 g, or 10.4 percent, 43.8 percent, and 35.3 percent of the total mass of each plotted artifact, reflecting severe fragmentation that precludes their complete reconstruction.

Of other large mammal bone fragments 14 are deer and 12 are canid, probably dog. Of deer pieces, distribution of which is shown in Figure 52, half are antler portions, including three burrs that likely were used as billets, that is, soft-hammer percussors for flintknapping (Figure 53). As noted earlier (see Feature 3 under Features), a cut beam associated with F3 cross mended with fragments of a tine from a test unit dug just beyond the eastern house wall; this artifact probably served as an awl or punch for leather work (Figure 54). A burned and reconstructed metatarsal (Figure 55) was probably a tool, although it lacks the distal portion where evidence of use is expected. Other pieces are parts of a calcaneus, phalange, metapodial, long bone epiphysis, and mandibular molar. The first two may have been "riders" of a metapodial brought into the house to be made into a tool. The tooth was recovered from the exploratory trench beyond the house floor.

Of the canid pieces, distribution of which is shown in Figure 56, three are teeth and attached bone; two of these are most of the tooth row of a right mandible (Figure 57, left). The latter mend across a linear distance of at least 10 m from the western edge of the house floor to the center of the entryway. (The precise distance is not possible, as both are from water screened fill.) The cache pit (F14) yielded four post-cranial bones, three of a

Figure 51. Glenoid and blade portion of a bison scapula found in 89N 93E (0404-0143). This piece is 95 percent of the total mass of the piece-plotted scapula.

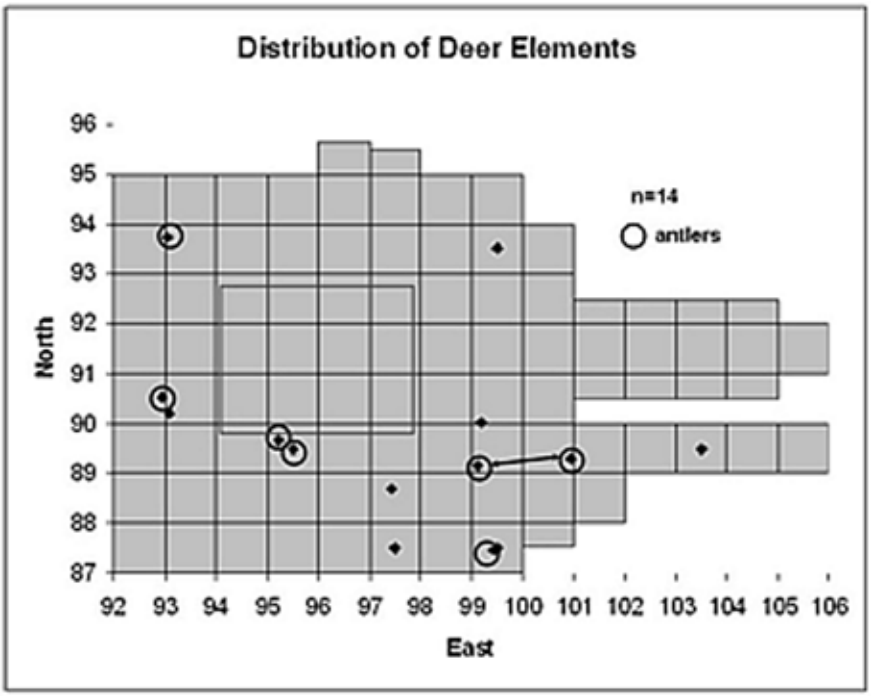

Figure 52. Distribution of deer remains. Note cross-mend of two antler pieces shown in Figure 54.

Figure 53. Deer antlers with worn burrs indicative of soft hammer percussion. From top to bottom: 0404-0045, 0404-0501, and 0404-0193. The upper piece is 71 percent of the plotted artifact, which is severely burned.

Figure 54. Deer antler tool. Fire-blackened tine was found in pieces within T4, outside the house wall and 1.6 m northeast of the cut beam that was associated with F3.

juvenile. The fourth bone, a distal humerus, exhibits cut marks at the fossa above the condyles on the cranial side (Figure 57, right). If this is from a dog, which is plausible given well-documented evidence of their use in the Great Plains (e.g., Bozell 1988; Walker 1980), this element supports the suggestion that this domestic animal served as a food source during pre-equestrian times (Thurman 1988). Two vertebral bones, a few femoral pieces, and a phalange may also be food remains.

Several shaped and worn bones show evidence of use for piercing or weaving tasks (Figures 58-60). They exhibit polish or striations parallel to the long axis of the piece or taper to a point (e.g., Figure 58a, 58h, 58i, 58l, 58m, and 58n). Most are too modified or small for taxon/element identification. Two pieces do not mend, but from comparable calcining, cross section, and proximity (they are from

Figure 55. Deer metatarsal (0404-0810), probably part of a tool.

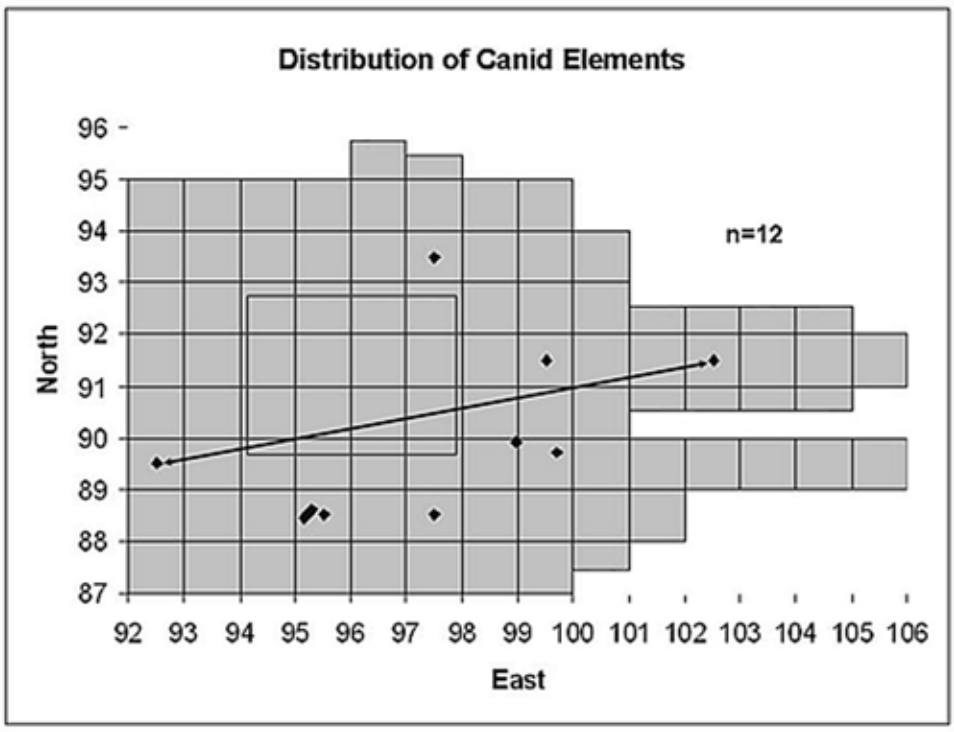

Figure 56. Distribution of canid elements in the house block, with cross-mended mandible (0404-0028 in 89N 92E; 0404-1517 in 91N 102E) shown below. Those in 88N 95E were found in the cache pit, F14.

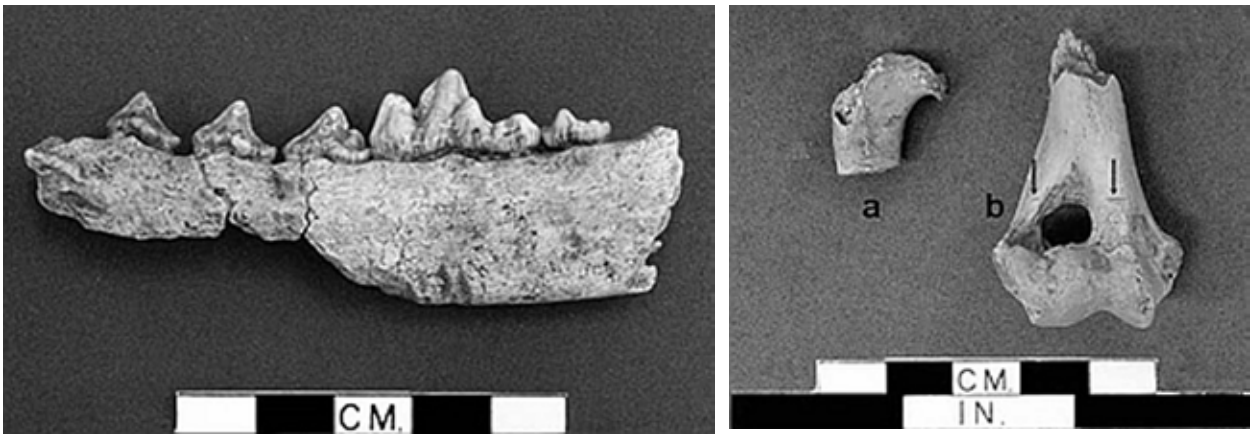

Figure 57. left. Canid mandible. right. Scored-and-snapped owl bone (a) and canid distal humerus (b) from F14. Arrows indicate cut marks.

Figure 58. Bone rods (awls?) and fragments. Cross-mends of j (four pieces) and l (five pieces) are shown in Figure 59, left and right respectively. Calcined pieces f and g, parts of a jackrabbit tibia, were found in 89-90N 93E; n, was mended from eight water-screened pieces from 89N 93E.

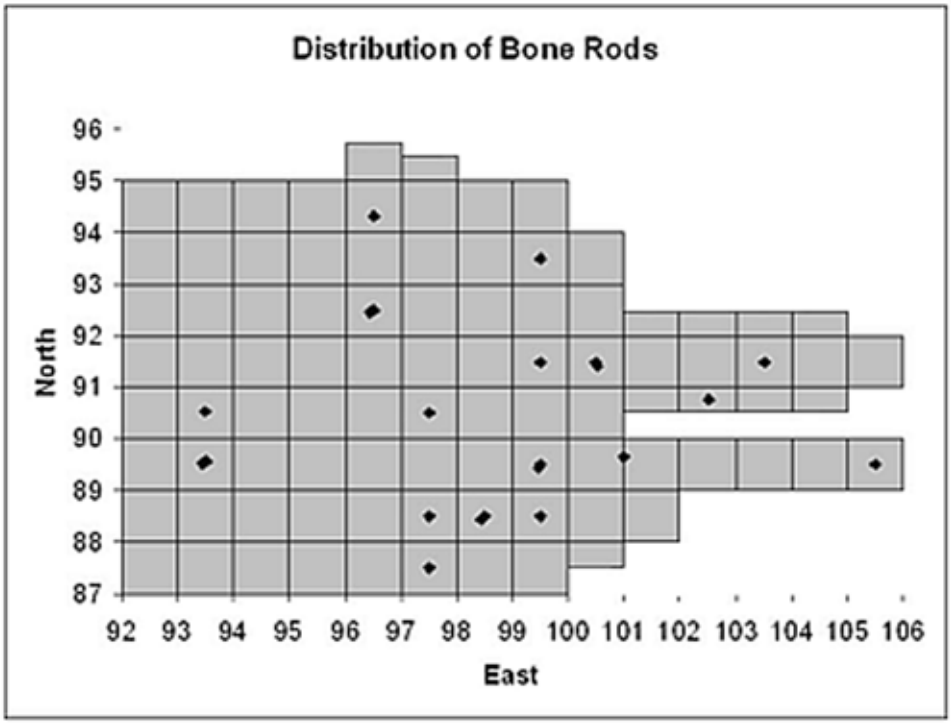

Figure 59. Map showing distribution of bone rod fragments. Note how most are in the eastern half of the house or entryway and exploratory trench.

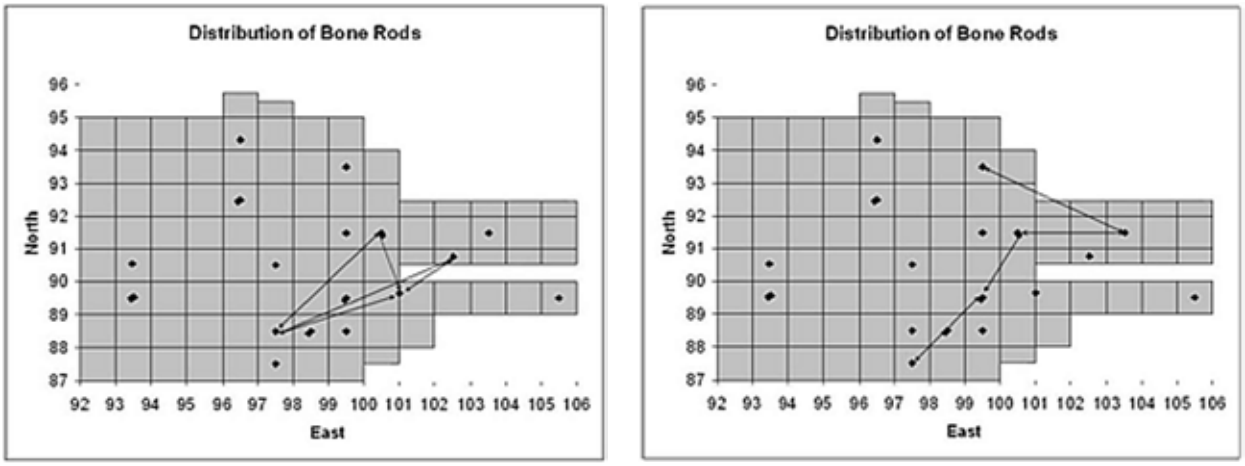

Figure 60. left. Cross-mend pattern of bone rod j. right. Cross-mend pattern of bone rod l (Figure 58).

adjacent units), they are clearly parts of a tool made from a jackrabbit tibia (Figure 58f and 58g). Three other pieces that share the same color, cross section, and general provenience may be a deer tibia, though all are too altered to know for certain (Figure 58j-58l). The bone shown in Figure 58k is from 89N 99E. Another (Figure 58l) is a mend of five pieces from units including 89N 99E that are along the south-central and northeastern walls and entryway (Figure 60, right). The third (Figure 58j) is a mend of four pieces from house, entryway, and extramural units around, but not including, 89N 99E (Figure 60, left). Interestingly, no rod fragments were recovered from the northwestern quadrant of the house fill, suggesting their use or storage did not occur in that part of the lodge.

These tools may have been used as awls or needles for hide work, clothing production, or weaving. Latham (2004:56) described such artifacts from 14ML417, a Solomon River phase site on the eastern edge of the Waconda Reservoir locality, 50 km southwest of the Phil site, as awls, some modified from the tibiae and split ribs of deer. In her analysis of similar tools from CPt sites, Roper (2001) refers to them as bone rods, the non-functional term used here, and notes that they could have served as piercing or flint-knapping tools, in the latter case for notching arrow points.

Another modified bone is a bead (Figure 61) made from the long bone of an unidentified animal. Latham (2004:56) suggested that comparable beads from 14ML417 were made from bones of birds or rabbits. Of cylindrical shape, the one from 14JW48

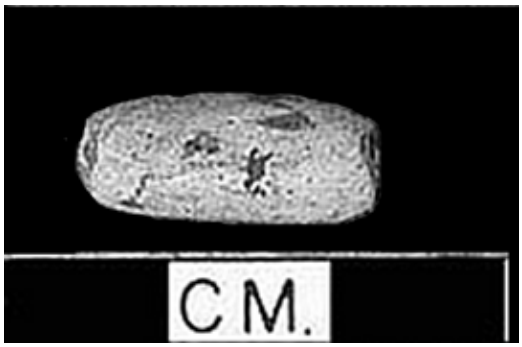

Figure 61. Bone bead.The Simon Clovis Cache: One of the Oldest Archaeological Sites in Idaho.

is 17.5 mm long and 8 mm in exterior diameter. The hole through which it would have been threaded is 4.0-4.5 mm in diameter. Both ends have been rounded, and the exterior surface shows wear polish. The bead was found in T5, outside the house (see Figure 12 for unit location). In the following section Bozell describes other evidence of bone bead work that utilized small mammal and bird elements.

SMALL MAMMAL, BIRD, AND REPTILE REMAINS

By John R. Bozell

METHODS

In December 2007 all small faunal remains from the Phil site were transferred to Bozell for identification and analysis. The senior author retained

and identified the bison, deer, canid, and most of the modified bone for study at Kansas State University. The small remains were initially sorted into unidentifiable and identifiable groups, and the identifiable materials were further segregated by gross taxonomic category. The fish remains were subsequently transferred to Falk for identification and analysis.

The non-fish small fauna was identified using modern reference skeletons curated by the Nebraska State Historical Society, Archaeology Division and the University of Nebraska State Museum, Zoology Division, both in Lincoln, Nebraska. Establishing taxa was augmented through consultation of published modern distributions (Jones et al. 1985; National Geographic Society 1987; Collins 1993; and Mollhoff 2001). Basic information was recorded for each specimen, including taxon, skeletal element, anatomical side (left, right, axial), element part or portion (complete, near complete, proximal, distal, etc.), butchering marks (present/absent), burning (present/absent), and other modification (e.g., rodent gnawing). Additional comments were recorded in an open format. All data, organized by catalog number, are included in Logan 2008:Appendix 3.

Table 20. NISP/MNI of Identified Unmodified Reptile, Bird, and Small Mammal Remains.

Taxon	NISP	MNI
Emydidae (box/water turtle)	9	1
Chrysemys picta (western painted turtle)	1	1
Subtotals	10	2
Botaurus lentiginosus (American bittern)	1	1
Anatidae (duck)	2	1
Anas discors/crecca (teal)	2	1
Tetraonidae (grouse/prairie chicken)	3	2
Passeriformes (perching bird)	2	1
Subtotals	10	6
Scalopus aquaticus (eastern mole)	4	1
Sylvilagus floridanus (eastern cottontail)	6	2
Sciuridae (squirrel)	1	1
cf. *Spermophilus tridecimlineatus* (ground squirrel)	1	1
Sciurus sp. (tree squirrel)	1	1
Geomys bursarius (plains pocket gopher)	16	4
Castor canadensis (beaver)	1	1
Cricetidae (mice)	4	3
Microtus sp. (vole)	3	1
Ondatra zibethicus (muskrat)	4	1
Mustela frenata (long-tailed weasel)	1	1
Subtotals	42	17
Totals	62	25

ACCOUNT OF TAXA

The non-fish small unmodified faunal sample consists of 62 elements (NISP = number of identified specimens) representing 18 taxa (Table 20). A total minimum number of 25 individuals (MNI) are present in the collection, arrived at by utilizing the standard method of tabulating the element, side, and portion that occur in the greatest frequency by taxon.

Emydidae (box/water turtles): Nine turtle bones could only be assigned to the family Emydidae. The sample includes a cervical vertebra, four marginal or costal carapace fragments, and four plastron fragments, representing a minimum of a single individual. The most common of these turtles in north-central Kansas are Chrysemys picta (painted turtle) and Terrapene ornate (ornate box turtle), and both have been recorded in CPt assemblages (Morey 1982:180). An eighth turtle bone, a lateral plastron fragment, is identified specifically as painted turtle. None of the 14JW48 turtle bones is burned or carries butchering marks and can be definitively associated with an archeological context.

Areidae (herons/bittern): A right proximal Botaurus lentiginosus (American bittern) humerus was recovered from Feature 14. The element bears small cut marks and that, combined with its recovery from a feature, strongly suggests that it represents a bird capture by lodge residents for subsistence. Bittern remains are not commonly recovered from CPt sites but have been recorded at the Hulme site (25HL28) about 80 mi north of the Phil site (Bozell 1991:232), the Glenwood locality southeast of Omaha (Green et al. 1990:31), and Waconda Lake about 50 mi south of 14JW48 (Lippincott 1976:107; Blakeslee 1999:78).

Anatidae (ducks): Five unmodified duck bones were recovered from the Phil site. Two of these are teals, one a coracoid and one a carpometacarpus. Based on modern distribution, these bones are likely either blue-winged (Anas discors) or

green-winged (A. crecca) teal, but neither could be definitively distinguished osteologically. The other two elements are proximal coracoids from small-bodied ducks but not teals. A variety of ducks has been reported regularly from CPt sites and sometimes forms the largest proportion of sample avian remains (e.g. Morey 1982:183-187). These five elements are not burned and do not have cut marks, but another Phil site teal element has been scored, probably related to small bead manufacture (see below).

Tetraonidae (grouse/prairie chicken): Two proximal coracoids and distal tibiotarsus, identified only to the family Tetraonidae, were recovered. Members of this family occurring in north-central Kansas include Tympanuchus cupido (greater prairie chicken) and T. phasianellus (sharp-tailed grouse). Although neither element is burned, cut, or recovered from a sealed feature, Tetraonidae bones are regularly identified with CPt secondary subsistence pursuits (Bozell 1991:235; Morey 1982:185).

Passeriformes (perching birds): A proximal radius and a proximal ulna are from an unidentified small perching bird. Passerine remains from Plains Village contexts are typically considered to be natural intrusions, although burned perching bird bones were recovered from a protohistoric component south of Omaha (Koch et al. 2010).

Talpidae (moles): Four Scalopus aquaticus (eastern mole) elements were recovered, including two humeri, a pelvis, and an ulna. The origin of these elements cannot be firmly established, although its burrowing habits suggest natural intrusion.

Leporidae (rabbits): Six unmodified rabbit bones were recovered, and all are identified as Sylvilagus floridanus (eastern cottontail). Two modified Lepus (jackrabbit) bones also were recovered and were discussed previously. The cottontail sample includes an incisor, two femora, a tibia, a humerus, and a metatarsal. They are unmodified, except one element is charred. Two were recovered from Feature 3. Rabbits never make up a major portion of CPt subsistence taxa but do occur in low frequencies at some components (Morey 1982:178; Turnmire 1996:189-190).

Sciuridae (squirrels): A fragmentary squirrel pelvis was identified as a ground squirrel (Spermophilus franklinii, Franklin's ground squirrel; S. tridecemlineatus, 13-lined ground squirrel), prairie dog (Cynomys ludovicianus), or a tree squirrel (Sciurus niger). The element is not burned or cut. Two other elements could be more specifically identified: a tree squirrel femur and a 13-lined ground squirrel mandible. Squirrels have been occasionally associated with CPt secondary subsistence activity (Koch et al. 1999:77; Koch and Nelson 2002:40).

Geomyidae (gophers): Sixteen elements were recovered, representing a minimum of four individual plains pocket gophers (Geomys bursarius). Elements identified include a single ulna and 15 cranial elements and loose teeth. The majority of the sample was retrieved from Feature 14, although burning or cut marks were not recorded. The origin of the gopher material is unclear, although gophers occasionally have been documented as food items in Woodland and CPt subsistence strategies (Bozell et al. 2006:381; Koch et al. 1999:77; Koch and Nelson 2002:40).

Castoridae (beavers): A single immature Castor canadensis (beaver) tooth fragment was recovered. The item is not burned, and its origin is unclear. Beaver remains are identified with CPt subsistence on an irregular basis (Bozell 1991:235) but also can be expected to naturally occur in a riparian setting.

Cricetidae (mice and voles): Identified cricetid remains include three Microtus (vole) elements, four Ondatra zibethicus (muskrat) bones, and four mice mandibles. The mouse jaws do not have teeth, precluding specific identification, but the tooth row lengths are consistent with several forms of Peromyscus (deer mice) or Onychomys leucogaster (grasshopper mouse). The muskrat specimens include two humeri, a scapula, and a tooth fragment. Muskrats are sometimes identified with CPt secondary subsistence pursuits (Bozell 1991:235), but this riparian species occurs naturally in settings similar to 14JW48. The vole elements are cranial and could be either M. pennsylvanicus (meadow vole) or M. ochrogaster (prairie vole). Their origins are unclear, as are those of the mouse jaws.

Mustelidae (weasels): One burned Mustela frenata (long-tailed weasel) mandible was recovered and is likely associated with subsistence efforts. Weasels and other small fur-bearers occur regularly from CPt contexts but typically in low frequencies (Koch et al. 1999:83).

MODIFIED BONE

Four modified bones were sorted from the small vertebrate material. One (0404-2309) appears to be a small bone bead. It is a 12.12-mm-long diaphysis segment that is 5.85 mm in diameter and has been scored and snapped on both ends. The species and element cannot be determined, but it appears to be a long bone from a rabbit or squirrel-sized mammal. Three modified bird bones are assigned catalog number 0404-1975. The first is a complete left teal ulna that has been scored around the entire circumference of the diaphysis but has not been snapped. The bone is 49.9 mm long and 3.36 mm in diameter at the point along the diaphysis where the score has been placed. The other two modified bones are owl elements, although a species could not be determined. Their size compares favorably with Bubo virginianus (great-horned owl). One object is a right distal tibiotarus (length = 25.74 mm; width = 15.69 mm), and the other is a right proximal medial femur (length = 17.03 mm; width = 9.3 mm; 13a). Both elements are scored and snapped on the diaphysis and appear most likely to be bead manufacturing debris.

FISH REMAINS

By Carl R. Falk

The identification of fish materials from the Phil site was completed utilizing modern skeletons in the possession of the author. Specimens were regarded as "identifiable" if the anatomical element or element group could be determined. Basic information was recorded for each identified piece: taxon, skeletal element, anatomical side (left, right, axial), element part or portion (complete, near complete, proximal, distal, etc.), butchering marks (present/absent), burning (present/absent), and other modification (e.g., rodent gnawing). Specimen color was recorded using a Munsell color chart. All data, organized by catalog number, were entered on an Excel worksheet (presented in Logan et al. 2008:Appendix 3).

The sample submitted for examination consists of 37 pieces of fish bone (Table 21). None of the identified specimens is clearly burned, although two pieces are blackened at one end, possibly a result of burning. A mottled brown to dark brown and reddish-brown color noted for many specimens may indicate exposure to heat (see Nicholson 1993), but these observed color variations also may reflect post-depositional staining.

Two specimens, a caudal vertebra from an unidentified sucker (Catostomidae) and an anal spine from a freshwater drum (Aplodinotus grunniens), display tool marks. The drum spine shows two clear diagonal tool marks, one at the broken dorsal end of the element and the other mid-shaft. Both marks have characteristics associated with use of metal tools (knife?): a steep and smooth-sided V-shaped profile (see, for example, Greenfield 1999; Walker and Long 1977). The tool mark on the sucker vertebra also appears to be from a metal tool and may be recent. More intensive microscopic study of the fish sample might yield additional pieces with apparent "cut marks," although many of these marks may be a result of contact with excavation tools. The sucker vertebra noted above also shows evidence of rodent gnawing.

Hiodontidae (mooneyes): A single abdominal vertebra is assignable to the mooneye family and is tentatively identified as goldeye. The bone is unstained and well preserved. The surface is pitted and eroded, resembling partially digested (scatological) bone. A white chalky substance is present in the body cavities.

Catostomidae (suckers): Two vertebrae are referred to the sucker family. One is an abdominal vertebra, representing an unidentified large-bodied sucker (e.g., river carpsucker, Carpiodes carpio; buffalo sucker, Ictiobus sp.; or redhorse sucker, Maxostoma sp.). This specimen shows a slightly weathered and leached appearance. The second specimen, a caudal vertebra from an indeterminate sucker exhibits a single tool mark and rodent gnawing.

Ictaluridae (bullhead catfishes): A single specimen, a caudal vertebra centrum, is tentatively assigned to this catfish group.

Esocidae (pikes): The pike family is represented by one well-preserved abdominal vertebra. The specimen is from a relatively large fish and is likely northern pike (Esox lucius); further identification is difficult on morphological grounds.

Centrachidae (basses and sunfishes): A total of 20 pieces are assigned to the centrachid family. Eighteen specimens are tentatively referred to

Table 21. NISP/MNI Values of Identified Fish by Taxa.

Taxon	NISP	MNI
Hiodon cf. *H. alosoides* (goldeye)	1	1
Catostomidae (suckers)	2	1
Ictaluridae (bullhead catfishes)	1	1
Esox sp. (pike)	1	1
Centrarchidae (sunfishes and basses)	2	—
cf. *Pomoxis* sp. (crappie)	18	2
Aplodinotus grunniens (freshwater drum)	12	1
Totals	37	7

the genus Pomoxis and may represent either white crappie (P. annularis) and/or black crappie (P. nigromaculatus). The white crappie can be considered a native fish, while black crappie is a comparatively recent historic introduction. At least two individuals are represented based on two left subopercules, two left preopercles, two left dentaries, and marked size differences between left and right maxillae. Nearly all of the bones are well preserved. Most are dark brown to reddish brown in color, and many specimens evidence a polished, almost "greasy" appearance. Two specimens, both maxillae, are blackened at one end and may be burned.

Sciaenidae (drums): Twelve freshwater drum (Aplodinotus grunniens) bones are included in the sample. A minimum of one individual is represented. The identified specimens are well preserved, although two vertebrae and spine are moderately weathered with slight surface flaking and a leached appearance. Most specimens are a light brown in color, although several specimens are brown to dark brown or dark grayish brown. As noted above, one specimen shows clear tool marks.

The cultural association of the recovered fish sample is somewhat problematic. The site is normally inundated by an artificial reservoir (Lake Lovewell), and it is thought that the recovered fish bone might be of comparatively recent origin—the accumulated result of natural death and/or discards by modern fisherman (Brad Logan, personal communication [letter to Rob Bozell], December 12, 2007). However, with one exception the sample appears to include only fishes native to the Kansas River basin (Cross 1967; Cross et al. 1986; Lee et al. 1980), and any or all might be expected in an archeological assemblage within the Central Plains, particularly where fine-screen recovery techniques are employed (Koch 1995; Morey 1982). One species, the northern pike, is generally not considered a native fish in Kansas but is occasionally reported in archeological contexts from other areas of the lower Missouri River basin (e.g., Blakeslee 1999:101; Morey 1982).

With one exception, a crappie opercle fragment from a general excavation flotation sample, all fish bone was recovered from general unit (house fill) samples, water screened over 1/8-inch mesh. Fish bone was not found within excavated features. Most of the fish bone is rather well preserved; three freshwater drum elements and one sucker specimen show slight weathering. These four pieces are from units located in the southwestern quarter of the excavation, an area of relatively high bone density (see Artifact Distributions, Figure 27). Overall, preservation characteristics for the sample are not markedly different from those noted for specimens recovered from other Central Plains locations. At least one specimen (freshwater drum spine) may show evidence of metal tool marks, suggesting a recent origin. At least two centrachid elements may be burned, but the evidence here is inconclusive.

SUMMARY

By Brad Logan

The faunal remains from 14JW48 are typical of CPt sites with regard to species represented, their diversity, and utilization for food and a variety of tools (Blakeslee 1999; Bozell 1991, 1995; Brown 1982; Falk 1969; Koch 1995, 2004; Koch et al. 1999). Bison bones are primarily scapulae, all likely used as hoes; other remains are limited to a few sesamoids, vertebral fragments, a tooth and bits of enamel. Although relatively few in number, other elements represent a variety of other mammals used for food, tools, or pelage (coat), as well as waterfowl, other birds, and fish. Like those from most other CPt sites, the assemblage presents a marked contrast—one that was expected given recent research—to the low diversity characteristic of the White Rock phase, the regional representative of the Oneota tradition.

Analysis of assemblages from Warne (14JW8), Montana Creek (14JW46, 14JW47), and White

Rock (14JW1) (see Figure 1), all of Late Prehistoric age and less than 3 km (1.9 mi) west of the Phil site, revealed a strong bias toward bison (Logan 1995, 1998b, 2006; Ritterbush and Logan 2006). None is assigned to the CPt. The Montana Creek sites are not affiliated with either tradition and remain something of a mystery in that regard. Still, from the perspective of 14JW48, the contrast in subsistence economies between CPt and other Late Prehistoric adaptations in the White Rock valley is apparent. The NISP of non-bison remains from seven White Rock phase sites at Harlan County Lake, Nebraska, and Lovewell Reservoir, where this information is available, totals only 42 fragments of deer, canid, bird, turtle, and mussel (Logan 1998b:363). The Phil site yielded 125 identified non-bison remains. Even excluding rodent and fish bones (n = 64), which may be intrusive, the number and variety of non-bison bones still exceeds those at all other Late Prehistoric sites in the project area.

The 14JW48 assemblage thus supports interpretation of a significant difference in the subsistence economies of the Central Plains and Oneota traditions in the lower Republican River basin, the former diffuse and the latter focal (in the sense of Cleland 1976; Logan 1998a, 1998b). Laura L. Scheiber (2007) has suggested that the archeologists cited above with regard to CPt faunal utilization may have over-reacted to earlier descriptions of a more bison-focused CPt economy by Strong (1935) and Wedel (1934, 1959, 1986). She stated that the use of diversity indices and NISP, to the exclusion of MNI, MNE, and MAU, have made it appear that bison were of no importance to the CPt subsistence. In her examination of bison remains from the Donovan (5LO204) and Albert Bell sites on the High Plains of Colorado and Kansas, respectively, she demonstrated a greater dependence on this animal; however, these sites are in the bison-rich territory west of the CPt heartland.

Some support for Scheiber's revision comes from the Windmill Creek site, another CPt house occupation a few hundred meters west of the Phil site and just below the ridge on which the White Rock site is located. A pit feature at that site yielded 134 identified bones and teeth, of which 122 are bison, 10 are deer, and 1 (mended from 2 bones) is canid. The MNI for each of these animals is one, although the edible meat yield of the bison far outweighs the others (Logan 2007). Moreover, the elements and their comminuted (fractured) condition attest to bone grease extraction, a process documented at the nearby White Rock site (Logan 1998b). Thus, at least as they are represented by this activity at these sites, both the CPt and Oneota traditions shared this aspect of bison utilization. However, be aware that if the pit that contained these remains had not been excavated, the Windmill Creek site fauna would have been limited to a single long bone diaphysis and 17 bison scapula fragments recovered from the surface. The latter very likely belonged to scapula tools, which are ubiquitous at sites of both traditions in the Lovewell area.

The Windmill Creek assemblage, derived from limited test excavations, may be the "exception that proves the rule" with regard to the contrast between CPt and Oneota faunal exploitation in the region. The Phil site assemblage still stands as evidence of animal procurement and utilization considerably less focused than that of White Rock phase hunters. A reasonable interpretation of CPt subsistence is that it was opportunistic, which explains variation in the relative representation of faunal remains at sites across the Central Plains. The focal bison economy of the Oneota tradition, practiced by its western populations, was practical because its social organization consisted of units well integrated at a higher level, one that could be more easily adapted to the demands of intensive bison procurement—similar to later protohistoric and post-contact tribes of the region, such as the Pawnee and Wichita. The CPt social organization was composed of more loose-knit communities of self-sustaining farmsteads, supported by hunting and gathering a variety of animal resources within the catchment area of each site.

CONCLUSIONS

By Brad Logan

While many house sites of the CPt have been excavated, investigation of others is necessary in order to apply the latest methods of data recovery, which make possible better understanding of both commonalities and variability with regard to their extramural composition, structural attributes, associated features, artifact assemblages, and relations among

CPt populations and those of other cultures. It is particularly important to do this when such sites are endangered by erosion, a process that had exposed 14JW48 and promised in the long term to destroy it. As a result of excavations at the site and more limited investigations at a few others, more insight has been gained about the extent of CPt occupation of White Rock Creek valley, of adaptations to its environment, and to the temporal relationship of Central Plains and Oneota traditions in this region.

Extramural Context: Surface collection beyond the Phil site house remains yielded a modest assemblage of ceramic, lithic, and bone artifacts. It was apparent that the density of this material was greater nearer the house, particularly beyond the extended entryway from which the occupants must have periodically disposed of trash. Undoubtedly some artifacts mark locations of extramural activity areas, where such tasks as animal and plant food processing, hide preparation, lithic tool manufacture and maintenance, and perhaps gardening, occurred. Unfortunately, wave action from fluctuating lake levels has obscured them. Indeed, the light, shallow scatter of artifacts well north of the house area points to water transport of some material from the sheet midden and activity areas, reducing whatever clarity activity areas once may have had. This was confirmed by test excavations, which revealed no subsurface artifacts in the northern area and a thin (<15 cm) horizon of material in the southern part of the site. The only artifact types represented beyond the house not found within the house fill are a couple of cores and tested pieces of chert. These classes point to primary reduction, an activity that appears to have occurred "outside" rather than "inside." Beyond this, little can be said about extramural activities. No cache pits were apparent, and random probes with an Oakfield coring tool in areas of high artifact concentration failed to discover any. Still, continued erosion of the site by the lake may reveal such features, which are not uncommon at CPt habitations. In this respect it is worth noting that during the 2006 investigation of the nearby Windmill Creek site, a conspicuous circular wet stain on the surface proved to be a pit feature (Logan 2007). Such anomalies may yet appear at 14JW48; thus, it is suggested that it be surveyed during times of low lake level.

Structure: With regard to the shape of CPt houses, variation is the norm. Blakeslee (1999:57-74) noted that the supposed template of a four-internal post, square shaped lodge was not followed as frequently as most assumed. He noted that such a template appears to have been followed more closely among eastern CPt groups, referring in particular to those of the Nebraska phase (and the Scott site of the Steed-Kisker phase exemplifies this pattern; Logan 2010c). Among western CPt groups, "there was no single architectural model and a good deal of variability" (Blakeslee 1999:72). The Phil site house exemplifies the square pattern, although outlined by posts not strictly linear. It compares in some respects to the both Type A and Type C houses, recognized by Blakeslee for Waconda Lake lodges, the former essentially square with four major internal supports and the latter with many wall posts, eastward-facing entryway, but no clear internal support post pattern. The internal house supports do not form a perfect square, rather a rhomboid, if indeed the post molds documented were those of roof supporting timbers. Equally possible is that the cluster of shallow posts molds a short distance southeast of the central hearth (itself a salient feature of classic CPt lodges) marked poles that held gear. Similarly, some off-line post molds along the perimeter of the block excavation may have marked structures, such as beds. Whatever the alternative, the overall configuration of the Phil site house is that of a square structure, centered on a fireplace, which was set within an arrangement of internal supports that had diameters more frequently greater than those of the perimeter posts.

The eastward-extending entryway, another feature of Blakeslee's Type C lodges at Waconda Lake, was clearly marked by a linear arrangement of post molds. Notably, if perhaps due to chance, the structure was aligned with the cardinal directions. Again, Blakeslee noted some variability in this regard, although two of his Type C structures (X103 at 14ML15 and X101 at 14ML371) resemble the 14JW48 house closely. Entryways on the Central Plains rarely point north, an invitation to cold winter winds. A southward orientation may not have been selected because strong southerly winds are common there, as noted during warm September and cold November excavations and several investigations at Lovewell Reservoir since 1989.

Several burned timbers were recovered from the house floor, a sample of which was taxonomically

identified as a variety of locally available hardwoods, including ash, slippery elm, American elm, and white oak group (i.e., bur oak). As no pattern was noted in their distribution, there was no apparent selection of certain species for peripheral or internal supports. More observable was selection of timbers with greater diameters for the latter, which is to be expected of these more load-bearing supports.

The Phil site house of wattle-and-daub construction covered an area of ~56.25 m^2 that would have accommodated as many as 11 people, based on the estimate of 5 m^2/person used by some Great Plains archeologists (e.g., Lensink 2005:142, Wedel 1979; compare Blakeslee 1989 for estimates based on number of persons per bed and bed length/length of walls). If that maximum was attained, it suggests occupancy by either a large nuclear family or an extended one. Blakeslee (1999:71) made the case for alternative scenarios in this regard, suggesting from the size range of CPt houses at Waconda that they could have been used by either nuclear or polygamous extended families.

Features: Of 52 features documented in the Phil site house, 49 were post molds; others were the central hearth, a cache pit, and a concentration of burned limestone. As the post molds were summarized above, only the others are discussed here. As Roper (2006) noted of hearths in general found within CPt houses, the hearth at 14JW48 was stone-free, consisting of a mass of ash, oxidized soil, and small amount of charcoal within a shallow basin. Flotation of the feature fill yielded small chipped stone debris (n = 348; 53 g), two retouched flakes, and a modest amount of pottery (n = 19; 29.2 g). Given that the hearth area, defined by that part of the house floor within the internal post molds, was kept fairly clean of cultural debris (see Spatial Relations below), it is not surprising that the hearth contained little cultural material.

That the hearth may have been lined at times with stones was suggested by concentrations of burned limestone in the southeastern corner and along the north-central wall of the house. Flotation of the fill associated with the former concentration, designated Feature 3, yielded few artifacts. The stones might have been cleaned from the hearth and kept in the house for future use or for later discard. The soil below the stones was not oxidized in either area, indicating that the stones were not burned where they came to rest.

Despite probes with an Oakfield coring tool at several places within the block excavation, only one cache pit was found. Blakeslee (1999:72) noted that the number of pits within CPt houses ranges "from none to ten or more." That at the Phil site was just over a meter deep, the upper 30 cm of which was the cylindrical shaft. Somewhat asymmetrical, the portion below the access shaft was essentially 1 m in diameter. The capacity of the belled pit was toward the larger end of the range for CPt pits.

The pit's floated fill yielded a variety of lithic, ceramic, and organic materials. It was difficult to determine whether these contents suggested that the pit had served its original purpose and had become a receptacle for trash. They may have entered the pit from a collapsed roof. Because the storage portion of the cache feature was below lake level, piece-plotting of artifacts that might have given insight into how the pit was filled was not possible; rather, excavation entailed bailing of the saturated fill and subsequent flotation. Recovered artifacts are a preform, biface, biface fragment, endscraper, and retouched/utilized flake. Also included is nearly the same amount of chipped stone debris as that retrieved from the hearth (n = 349), though of slightly greater mass (72.6 g). Several sherds, including five rims, also were found. Well-preserved bones represent a variety of fauna, particularly bones of rodents that were undoubtedly intrusive. The presence of daub and wood a short distance below the shaft of the pit imply that it was open when the house burned.

Assemblage Variability: The material inventory is typical for CPt houses, although it provides insight into what may yet be recognized as a community of the Lovewell locality. Lithic tools, in no way unique when compared to others of the CPt, provide the basis for comparison and contrast with those found at nearby sites of the White Rock phase, particularly with regard to raw materials represented. Like the population of the Oneota tradition that arrived at the Lovewell locality sometime after the Phil site house had been abandoned, its CPt inhabitants relied primarily on cryptocrystalline stones of both Permian and Cretaceous formations. Flint Hills cherts and Smoky Hill silicified chalk were used to great extent. Exotics are few, though

telling. Obsidian was absent, but a low incidence of tools made of chalcedony hint at relationships with western groups. Trade, perhaps down-the-line, with southern Plains groups is suggested by a similarly low frequency of tools made of Alibates agatized dolomite, a material not represented at the White Rock site.

Pottery in general is comparable in form and decorative treatment to other CPt ceramic assemblages. Notably, the frequency of thickened (including collared) rims is lower than in assemblages from other western phases (Upper Republican, Solomon River, Smoky Hill). One motif, an incised "ladder" decoration on the rim, may occur in higher frequency at Lovewell Reservoir sites than elsewhere. Several common attributes of vessels from the Phil and Windmill Creek sites point to a close relationship between families or perhaps occupation of each house by the same family but at different times. Exploration of other CPt sites in the Lovewell locality may lead to recognition of a community distinguishable from others on the basis of such ceramic attributes.

With regard to faunal remains and evidence of subsistence preferences they provide, the house at 14JW48 does not differ markedly from most other CPt sites. No animal appears in the assemblage that is not represented elsewhere; neither is their relative frequency remarkable. Most bison bones were used as tools; eliminate them and there would be little to suggest that the animal contributed significantly as a food resource. Overall the variety of animals supports interpretation of CPt hunters as opportunistic generalists.

Spatial Relations of Material Remains: Excavation of the Phil site house with a superimposed grid of 1-m^2 units, water screening of fill through 1/8-inch mesh hardware cloth, and systematic piece-plotting of artifacts of specified size ($\geq$2 cm) made it possible to plot the distribution of various cultural material classes. Control for the loss of any material below the water screen threshold was provided by flotation of systematically collected samples from each unit and all features. These data recovery methods made it possible to recognize informative patterns of household activities, material storage, and debris discard. Moreover, it is feasible to infer, albeit cautiously, whether destruction of the house occurred after it was abandoned or during a time when the inhabitants intended to continue their occupation.

Collection of spatial data pertaining to structural materials, such as daub and house supports, can aid in "taphonomic" interpretation of house destruction. At 14JW48 daub was found throughout the house fill, but there were two areas of concentration, one at the center of the house over the hearth and the other in the southwestern quadrant. The former may reflect material that formed around the smoke hole; the latter may indicate more extensive firing of house plaster in that part of the structure. This shows some variation from other CPt houses where daub in general centered on the hearth (compare Calabrese 1969:38; Logan 2010c; also see Figure 29). Undoubtedly a variety of factors affected the creation and distribution of daub in the archeological remains of CPt lodges, including the placement and relative mass of plaster in different areas during construction, the nature of the fire (e.g., point of origin, availability of fuel, and duration) that burned it, and the direction of any wind that may have aided the fire and contributed to the fall of the house (e.g., inward or outward wall collapse).

While pottery sherds were scattered throughout much of the house, areas of ceramic concentration nearer its center were apparent. These mark the locations of most of five vessels, one of which was almost completely restored. Various degrees of warping or surface discoloration indicate that these pots were affected by burning of the structure, perhaps acquiring these characteristics because they were stored near the hearth area in order to dehydrate before being fired. If this interpretation is correct, it suggests that the house was still being occupied and that its burning might have been accidental.

The distribution of lithic debris, also ubiquitous, revealed three distinct concentrations of debitage, inferred to have been drop-toss/displacement zones of hearth-centered, tool maintenance activity areas. From their locations, high frequency of tertiary flakes, absence of heavy-duty and early stage bifaces, and the number of arrow points and knives vis-à-vis scrapers, this activity primarily entailed finishing, resharpening, and rehafting smaller bifacial tools.

At least five bison scapulae were present, based on as many glenoids. Although most were

fragmented by burning that made functional identification problematic, they were likely gardening tools. From their locations it appears that they were stored beyond the hearth area, most in the north-central part of the house. Given their gendered nature, they may indicate where women of the house kept their belongings.

The overall picture presented by the distribution of these various classes of material indicates that the abandonment of the house was not planned. The presence of a few restorable jars, bison scapula tools, distinct lithic work areas with close correlation of debris drop-displacement zones and tool distributions, and a pile of hearthstones suggest the house burned before a cleaning event. Given that several of the stone tools, gardening implements, and ceramic vessels were probably still usable, possibly the house was still occupied.

Relations of the Central Plains and Oneota Traditions in the Lovewell Locality: The CPt is centered in Nebraska and northern Kansas. East of the Missouri River it is limited to the Glenwood locality of the Nebraska phase and the Kansas City locality of the Steed-Kisker phase. Roper (2006:132) suggested that its members were of Caddoan linguistic stock. Oneota is acknowledged as a Siouan-speaking tradition of the Midwest, including parts of the present states of Wisconsin, Iowa, Missouri, Minnesota, Nebraska, and Kansas. It is known from sites along the Missouri River and in the heart of the Central Plains on the Republican River and its tributaries, especially along White Rock Creek. The latter are assigned to the White Rock phase (Logan 1995, 1998a; Ritterbush 2006a; Ritterbush and Logan 2000). Few people addressed the question of relations between these two traditions, particularly with regard to White Rock, until it became apparent from radiocarbon chronology that the Oneota culture expanded in the early fourteenth century AD and that the westernmost migrants of that time may have encountered CPt groups (Logan 1995). Even with that realization, discussion of interaction focused primarily on sites along the Missouri River, such as Leary and Kullbom Village (13ML10). At the former it is not clear whether the CPt and Oneota components were contemporaneous (Ritterbush 2002, 2006a:152-158); at the latter Oneota traces consist of less than a dozen sherds (Billeck 1993; Ritterbush 2006a:163). Given accumulating evidence of occupation of the Lovewell locality by a CPt community during the thirteenth century, that question is of greater concern and particularly germane to the White Rock phase.

Prior to discovery of the Phil and Windmill Creek sites and the mortuary component of the nearby Eckles site, evidence of the CPt at Lovewell Reservoir was limited to the Johns Creek site, a small habitation (Logan 2006), and two mortuary sites, Begin Ossuary (Thies 1982) and Russell Mound (Neuman 1963). Other evidence came from Bud Hill (14JW301) on Middle Buffalo Creek, a tributary through Buffalo Creek of the Republican River, 19.75 km south-southwest of 14JW48. The remains of two houses there were excavated by the Kansas Historical Society in 1964 and 1965. In spring 2007 Ritterbush (personal communication) and students in her archeology laboratory methods class at Kansas State University undertook preliminary analyses of the Bud Hill assemblage. As a contribution to that effort, the author obtained an AMS radiocarbon date on a sample of maize from a concentration of charred kernels from House 2 (F215). That assay of 705±30 rcybp (d13C -9.79; OS-59504) calibrated to a two sigma range of AD 1259-1307, 1362-1386. Of the two probabilities, 85 percent falls within the earlier range, indicating thirteenth-century occupation, perhaps contemporary with those at Phil, Windmill Creek, and Bergstrom sites. Indeed, five assays (four of which were obtained with the AMS method) from these CPt sites are statistically the same (pooled mean age = 735.7±20.3; test statistic $T = 4.5$; X^2 [.05] = 9.5) and provide a two sigma calibrated range of AD 1270-1292, reinforcing the inference of CPt occupation of the Lovewell Reservoir area during the latter half of the thirteenth century (Logan 2010b:285). [Note: This discounts a previous date from Bud Hill obtained from the now discredited Gakushuin Laboratory (Steinacher 1976; Witty 1965.)]

Prior to investigation of 14JW48, no CPt site at Lovewell Reservoir had yielded substantial evidence of long-term occupation, although the presence of interment areas of the dead hinted at such. It now appears likely that the mortuary sites were used by occupants of the houses at Phil, Windmill Creek, and Bergstrom sites and perhaps of lodge sites not yet recorded. (Given that Phil and Windmill Creek sites were once in buried soils since exposed by wave

erosion, survey along White Rock Creek may discover others.) As noted, radiocarbon dating of these lodges to the thirteenth century indicates occupation shortly before Oneota immigration around AD 1300 (Logan 2010b). Indeed, their temporal propinquity demands further refinement of the radiocarbon chronology for both traditions at Lovewell Reservoir in order to better determine whether that factor would support any contact hypothesis.

At present only slight evidence of interaction exists. It is certainly peculiar that, despite the proximity of Phil and Windmill Creek sites to the White Rock site, no artifacts diagnostic of one tradition have been found at the site of the other. Pottery perhaps is the best indicator of trade or intermarriage. Yet both Phil and Windmill Creek site ceramic assemblages consist entirely of CPt wares. Similarly, no sherds of CPt pottery have been documented in ceramic assemblages from the White Rock or Warne sites. Since 2010, however, investigations at Bergstrom and Montana Creek East sites have revealed possible evidence of interaction in the form of associated pottery diagnostic of these traditions (Logan 2010a, 2010b; 2011). More work is needed at these and other such sites in order to document the context of any putative association. Pending that research, it is difficult to imagine neighboring groups would have ignored each other. It is equally hard to believe that they would not have engaged in some form of exchange that might be evident in the archeological record. Thus, it can be hypothesized that Oneota immigration happened a short time after CPt abandonment of the locality or that it might have prompted it. If the former is true, further investigation must determine what factors brought about the departure of people who had successfully adapted to the valley long enough to build and occupy substantial houses and bury their dead. The latter implies that the temporal juxtaposition of the two cultures at Lovewell Reservoir was more than coincidental and that Oneota immigration was a causal factor in CPt abandonment of the locality. If correct, then the relationship between people of these traditions apparently was not amicable and might reflect substantial differences in lifeways, the lack of any perceived need for exchange to cement relations, and competition for resources.

The social organization of White Rock Oneota probably differed significantly from that of the CPt. Evidence of this can be seen in the greater reliance on bison of the former. In order to kill bison in numbers, greater than the occasional one dispatched by CPt hunters, the Oneota at Lovewell Reservoir probably cooperated in groups beyond the household level. The greater spatial extent of the White Rock and Warne sites and their more numerous pit features and hearths point to social units of greater size than those of the few CPt households at Lovewell. Given Benn's (1989) interpretation of the Oneota as aggressive people, who co-opted members of other cultures as a source of labor, it can be hypothesized that their entrada to the Republican River area entailed the capture of CPt peoples or in some way stimulated their relocation. This idea, which the author (Logan 1998a, 2010b) presented before knowing about the CPt occupations at the Phil, Windmill Creek, and Bergstrom sites, is now more plausible. It is hoped that continued research in the Lovewell locality and other areas of the Central Plains will shed more light on this important development.

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BOOK REVIEWS

The Simon Clovis Cache: One of the Oldest Archaeological Sites in Idaho. STEVE W. KOHNTOPP. Center for the Study of the First Americans, Department of Anthropology, Texas A&M University, College Station, 2010. 71 pp., 45 figures (2/3 in color), appendices, glossary, references cited/notes. $27.50 (paper). ISBN 978-0-9786137-4-7. *Reviewed by* Jim D. Feagins, St. Joseph Museum.

The well-known Simon Cache site, often cited in Paleoindian studies, is not as "well known" in print as this reviewer thought. As is often said, "the devil is in the details," and many particulars about this cache had never been made available to the public before. Despite the cache's fame, most publications that discussed it were summaries (often as a part of broader studies) or focused principally on certain attributes of the cache site and/or its artifacts. The most intensive study was an unpublished Master's thesis (Santarone 2007). The present volume helps to fill a gap for the public. *The Simon Clovis Cache: One of the Oldest Archaeological Sites in Idaho* presents much information about this important site, but, as one might expect, a number of questions still remain.

The cache was exposed in 1961 by Bill Simon, Jr., while pulling a hydraulic land leveler. As the power equipment shaped a new irrigation ditch on the family farm, it also scraped away and scattered the upper portion of a cache of large bifaces, Clovis points, and other stone tools. B. Robert Butler from the Idaho State University Museum was eventually contacted, and the initial professional archeological investigations began at the site the following year.

The Simon Cache find spot is located in the Camas Creek Basin, a flat intermountain valley in south-central Idaho. No geological markers are present on this broad and relatively featureless prairie. Approximately 40 miles long and 8 miles wide, the valley is mostly surrounded by the Mount Bennet Hills to the south and a portion of the Sawtooth Mountain chain on the north. For many centuries the Camas Creek Basin served as an important trade route for native people, and during historic times it was an important location for the harvest of a dietary staple: camas roots.

Bill Simon inadvertently exposed one of the oldest lithic caches in North America. The cache contains no osteological materials or charcoal, and it has never been precisely dated. The estimated age is within 11,000 to 12,000 radiocarbon years before present (rcybp), based on similar Clovis sites dated elsewhere.

One of the advantages of studying lithic caches, such as the Simon Cache, is the opportunity to examine a variety of items in Clovis tool kits. Kill sites contain a very limited range of tools: those used for the kill and the initial processing of the meat. While camp sites yield a broader selection, the implements generally are worn out and discarded or were broken during earlier stages of manufacture. Almost all the artifacts in the majority of Clovis lithic caches still have significant use-life, i.e., "high remnant utility." They often represent stages of manufacture and range of tool types that are rarely found on camp and kill sites (Kilby 2008).

The collection was obtained in a piecemeal manner because the artifacts were scattered by the land leveler and several researchers carried out excavations and surface inspections over the years, resulting in discrepancies among investigators as to the actual number of artifacts in the cache. Another area of confusion has to do with a very large (29 x 21 x 2 cm) bifacially worked flake tool that was broken prehistorically; its several large fragments were used as individual tools for various purposes prior to caching. While the pieces can be refitted, are they to be considered as several different tools or a single artifact? Approximately 60 items are thought to come from the Simon Cache (p. 24), including a red ocher nodule, 5 retouched flake tools, 45 bifacially shaped artifacts, and 9 pieces of lithic debitage.

Many of the Simon Cache bifaces are oversized, as often occurs in caches. The bifaces represent many stages of lithic reduction and greatly contribute to an understanding of the manufacturing sequences for various Clovis tools, including projectile points. The Clovis points from this cache, as well as the other bifaces, are nicely made from good materials. The fluting, edge grinding, and other attributes compare favorably with Clovis points from other caches.

The lithic material present in the Simon Cache came from at least 14 different geological sources; however, the sources for 46 percent of the artifacts are unidentified. The cache contains four exotic quartz crystal bifaces, and the sources of the quartz are not known. Most of the identified stone originated in Wyoming and Idaho. One artifact appears to be Alibates (jasper-like) silicified dolomite all the way from the Texas panhandle. As with Clovis people in general, the individuals who deposited the Simon Cache traveled great distances, even if they personally did not visit every procurement area. In fact, the average distance to the known lithic sources is greater than for any other known Clovis cache. Amazingly, this average distance (682.5 km) exceeds the length of the state of Kansas.

When first found, many of the Simon Cache bifaces were said to have been covered in red ocher. The Simon family washed the artifacts to remove the soft pigment; that way, when shown at school, children would not get red powder all over their hands. It is not uncommon for Clovis biface caches to contain an abundance of red ocher. While its purpose is not known, perhaps it served a ceremonial function.

Portions of the collection currently are stored in two, possibly three, institutions (p. 10). The majority of the collection is on display at the Herrett Center for Arts and Sciences at the College of Southern Idaho in Twin Falls.

Kohntopp discusses various lithic cache types and compares them to the Simon Cache. He correctly suggests that the site itself and the collection merit additional studies. High magnification use-wear analyses could determine how some of the cache tools functioned prior to caching and might shed light on the purpose of the cache itself. As new Clovis caches are found and more are investigated in detail, a greater understanding of the various cache types may be gained.

The line drawings and the artifact photographs in general are well done in this small (5 x 9-inch) slick paper volume. However, almost all of the images within the text are much too small to be viewed to their best advantage. Even those illustrations in the appendix, while adequate in size, could be better studied if larger and cross-referenced with the text.

In this reviewer's opinion the volume could have been greatly improved in three ways: publishing in a larger format; incorporating additional metric data on the fluted projectile points, perhaps as tables in the appendix; and adding an index. While the organization is a little strained in places, it is definitely worth the read. There are a few errors. For example, Figure 25 is not (as stated) the reverse view of the artifact shown in Figure 24, and Alibates "chert" is actually a silicified dolomite.

While primarily written for the general public and archeological layperson, professional archeologists will find the volume useful. The reference/note section is helpful, and the fine glossary should prove beneficial for neophyte readers. *The Simon Clovis Cache: One of the Oldest Archaeological Sites in Idaho* is recommended to anyone interested in Paleoindians, lithic caches, or Clovis lithic technology and to those who simply appreciate viewing beautiful prehistoric craftsmanship. Over the years this reviewer often has seen the Simon Cache cited and discussed in the Clovis literature. It is gratifying to read about this important cache in significantly more detail and know that more information is readily available to the public at long last.

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The Simon Clovis Cache: History, Technology, Habits and Expert Artisans. Unpublished Master's thesis, Department of Anthropology, Idaho State University, Pocatello.

Across Atlantic Ice: The Origins of America's Clovis Culture. DENNIS J. STANFORD AND BRUCE A. BRADLEY, foreword by MICHAEL B. COLLINS. University of California Press, Berkeley, 2012. xvi+319 pp., 80 illustrations, 6 tables, references, index. ISBN-978-0-520-22783-5. $34.95 (hardcover). *Reviewed by* Donna C. Roper, Kansas State University.

On February 29, 2012, the *Washington Post* and other news media broke a story about a radical and controversial hypothesis for the origins of the Paleoindian-age Clovis culture of North America. Developed by Smithsonian Institution archeologist Dennis Stanford and his collaborator Bruce Bradley of the University of Exeter in England, this proposition is generally known as the Solutrean Hypothesis. It holds that Clovis culture, the earliest widely accepted cultural tradition in North America, dating to around 11,300-10,900 radiocarbon years ago (around 13,500–13,000 calendar years ago), derived not from the culture of people who had crossed the Bering Land Bridge, exposed when the last glacial event lowered sea levels and left dry land connecting and also surrounding modern Siberia and Alaska (a large province generally called Beringia), but from people of the southwest European Upper Paleolithic Solutrean culture who had crossed Atlantic Ocean ice to reach North America. The news release was timed to coincide with the publication of the book under review here, which is a full account of the background to and statement of this controversial hypothesis.

The Solutrean Hypothesis is not new, and this book is not the first statement about it. Stanford and Bradley have been developing the idea since sometime in the 1990s. They have discussed it at meetings and undoubtedly also informally. Probably speaking to the controversial nature of the hypothesis, two critiques were published when it was in the fairly early stages of development (Sellet 1998; Straus 2000), even though its essence, and certainly not its details, had yet to be published in the peer-reviewed literature (or, for that matter, in the non-peer-reviewed literature). Until this book, which was peer-reviewed, as would be expected of a university press publication, appeared, Stanford and Bradley's only previously published statement was a 20-page summary (their word for it) in a 2004 thematic issue of *World Archaeology* devoted to "Debates in Archaeology" (Bradley and Stanford 2004). As befits a true debate, the article soon elicited a joint response from three archeologists: one each an expert in Solutrean archeology (Lawrence Guy Straus), North American Paleoindian archeology (David Meltzer), and the archeology of Beringia (Ted Goebel) (Straus et al. 2005). Bradley and Stanford (2006) replied to that with what was more a rebuttal of the points Straus et al. made than an exposition of further detail regarding the hypothesis. All of this, particularly the published critiques of the hypothesis before its authors had published it, is a rather unconventional publishing trajectory and alone is sufficient reason to welcome this book. Publication will not settle the controversy but simply acquaint more people with it and ramp up the debate. This, of course, is not a bad thing.

The timing and route of the first peopling of the Americas has been a topic of research, debate, speculation, and sometimes fantasy for many years and arguably even for centuries, as the idea that people arrived in this hemisphere by crossing Beringia was first proposed in the year 1590. Once the antiquity of Clovis culture was recognized, the question of its origins also became an important research topic. A number of conclusions have become apparent as research on these two topics has proceeded in recent decades and has raised issues that must be considered: 1) Fluted points are very rare in Siberia and only somewhat better represented in Alaska. In the few instances in which they have been found in context, associated radiocarbon dates indicate that they are younger than Clovis. Thus, it is apparent that Clovis was not brought to North America by migrants from Siberia, but rather developed on this continent from an as-yet unidentified antecedent. 2) Paleolithic/Paleoindian-age complexes in Siberia and Alaska, equivalent in age to or older than Clovis, do share with each other notable similarities in tool form and manufacturing technology, but Clovis does not share those similarities. It thus appears that Clovis did not derive from this Beringian tool tradition. 3) Clovis remains, or fluted points, are most abundant in the Southeastern part of the United States and decrease in density to the west and to the north into western Canada (eastern Canada was still ice-covered in Clovis times). The implication is that Clovis was earlier in the Southeast

than elsewhere on the continent. The radiocarbon evidence is somewhat ambiguous but at least is not contradictory, and it may even provide some weak support (e.g., Roper and Wygal 2002). 4) A clear conclusion, which should be non-controversial, is that new thinking and alternative hypotheses are required to account for Clovis origins. Stanford and Bradley's Solutrean Hypothesis is only one of a number of alternatives proposed in recent years but probably the most controversial of the lot, likely because the rest adhere to some version of an entry from the west.

As with any hypothesis worth considering, the Solutrean Hypothesis derives from and seeks to accommodate additional observations and conclusions. These conclusions are drawn by the originators of the hypothesis and may not be agreed upon by all (or even by very many). That is the source of controversy in this case. Observations that Stanford and Bradley make and conclusions that they draw pertinent to the Solutrean Hypothesis may be stated as follows—these will be in addition to the conclusions summarized above, since those are equally pertinent: 5) Clovis appears to exhibit numerous technological similarities to the Upper Paleolithic Solutrean culture of southwest France/northern Spain. These similarities include morphological resemblances of certain tool forms, both chipped stone and bone, and similarities in stone tool manufacturing technology. In many ways, as becomes apparent throughout the book, this is the crux of the Solutrean Hypothesis. Stanford and Bradley suggest that the similarities are too great to not have resulted from relatedness of the two cultures. However, Lawrence Guy Straus, one of their critics, considers the similarities to be few and superficial and suggests that "there are vast differences between the Solutrean and Clovis technologies" (Straus 2000:221). This is a pretty bald statement, though, and now that we have Stanford and Bradley's detailed account of how they see the similarities, it will be interesting to hear the responses to it.

Leaving that aside for now, an incontestable observation is that 6) Solutrean dates to ca. 25,000–16,500 radiocarbon years ago and is older than Clovis. Obviously whatever culture is antecedent to Clovis needs to be older than Clovis or at least be recognizable beginning from an earlier date. The problem here is that the gap between the latest Solutrean date and the earliest Clovis dates spans a rather formidable 5,000 years. This is one of the first things that critics of the Solutrean Hypothesis have pointed out (Straus 2000:220; Straus et al. 2005:508), as well they might. Stanford and Bradley, however, do not find this to be a problem, because 7) they view various pre-Clovis sites in eastern North America (right where they should be if Clovis really is earliest in the east) both as being coherent as a valid early cultural complex and as sharing certain traits with Solutrean and Clovis. Stanford and Bradley argue that some diagnostic artifact forms are similar to Solutrean forms, and they find the lithic manufacturing technology to be shared with Solutrean and Clovis. Importantly, dates for these sites fall between those for Solutrean and Clovis.

A requirement that must be met for the Solutrean Hypothesis to have any validity is to show that it actually is feasible for people of Solutrean culture to have made it to the east coast of North America at a time when large parts of northern Europe and North America were covered by ice. In fact, this is the time when glaciers were at a maximum—for this, the interval has received the proper designation of Late Glacial Maximum (LGM)—so such a trip would have required crossing ice, not land. Boats were necessary, as was the ability of people to obtain food and water during the passage along the corridor from southwest Europe to North America. Lack of evidence for boats is another of the expressed criticisms of the Solutrean Hypothesis, as well as for several hypotheses for the peopling of North America that involve the Beringia route and water in some way. However, Stanford and Bradley, among others, in this regard would subscribe to the often-repeated (but true) phase "absence of evidence is not necessarily evidence of absence." Indeed, as they and others point out, landmasses such as Australia were colonized by humans even earlier and, because Australia was never connected to Asia by a land bridge, boats would have been essential for reaching that continent. Humanity did have that technological capability by LGM time. The boats debate undoubtedly will continue for many years in many contexts.

The matter of sustenance for people crossing the ice is something else. Thus, a further pertinent observation and conclusion is that 8) Solutrean is

known mostly from rockshelter and cave sites near the Atlantic coast. This landmass is fronted by a substantial continental shelf that could hold submerged sites, which may have functioned differently from the inland sites. Stanford and Bradley thus consider the possibility that Solutrean people might have made greater use of maritime resources than currently is recognized, and they cite ethnographic evidence of Arctic hunters surviving for months on the ice using resources of the sea to demonstrate the feasibility of maritime-adapted Solutrean hunters surviving an Atlantic crossing along the ice. One published response, however, used paleooceanographic data to suggest that the suitability of the proposed migration corridor is questionable (Westley and Dix 2008). This debate, too, likely will continue.

To this point this review has dealt more with the Solutrean Hypothesis than with the specific book ostensibly under review. But then, as noted, the hypothesis has been over a decade in development, and much thought and effort has been put into that development. Considerable debate already has taken place, and the book simply had to be placed in this context. Turning to the book now, it is organized into two parts, each with five chapters. Part 1, "Paleolithic Peoples," reviews the background to the development of the hypothesis. Chapter 1 is, in effect, a primer on flintknapping techniques and terminology, at least those techniques and terms pertinent in this case, and is necessary background for understanding the arguments about technology that are so central to the Solutrean Hypothesis. Chapter 2 is a review of Clovis culture, including details of its lithic manufacturing technology, and Chapter 3 discusses the archeology of Beringia, once again with a strong emphasis on lithic technology. Chapter 4 reviews eastern, predominantly mid-Atlantic coast, pre-Clovis sites and components that Stanford and Bradley see as antecedent to Clovis. These include the lowest cultural stratum at Meadowcroft Shelter in western Pennsylvania and the Cactus Hill site in Virginia, as well as some lesser known sites. Among these is a site known as Cinmar that is submerged on the continental shelf off Virginia. From it, a fishing vessel named the *Cinmar* once netted, along with its expected load, a large leaf-shaped biface (illustrated at approximately actual size on the front of the book's dust jacket) and a fragment of mastodon bone dated to around 21,000 radiocarbon years ago. This specific biface form is not known in any cultural complex identified in North America but strongly resembles leaf-shaped bifaces that are a diagnostic Solutrean form. The Cinmar biface is not the only example known either, for several additional specimens have been found in the Chesapeake Bay region. Dates for all these sites, when available, are earlier than Clovis and, basing the argument largely on details of lithic technology, Stanford and Bradley see them as part of the same technological tradition as Clovis and as ancestral to the distinct Clovis technology they identified in Chapter 2. Importantly, Stanford and Bradley also see the technology of Meadowcroft, Cinmar, and the other sites as part of the same technological tradition as Solutrean culture.

Each chapter of Part 1 is a very solid and useful review of its topic. The text is extensively referenced and readily directs the reader to sources of additional information about Clovis culture, pre-Clovis culture, etc. One does not have to be particularly interested in the Solutrean Hypothesis, or at least have any particular opinions about it, to find this part of the book a very useful and up-to-date source. Further, it is not particularly controversial except possibly for some of the material in Chapter 4, as many people still do not accept the lowest stratum of Meadowcroft, the Cactus Hill site, and some of the other sites as representative of a single cultural complex (the Miller complex) that pre-dates Clovis or even as valid pre-Clovis sites. And certainly the biface find at the Cinmar site and elsewhere nearby have only recently been revealed and, judging from listserve discussions (to which this reviewer has made a contribution or two), few know what to think about them and actively debate alternative explanations for them. Stanford and Bradley brought casts of these bifaces to the 2012 SAA meeting in Memphis and were willing to discuss them with all comers. Displays in Riker mounts are nice, and it is exciting to handle and examine a cast of the specimen, but it does not resolve the question of what they represent. Here is yet another discussion that will continue.

Part 2 of the book, "The Solutrean Hypothesis," is the detailed development of the hypothesis, including quantitative and qualitative culture comparisons among Clovis, pre-Clovis, Solutrean, and

Beringian cultures. The quantitative comparisons take the form of cluster analyses of first tool assemblages and then technology. Cluster analysis works by scoring, in this case as present or absent, each case, be it Clovis, Late Solutrean, pre-Clovis, or some of the Beringian complexes, on a series of variables, calculating similarities among each case compared with each other case, and linking first the most similar, then the next most similar, and so forth to form groups. In these analyses Clovis groups with pre-Clovis and Solutrean and not with Beringian materials, particularly on the comparison involving technology. Unfortunately, though, the analysis is not described in detail. Perhaps the level of description is appropriate for this particular book, but reference to a publication, preferably peer-reviewed, providing the full details of the analysis is expected but lacking. Nor does a Google search for such a reference return a listing for one, leaving the distinct impression that this analysis has not been published in detail. As one who knows something about cluster analysis and has performed many of varying kinds, it is apparent from looking at what is presented here that the analysis has several problems. Until the analysis is published in full, it cannot be accepted.

The qualitative comparison is more convincing. Bruce Bradley is one of the elite flintknappers in the world at this time and has amply demonstrated his ability to use his expert understanding of knapping to analyze the technology represented in stone tool assemblages. The detailed material presented here and that scattered through earlier chapters draws on this expertise and experience to make a case for similarity of Clovis, pre-Clovis, and Solutrean technology. His conclusions merit serious consideration. The question, though, will turn on whether or not the similarities are so overwhelming (as Straus, quoted earlier, would suggest they are not) and so nearly exclusive to Clovis, pre-Clovis, and Solutrean as to suggest the conclusion that Clovis and Solutrean share an ancestor-descendant relation via the pre-Clovis complexes described earlier.

The book then continues with two chapters that first review Solutrean adaptations to the environment of coastal southwest France and Spain during the last glaciation when Solutrean flourished and second discuss the LGM climate. The final chapter puts this together to present an argument as to how people might live on Atlantic ice and make their way to the North American continent—in other words, how Solutrean culture was ancestral to the pre-Clovis cultures of the east and, through them, to Clovis. While much factual information is presented, these also are chapters of "coulds," and "would bes." Unfortunately, many things that could have happened in times past never did happen. It will take much research in the coming years to determine if some of the "could have happeneds" really did occur.

Perhaps a bottom line here is that *Across Atlantic Ice* is a well-written and informative book about a controversial subject. The real issue, therefore, is not how well the book is written, but whether the Solutrean Hypothesis is valid. At this point in time, that just is not clear. Although the questions of the first peopling of the Americas and the origins of Clovis have been bound up together for decades, they are not necessarily the same question. A very recent review of multiple lines of evidence suggests at least two waves of migration from the Old World (Pitblado 2011). From this, it definitely is possible that the first people in North America did come via Beringia but that Clovis is not descended from them. It also is possible, for the sake of argument, that bearers of a Solutrean culture did enter North America across the Atlantic and that their immediate descendants developed a distinctive technology, which subsequently was adopted by unrelated descendants of migrants who came earlier and/or from different directions. Genetic evidence reported as recently as July 2012 suggests at least three waves of migration from the Old World to North America (Gibbons 2012), although it specifies neither the time nor the source of the various migrations. The point is that many alternatives to the no-longer-tenable Clovis-coming-across-Beringia scenario can be conceived. Many are some of those "could have but did not happen" scenarios. All in all, though, Stanford and Bradley are correct when they assert that new thinking is needed. There now seems to be little question that people were in North America before Clovis. But good evidence is scarce, and for that matter much of the Clovis material is from contexts that are not overly secure; few Clovis sites have been excavated in detail. The Solutrean Hypothesis should remain on the table for discussion. It is the kind of hypothesis that should engender

considerable research, if only, in some peoples' minds, to show that it is wrong. Meanwhile, neither it nor any other hypothesis should be unequivocally accepted—that seems unlikely to happen any time soon anyway. It is likely, however, that in the years and decades to come, the story will be revealed as much more complex than anyone currently thinks.

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ABOUT THE AUTHORS

Tobias Blake

[redacted]

After graduating from Kansas State University with a BA in anthropology and history, Tobias earned his Master of Theological Studies from the University of Notre Dame. Currently he is the assistant director of educational programs for Multicultural Student Programs and Services at the University of Notre Dame, where he designs programs that explore the intersections of race, culture, and higher education.

John R. Bozell

[redacted]

Bozell is an archeologist with the Nebraska State Historical Society, currently managing the Nebraska Highway Archeology Program. He received BA (1979) and MA (1981) degrees in anthropology from the University of Nebraska-Lincoln and has been actively involved in archeological research and cultural resource management in Nebraska and surrounding states for more than 30 years. His professional and research interests have focused on the central and northern Great Plains and include: late pre-contact and post-contact Native American archeology, subsistence and environmental change, fur trade archeology, repatriation, and tribal consultation. He has authored numerous technical reports, journal articles, and book chapters on these subjects.

Carl R. Falk

[redacted]

Formerly with the National Park Service's Midwest Archeological Center and the Department of Anthropology, University of Nebraska-Lincoln, Carl is a co-founder of the PaleoCultural Research Group (Broomfield, Colorado). He has more than 48 years of professional experience with primary interest in the Great Plains and specialization in the archeology and zooarcheology of village horticulturalists living within the Middle Missouri and Central Plains subareas. He has authored/co-author numerous technical reports, published articles, and contributed papers presented at regional, national and international conferences.

Jim D. Feagins

[redacted]

Jim Feagins is a private archeological consultant who also serves as part of the adjunct archeological staff for the St. Joseph Museum and is senior archeologist for Environmental Advisors and Engineers, Inc. He received a BS degree from Pittsburg State University and a MNS degree from the University of Oklahoma. After 30 years as a science instructor for Consolidated School District No. 4, Grandview, Missouri, he retired in 1995.

Active in promoting archeological education, he is president emeritus of the Missouri Archaeological Society. He also served as president of the Kansas City Archaeological Society and as a vice-president of the Missouri Association of Professional Archaeologists and the Kansas Anthropological Association. He is a life member of the KAA.

Daniel J. Keating

[redacted]

Daniel earned both his MA with honors in anthropology and a JD at the University of Kansas (2012). His seven years of archeological experience includes work throughout the Midwest and even some Iron Age excavations in Israel. Supported by the Odyssey Archaeological Research Fund, Daniel's master's research looked at the late quaternary geoarchaeology of north-central Kansas along White Rock Creek. While in law school, Daniel was a research assistant for the Wheat Law Library and an articles editor for the *Kansas Journal of Law and Public Policy*. He is admitted to the Kansas Bar and currently works for Kansas Legal Services. When not working, Daniel enjoys helping coach youth baseball teams.

Brad Logan

[redacted]

Brad earned his MA in anthropology at the University of Nevada, Reno (1977) and his PhD at the University of Kansas (1985). He has 37 years of archeological experience with work in the Great Plains, Rocky Mountains, Great Basin, southern France, and lower Austria. Until 2003 Brad was Senior Curator and Director of the Office of Archaeological Research at the Museum of Anthropology at KU. Since 1998 he has been Research Associate Professor at KSU where his recent research has focused on prehistoric, ceramic-age cultures of the central Plains. A native of Clay Center, Kansas, he is a life member of the KAA.

Lauren W. Ritterbush

[redacted]

Lauren is Associate Professor of archeology at Kansas State University and life member of the KAA. Her expertise lies in Great Plains archeology and ethnohistory with special interest in the Central and Northern Plains. She is especially intrigued by issues related to migration of peoples into the Plains, what factors stimulated those movements, the impacts on native populations already in the Plains, and how migration can be interpreted through the archeological record. These interests have led Lauren to archeological study of late prehistoric Oneota and Central Plains tradition populations in Kansas, Nebraska, and regions to the east; ethnohistoric research of native peoples in the northeastern Plains during the fur trade era; and new research into the movement of the Kansa Indians into their namesake state around the time of initial contact with Europeans.

Donna C. Roper

[redacted]

Donna C. Roper, the details of whose background is listed in several previous issues of *The Kansas Anthropologist*, currently is involved in too many projects to list them all. Her main interests are with the late prehistoric cultures of the Central Plains, and many of the publications she produces are concerned with some topic related to that period. However, one of the projects on the list not given requires her to take a spatially and temporally broader view of Plains archeology, so the *Across Atlantic Ice* book she reviews here fits well with that project. Besides, the idea of the Solutrean Hypothesis was far too intriguing to pass on looking at carefully.

Joyce Thierer
[redacted]

Joyce Thierer is associate professor of history at Emporia State University, where she teaches Kansas History, Themes in American Indian History, Country Folk and the Land (an agricultural history class), Westering or Westward Expansion, Women of the Old West, Santa Fe Trail, Introduction to Public History, and a historical performance course, among others. Thierer has a BS in history from Kansas State University, MLS and MA in history from Emporia State University, and PhD in American history with emphasis on agricultural history, women's diverse roles, and the West from K-State.

In fourth grade Thierer declared that she was going to be an archeologist but was told that girls could not be archeologists. However, during her undergraduate work she enjoyed archeology classes at K-State with Dr. Patricia O'Brien. She has carried her passion for archeology into her history classrooms, as well as her work with Ride into History, a historical performance touring troupe that has been juried into the Kansas Humanities Council, Kansas Arts Council, and Arts Midwest. For Ride she portrays an earthlodge woman, Grower, who reacts to the information that her people's land has been sold to someone named Jefferson in a place called Washington. Surrounded by the tools she has made and by trade goods, Grower reflects on generations of changes as her people have interacted with Spaniards, French, and Americans. Thierer lives in a rural setting with five horses, two dogs, and Ann Birney, the other partner in Ride into History. All are willing partners in doing the tasks that she described in her article.

Sarah Trabert
[redacted]

Sarah is a PhD candidate at the University of Iowa. She received her BA from Kansas State University and her MA from the University of Iowa. Her research interests include prehistoric and protohistoric ceramics, foodways, identity, hybridization and creolization, and the effects that European colonialism had on Native American groups living on the Great Plains. Her PhD research focuses on the Dismal River aspect, analyzing ceramics from Kansas, Nebraska, Colorado, and Wyoming to examine whether this group of people felt the down-the-line effects of the Spanish colonization of the U.S. Southwest.

Thomas G. Wyatt
[redacted]

Tom completed business courses at Mercer County Community College and attended Kansas State University. He is an avid American Indian artifact collector and has exhibited his collection and won awards at artifact shows in nine states, including Kansas, Missouri, Illinois, Oklahoma, Kentucky, Texas, Indiana, New Mexico, and Colorado. He has contributed several articles concerning Kansas anthropology and archeology to the *Central States Archaeological Journal* from Ohio, the *Indian Artifact Magazine* from Pennsylvania, and the Kansas Archaeological Society publication. He also published in issues 9 (1996) and 10 (2000) of *Who's Who in Indian Relics*. Tom is a member of the Kansas Historical Society, founder and past president of the Kansas Archaeological Society, and a member of the Central States Archaeological Society, Illinois Archaeological Society, and the KAA.

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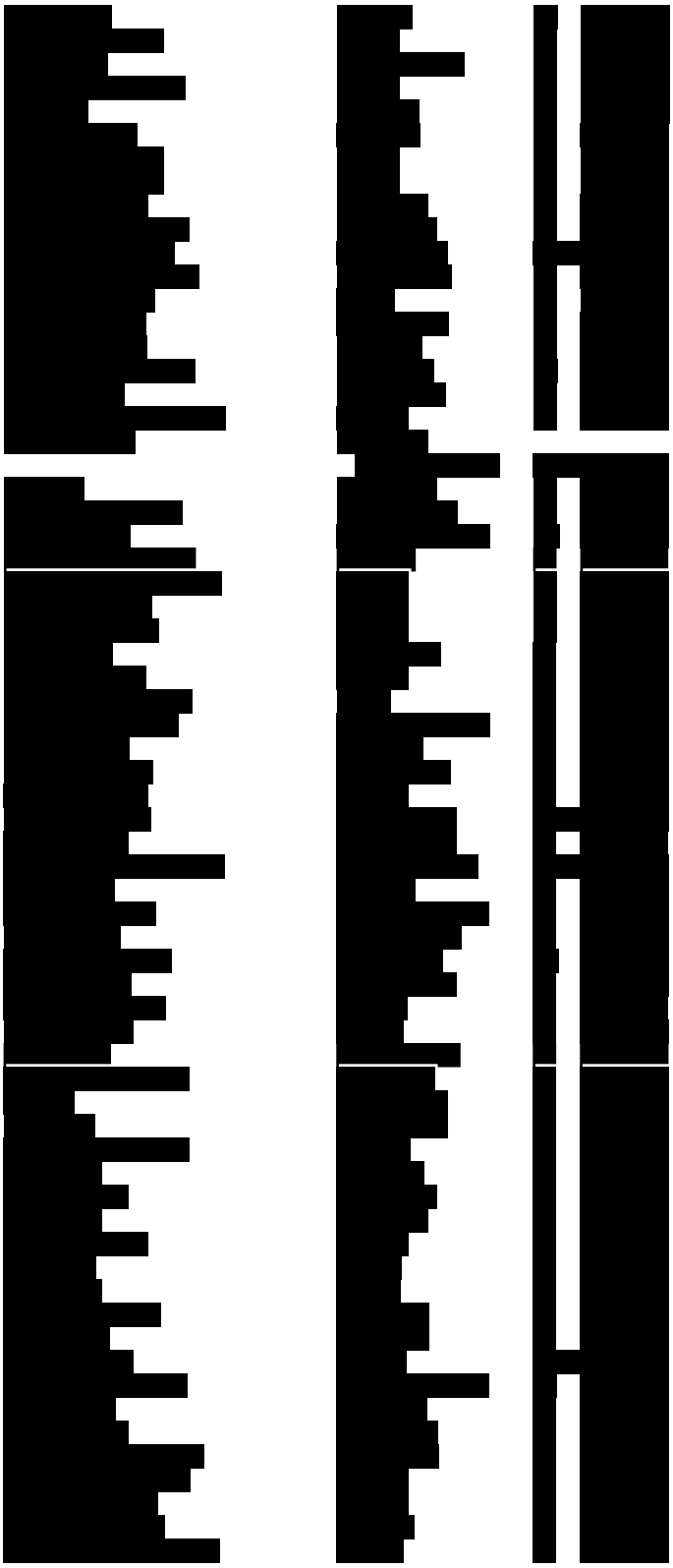

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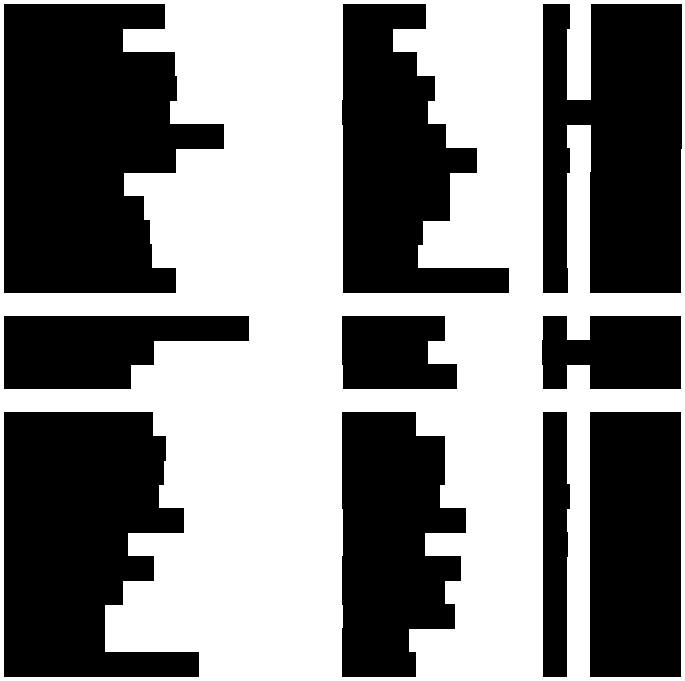

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The varied readership of the journal should be kept in mind when preparing papers. **Jargon should be avoided**. The style authority is *American Antiquity* (see Volume 57, Number 4, 1992). Professionals are expected to submit their manuscripts in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

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Virginia A. Wulfkuhle, Editor
Archeology Office, Cultural Resources Division
Kansas Historical Society
6425 Southwest 6th Avenue
Topeka, Kansas 66615-1099

Telephone (785) 272-8681 Ext 266; Fax (785) 272-8682; E-mail vwulfkuhle@kshs.org

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