2010

UTAH ARCHAEOLOGY

Utah's Journal of Archaeological Research

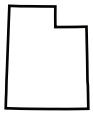
No. 1

23

2010

UTAH ARCHAEOLOGY

Volume 23, No. 1



2010

UTAH ARCHAEOLOGY

Volume 23, No. 1

A publication of the

Utah Statewide Archaeological Society
Utah Professional Archaeological Council
Utah Division of State History

Cover: Drawing of the "Virgin Mary medallion found at Solider Park". Original photograph from *Detecting the Ghost Road of the Uintas: The Carter Military Road* by Byron Loosle. See page 12 this volume. Drawing by Scott M. Ure.

Utah Archaeology is an annual publication of USAS, UPAC, and the Utah Division of State History. The journal focuses on prehistoric and historic archaeological research relevant to Utah. It is provided as a benefit for individual membership in either USAS or UPAC. Membership information for UPAC is found at www.upaconline.org/membership.htm and USAS at www.utaharchaeology.org/membership.html. Journal submissions, questions, comments, or information requests can be sent to the editors at the following address:

Utah Archaeology Editor
256 ALLN-BYU
Provo, Utah 84602

E-mail: utaharch@gmail.com

Printed and bound at the University Press Building, Brigham Young University, Provo, Utah.
United States of America.

ISSN 1040-6549

♾ The paper for this publication meets the requirements of ANSI/NISO Z39.48-1992 (Permanence of Paper).

2010

UTAH ARCHAEOLOGY

Volume 23, No. 1

Message from the Editors

As one ponders the depth and breadth of archaeology in the Intermountain West, it is hard not to be amazed at the vast history we share. An integral part of this account is the recent past, a record of native peoples, explorers, pioneers, and entrepreneurs. Also amazing is the relatively small amount of historic archaeology that is published and researched in a state that so values its recorded history. A quick glance through the titles of the roughly 132 articles, reports, and notes published in *Utah Archaeology* over the last 20 years (1988-2008), reveals that only six were specifically directed towards historic archaeology; less than five percent. Admittedly, the historic period is short in comparison to the thousands of years of prehistory in the region (of which two articles in this issue are a part), but we believe the amount of published research stands in stark contrast to the number of historic sites being excavated and/or developed.

This issue of *Utah Archaeology* focuses on some of the historic research being conducted in the state by local and avocational archaeologists, private contractors, and federal agencies. The topics range from railroad workers and dry farmers, to military roads, to pioneer homes, to Mormon forts. We hope that the research presented here reminds us of the place historic archaeology should have in a state such as ours; and would encourage the publication of similar efforts in the future.

The Editors

David T. Yoder
Chris N. Watkins

IN MEMORIAM
Claudia Fromberg Berry (1942–2010)

Steven R. Simms
Utah State University

Claudia held a Doctorate in anthropology and a Juris Doctorate in law, both from the University of Utah. She had a long career as an archaeologist, interrupted by a 12 year stint as an attorney for a prominent Salt Lake law firm. She was a committed liberal and free-thinker and supported such organizations as Planned Parenthood, Doctors Without Borders, the Southern Utah Wilderness Alliance, the Audubon Society, and many more. Claudia was a member of the Society for American Archeology, the Utah Professional Archaeological Council, the Colorado Council of Professional Archaeologists, the Registry of Professional Archaeologists, and the Utah State Bar. She is survived by her husband Michael and her daughter Alexandra.

In the early 1970s Claudia Berry was perhaps the most respected doctoral student in anthropology at the University of Utah. That is sure the way it seemed to me as an undergraduate student at the time. She seemed to know everything. Dr. Jesse Jennings was not known for mentoring many female Ph.D. students, but he certainly took notice of Claudia's love of archaeology, her attention to the empirical, and her combination of scholarship paired with a fierce tenacity toward archaeological fieldwork.

Claudia was a crew chief on the Utah 95 archaeological project prior to paving the notorious dirt road from Blanding to Hite. The project was an early example of contract archaeology and dozens of Anasazi sites were excavated just in front of the bulldozers. Claudia was the only female among 10 archaeologists. Dr. Jennings made Claudia live in the Cliff Palace motel in Blanding (on a per diem allowance of $8 a day!) while the rest of the crew rented an "apartment"—a shed at the local lumber yard made over into a dormitory of sorts.

Claudia appointed me as her digger, and our crew of two excavated several small Anasazi sites. She once instructed me to follow an intermittent line of thin, vertical slabs. I cleared sagebrush, and dusted away the sand from the barely visible stones until we exposed a fantastic slab lined Anasazi ceramic kiln that looked more like an unusually long horse watering trough to me. Claudia would simultaneously direct my digging and write notes, all while maintaining a monologue that darted from the mundane matters

of the ongoing excavation to the broadest issues in Anasazi archaeology.

In 1973 Claudia was assigned the duties of Teaching Assistant at the University of Utah Archaeology Field School at the Evans site near Cedar City. The school was directed by Jesse Jennings and John Marwitt who together comprised a one two punch of intimidation. Claudia did the heavy lifting of reviewing student's field notes and conveying the day to day instructions. She patiently explained her critiques, and offered tips for improvement. She read our written work at night. We had to read books and write reviews. I recall her dry comment on my review of Lewis Binford's book, *An Archaeological Perspective*. "You could have been harder on him." No nonsense academic rigor was one of the hallmarks of Claudia Berry.

Once I arrived late for work after a four day break. My ancient Volkswagen had conked out the night before with about a hundred miles to go. I repaired it and arrived at the site at the embarrassing hour of 10 am. I bee lined to the top of the mound and disappeared into my excavation hole. A few minutes later Claudia walked up the hill and casually inquired, "Ok, the old man wants to hear your story." I told her and she returned to the director's table. About a half hour later, she once again peered into my excavation and reported, "Well, he doesn't believe you, but I think it will be ok." She then proceeded to talk archaeology and the matter was never brought up again.

After field school was over in July, I was appointed to be Claudia's assistant, and as Dr. Jennings said "the driver, cook, mechanic, and map-reader" (the latter hardly necessary), for an archaeological reconnaissance across a swath of terrain from southern Castle Valley (Emery and Ferron) to Hanksville. We camped for over a month at the mouth of Red Creek along I-70 across from Sudden Shelter. Claudia insisted on incredibly long days walking perhaps 15–20 miles and recording sites (often revisiting sites recorded decades earlier by James Gunnerson). I was sure we would be killed by lightning as we braved storms under would be juniper trees the size of an old man's crook. At the end of each dawn to dusk day Claudia would spend the night reading—often all night. She was ever the Ph.D. student. This schedule would persist for several days before the 20–24 hour work days caught up with her. I knew it was a day off from this withering routine when Claudia would fail to arise in the morning. I once did a brake job on the Dodge truck during one of these all day sleeps. The following day, she inevitably began anew and the entire pattern would be repeated. She would say, "It is not enough to be good at recording and writing. You have to be able to crank out quality at a steady pace." All this was quite an education for a twenty-one year old, and was a heads-up as to what kids like me needed to do if we actually thought we were going to become archaeologists. There were no "real" jobs for archaeologists in those days.

Claudia Berry exemplified the elusive combination of field experience, a strong sense of the literature, boundless energy, and a pure quest to know what happened in antiquity. She was one of my earliest mentors of archaeology.

Claudia decided to tackle law school, and became a successful attorney in Salt Lake City. During her dozen years as a lawyer, she occasionally crossed paths with archaeology. She informally advised the Utah Professional Archaeological Council on legal matters during a period when the Council had a relationship with the Southern Utah Wilderness Alliance.

It was no surprise to find her returning to archaeology, and when she did, she headed straight to the field, running crews on cultural resource management projects such as the Kern River gas pipeline and others. Once again, she pursued the foundational combination of fieldwork, lab analysis, reporting – and reading.

Her lessons were foundational: an insistent adherence to the lessons of stratigraphy and provenience; a sense of the impact of different scales of time on interpretation; pragmatism as to what archaeology can and cannot inform. Memorably, she eschewed ideological agenda that masked as archeological scholarship.

Claudia never lost sight of the big picture. As I look back, some of her prognostications were indeed ahead of their time. For instance, tucked into a report of archaeological survey along the White River in the Uinta Basin, is a thesis proposed (with her husband Michael Berry) that the Fremont, and especially the Colorado Plateau Fremont were direct immigrants from early Basketmaker peoples of the Southwest. Claudia respected the responsibility to read, and the ideas of the earlier thinkers, such as Julian Steward and Marie Wormington in this case, were always held in ready for development as Claudia encountered new evidence. Archaeology was not just about being a technician—it is an intellectual endeavor, and intellectual history mattered. Indeed, there is a lesson here for contemporary archaeological education and practice, and I imagine how Claudia might comment on such matters with her characteristic dry wit. Nevertheless, Claudia's clarity about high standards never encroached upon her underlying optimism. She was a bit old school, and had little time for fatuous self-delusion. But Claudia inevitably looked forward to and was ever at the ready for all the tomorrows. ■

Detecting the Ghost Road of the Uintas: The Carter Military Road

Byron Loosle
Utah State Archaeologist, Bureau of Land Management

Between 2004 and the 2011 the Forest Service sponsored a series of Passport in Time projects and other research activities on the Carter Military Road, an 1880's era supply route that crossed the Uinta Mountains of northeastern Utah. This article reports the results of the 2004 through 2007 projects when experienced metal detecting volunteers and Forest Service personnel were able to identify and map several road segments, nine military construction camps, a government sawmill, two civilian occupations, and other features of the Carter Military Road. Each camp search had its unique challenges and a few examples are highlighted to illustrate the value of the collaboration of metal detecting, historical research, and archaeological techniques. A variety of military items (buttons, insignias, cartridges) and mundane artifacts (cut nails) helped us identify the military camps used in 1882-83 and to distinguish these camps from contemporary civilian cabins.

Ed Bagne called me over to examine his most recent discovery. Our morning's finds were already impressive: well-preserved US Army eagle great coat buttons, numerous discharged .45-70 cartridges, tent stakes, and even a Virgin Mary religious medallion with a German inscription. We had also found the more mundane lead soldered tin can fragments, bits of beer and wine bottles, and the ubiquitous cut or square nails. We had clearly found the Ashley Forks Camp used by Fort Bridger soldiers while they constructed a supply route from their post in 1882. It was a pleasantly cool mid-summer morning and gorgeous Leidy Peak, the eastern most baldy of the High Uintas, created a spectacular backdrop to our beautiful mountain meadow workplace. Ed held out an unfired cartridge. The lead was a heavily corroded chalky white, but the head stamp on the tarnished cylinder was still visible (Figure 1). It was a Colt .45 shell. No single artifact symbolizes the Old West quite like the Colt revolver. "God may have made man, but Samuel Colt made them equal," is an oft quoted phrase from that period. It was moving to hold such a poignant reminder of the history we were pursuing.

Just like the Colt revolver, the Carter Military Road symbolizes and embodies all the significant themes in the westward expansion of the United States (Figure 2). Some of the themes include conflict with Native Americans, taming of the frontier and civilizing the wilderness, developing natural resources, and even the more ugly aspects of land speculation and greed. The road's story includes many of the iconic figures of the era: cattle barons, frontier judges, soldiers, homesteaders, miners, and even Buffalo Soldiers. The road's history and our archaeological pursuits are too complex to present in their entirety in this article, so only a brief summary of the project will be presented here. This article will primarily focus on a report of the field projects of 2006 and 2007, which located the military construction camps that were used in 1882 and 1883.

Judge Carter's Road

The United States Army's presence in the Uinta Basin of northeastern Utah is primarily

Figure 1. Unfired Colt .45 cartridge.

a tale of overcoming substantial logistical challenges. Early scouting parties which visited the area reported to the Mormon leader, Brigham Young, that northeastern Utah was one of the least desirable regions in the entire Deseret Territory. Based on this information, there was little interest in Euro-American settlement in the area, and Abraham Lincoln established the Uintah Indian Reservation there for several Ute bands in 1861. However, the Ute were reluctant to move from the more favorable localities they once occupied to the arid and cold reservation lands. But after decades of conflict, hunger, and government mismanagement, the majority of starving Utes were forced onto the reservation in the 1870's. Although the region was never part of the official Mormon church settlement system, Anglo settlers began to trickle into the eastern Uinta Basin in the latter half of the 1870's.

Just across the border, in northwestern Colorado, other Ute bands also faced difficulties. In 1879, Nathan Meeker and the other male Anglo employees at the White River Ute Indian Agency were killed in an uprising that resulted from Meeker's overbearing efforts to turn the nomadic Ute into farmers. After a multi-day battle with US troops, extended negotiations, and the return of female hostages, the White River and Uncompaghre Ute bands lost their ancestral homes in western Colorado in 1881. The White River band was forced to join other Ute bands on the existing Uintah Reservation, while the Uncompaghre were given the adjacent newly created Ouray Reservation. Euro-American settlers along Ashley Creek, northeast of the reservations, were terrified of the arrival of "hostile Indians" in the area, especially so soon after General Custer's slaughter at the Little Bighorn. The homesteaders demanded a military presence in the remote region. They quickly found a powerful supporter in Judge William Carter who resided at the recently abandoned Fort Bridger. US Army leadership had determined a military presence was no longer needed in the region and had begun to close the difficult and costly to maintain outposts like Bridger.

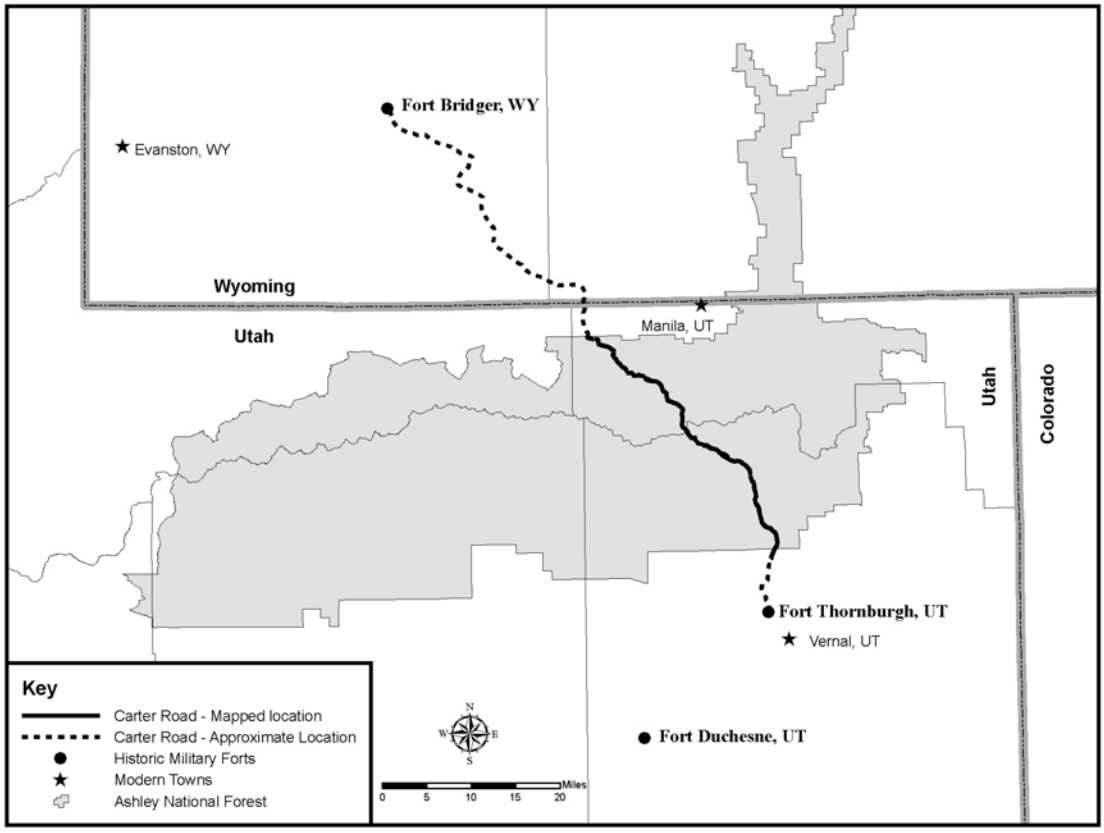


Figure 2. Map showing the general location of the Carter Road.

William Alexander Carter, originally from Virginia and a veteran of the Seminole War, was a prominent regional figure. He developed cattle, mining, and timber interests, but earned most of his money as a sutler (supplier) for the army. He also served as the local postmaster, justice of the peace, and eventually as the probate judge. Some have argued that Carter was powerful enough to influence the size and shape of state boundaries. They speculate Utah's unique corner-notched shape is because Carter did not want to be part of the Utah Territory (Stertz 2005:4). Carter had lost a significant business as a sutler when the army closed Fort Bridger in southwestern Wyoming. With the new Ute threat, Carter persuaded the army to not only establish a post in the Uinta Basin, but also return troops to Fort Bridger.

In the summer and fall of 1881, even before he won a contract to supply the troops in the Uinta Basin, Carter began building a road across the incredibly inhospitable Uinta Mountains where the road would have to cross elevations as high as 10,000 feet above sea level (the Carter Road was listed on the National Register of Historic Places in May 2001) (Figure 3). The route went from Carter Station along the railroad in Wyoming south through the Uinta Mountains to Fort Thornburgh in Ashley Valley (Figure 4). Unfortunately, the road construction cost Carter his life. In November, while supervising construction, he became seriously ill. After a short stay in a rustic cabin in the mountains, he was moved to Fort Bridger, where he passed away from pneumonia. Carter's widow, Mary, was awarded the supply contract in the early

Figure 3. A remnant of the Carter Road near Soldier Park.

spring of 1882, and her son Willie Carter hauled the first freight across the route in May 1882.

In 1881, the military entered the Uinta Basin and established Fort Thornburgh near the new Ute Ouray Agency on the Green River. The next year the commanding officer moved the fort to a new location over 30 miles away at the mouth of Ashley Creek Gorge, close to the Euro-American settlement on Ashley Creek. Although Carter's original improvements allowed passage of light wagons and horses along the road in the relatively dry fall of 1881, the intervening winter and wet spring destroyed portions of the road and made many other sections impassable. It took three weeks for the first supply train of twenty-six wagons to travel from Fort Bridger to Fort Thornburgh in May 1882 (Burton 1996:194). Army officers realized the road needed improvement. In 1882 and 1883, troops from Fort Bridger and the new Fort Thornburgh worked feverishly to improve the supply road and build a telegraph line across the Uinta Mountains. In spite of their efforts, this access road across the Uintas was only open for a brief period each year and was plagued by washouts, storms, ice, muddy bogs, steep dugways, and a myriad of other challenges that made freighting on the route a difficult and risky business. In some areas, the road was a formal elevated platform above a wet meadow. The soldiers constructed several dugways, bridges, and culverts, while rocks and trees were removed in long sections. However, in some areas the road merely consisted of any spot the horses and wagons could pass through the sagebrush. However, Fort Thornburgh was doomed and after a brief 18 months, the Fort was closed in 1884. The final straw for the Army generals in Omaha, Nebraska was squatters that claimed prior rights on the military reservation in Ashley Valley and demanded exorbitant monetary settlements for their land (Walker 1992).

The military still felt their presence was needed in the region, so in 1886, the Army established a new post, Fort Duchesne, in the Uinta Basin much closer to the combined Ute Agency along the Uinta River. Remembering the difficulties in freighting across the Uintas,

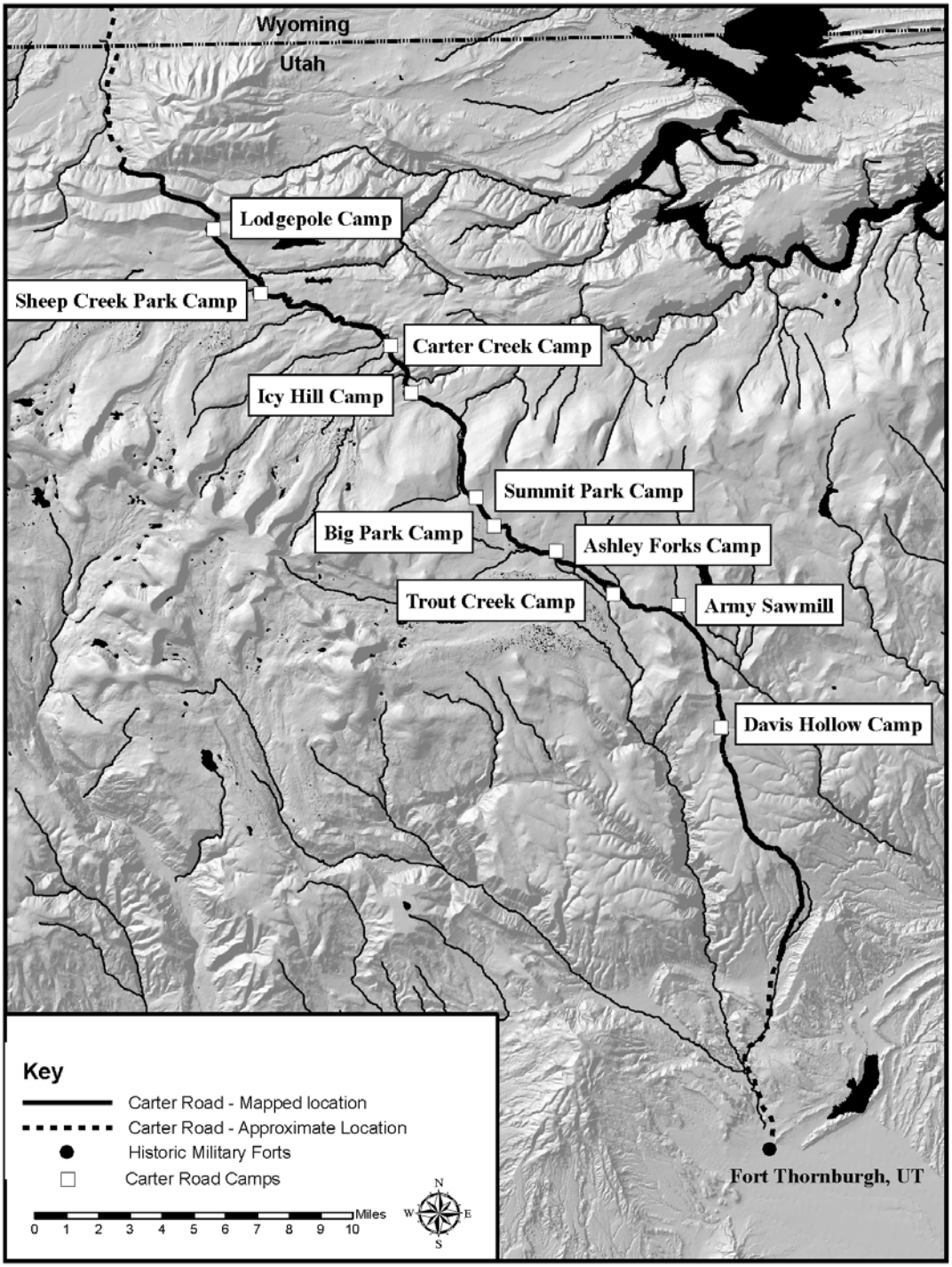


Figure 4. Map showing the documented location of the Carter Road in the Ashley National Forest.

they established a new supply route from a new railhead south of the Uinta Basin through Nine Mile Canyon. However, some of the troopers that would occupy Fort Duchesne, including Buffalo soldiers of the 9th Cavalry, traveled the Carter Road to their new post.

The Carter Road was only used to haul military supplies for three brief summers, but it became important for the development of northeastern Utah. After abandonment by the military, the northern stretch of the Carter Road was used to haul copper ore from the Dyer Mine north to Carter Station. Operating from 1900 to 1920, hundreds of tons of ore were shipped on wagons north and tiny bits of green rock can still be seen along portions of the trail, especially the Icy Hill Dugway. The Carter Road served as the primary route between Vernal and Manila until the 1930's (Standing 1967) when it was replaced by a more eastern route now under Highways 191 and 44.

Because the Carter Road was the main road into the Uintas from Vernal and Ashley Creek, a variety of early resource extraction activities and rudimentary cabins were constructed along its path. Army officers noted that almost every meadow had a herder's cabin even as they built the road. Most of the evidence of limestone kilns, sawmills, and grazing features the Forest Service has recorded along the route post-date the military. Structural remains at Young's Park and Davis Spring are the exceptions.

Project Objectives and Strategy

Passport in Time (PIT) volunteer Gail Carbiener faced some skepticism when he first proposed a metal detecting project along the Carter Road. Unlike some of the Oregon Trail projects Carbiener had participated in, at least 80% of the Carter Road route was visible, known, and in most cases photographed. In 1991, the Uinta Basin Archaeology Club (chapter of the Utah Statewide Archaeological Society-USAS) had placed markers along the route and printed a brochure for the trail. There seemed little that could be accomplished. However, Carbiener persisted and suggested he could help the Forest Service identify missing pieces of the route.

The Forest Service sponsored several summer field and winter lab projects to assist with the documentation and research the artifacts from the road. In 2004 and 2005, the project focus was to locate unidentified portions of the Carter Road, although we also hoped to verify some of rumored way stations, cabins, and other sites associated with the road. The Forest Service organized PIT projects, provided logistical support, and suggested locations for possible detecting excursions. The success of the projects, however, was largely due to a dedicated group of individual volunteers that emerged to outline strategy, methodology, and provide military knowledge. Carbiener and others helped recruit a variety of individuals from across the country, including states as far away as Wisconsin, California, and Oregon. The enthusiasm, dedication, and excitement of the volunteers became the hallmark of these summer projects (Figure 5).

The synergistic effort on the Carter Road investigations culminated with the addition of regional military historian, Gary Weicks. Weicks provided a wealth of information on the road and opened tremendous research potential. Based on information provided by Weicks, the focus of the summer projects changed dramatically in 2006 with an effort to identify the location of construction camps the military occupied along the Carter Road in 1882 and 1883. A few of the names the military used for the camps remain today, such as Trout Creek, Sheep Creek, and Davis Hollow. Many of the others, Ashley Fork, Grandview and Cold Water Brook no longer appear on any map. A handful of camps had been identified or partially discovered during 20 years of cultural resource activity on the forest. However, many of the camps had never been observed, or even suspected, by the professional archaeologists. The results of the succeeding three summers of effort were extremely successful as all of the historically noted military camps were eventually located and identified on the ground.

Figure 5. Ed Bagne and Ed Coker two of the many enthusiastic volunteers at the Fort Thornburgh rifle range.

During the summer of 2006 we focused on the south slope camps, and the summer of 2007 the north slope camps.

The main objective was to locate the road corridor and the military campsites across the Ashley National Forest, a distance of over 37 miles. This objective does not require that all artifacts be found in the road corridor and the campsites, but only a sufficient number to verify and clearly determine the road's path and the definite location of the campsites. Our methods were refined and modified during the course of the project and we experimented with a variety of small scale systematic approaches to test their effectiveness. The various techniques and approaches provided a wealth of information and revealed tremendous data potential during the project. The method of how the detecting was done, either directed wanderings or the use of controlled detecting (using transects), did not make a difference when artifacts were found in sufficient quantity to satisfy the objective of the study. Both directed wandering and controlled survey (transects) have their advantages and disadvantages, which will not be elaborated here. Directed wanderings consisted of the volunteers detecting where the terrain looked appropriate or they received signals from metallic objects (hits). Systematic detecting was done by walking formal transects or blocks which had been measured and marked. We collected GPS data for all historic artifacts and features with a Trimble GeoExplorer 3 or GeoXT. This allowed us to create maps and databases of all the artifacts noted. Significant

Figure 6. The Virgin Mary medallion found at Soldier Park.

artifacts were recorded on a half page form designed for the project. The GPS data allowed Friel (2008) and other professionals to develop hypotheses about camp organization and layout, but this was not the original intent of our efforts.

We conducted three small shallow test (1 to 2 meters in size and 10 to 40 cm deep) excavations during the project, primarily to verify the presence of buried features. We determined a small depression at Ashley Forks was a latrine, which will be briefly discussed later in the article. We also determined structural remains were present within a rock foundation at the Thornburgh sawmill site. Unfortunately, our excavation into a rock pile at Ashley Forks failed to provide any information about the origin of the rock or its purpose.

The Men Who Constructed the Carter Road

Camp Locations

We were able to find nine military construction camps and a military sawmill occupied during 1882-83 and confirm that two other locations were civilian occupations. These results were supported by Weicks' historical research, including the civilian sites. One cabin on the route had been rumored to be a military way-station, but our detecting and Weicks' research only found evidence of a civilian occupation. Each of the camp identifications involved a bit of historical, archaeological, and metal detecting detective work. Examples from four camps illustrate the group's efforts and results.

Ashley Forks

Before the 2006 PIT Project, Weicks calculated distances between the various reported construction camps. He was confident the "Ashley Forks" camp was located in the general area of Soldier Park. Forest Service staff was unaware of any historic occupation at Soldier Park. On the first day of the 2006 PIT Project, Weicks and the author visited the extreme northeastern corner of Soldier Park looking for historic structures that the Ashley's fisheries biologist had reported just the week before. However, the remains were from a 1950s or 60s sawmill and logging camp, clearly not the Carter Road period. Weicks was still confident the mileage was right for a military camp in Soldier Park. We searched the meadow and noticed two prominent rock mounds in a dry section and soon found several lead soldered tin cans and glass from the Carter Road era. We knew we had found the Ashley Forks Camp.

Metal detecting at the camp revealed an abundance of artifacts, including some personal items left by the soldiers. A religious medallion of the Virgin Mary with German text is one of the most unique items found during the project (Figure 6). This find seems particularly intriguing because one of the officers leading the telegraph construction crew who briefly bivouacked at the camp was Captain Gerhard Luhn, a German. The artifact distribution revealed some patterning at the camp that may suggest enlisted men versus officer's tent areas, which will be discussed later. We also noticed some features at the camp including the two rock piles and a potential latrine depression.

Trout Creek

Prior to 2005, this was one of the areas where the USAS Chapter and Forest Service archaeologists had been unable to determine the precise location of the Carter Road. Most researchers assumed it was under the modern road or located on the east side of the large meadow at this location where the ground is higher and drier. A majority of modern camping occurs on the eastern side of the meadow for this reason. A small crew of metal detecting volunteers attempted to find the location of the Carter Road during the 2005 PIT season. They spent a few days searching for artifacts and eventually found the road. A prominent road swale extends along the southwest portion of the meadow, on the opposite side of where we had suspected it to be located. The crew found several horseshoes and wagon pieces, which are artifacts commonly associated with road segments. A small grove of young lodgepole trees obscures the Carter Road where it turns northwest from the modern road.

Weicks insisted there was a major construction camp in Trout Creek, but we were unsure of where to begin our exploration. After our success at Soldier Park, we were eager to identify other camps. I remembered a rock pile, much like the rock piles at Soldier Park, and suggested the group start there. This idea was met with some skepticism from volunteers of the 2005 campaign because they had detected nearby while searching for the road the previous year and had not found any evidence to suggest a camp immediately below the road swale. However, we were quite surprised by the abundant evidence we found of the camp in 2006, in an area so close to where the 2005 crew had detected. We also found evidence the troopers had cleared rocks from a possible assembly area, in addition to the previously noted rock pile. This site emphasized how important it was to cover as much ground as possible with eyes and detectors, and not to assume everything significant had already been found by searching nearby.

Carter Creek

When Weicks identified the Brownie Lake area as the location of a camp, I was flummoxed. Unlike many of the other camps, there was no obvious candidate for this site location. Forest Service personnel had not recorded or noticed concentrations of historic artifacts in the area and casual reconnaissance of the region had failed to identify probable locations as we had done at Soldier, Trout, and Sheep Creek Parks. We had already surveyed much of the area around the lake in earlier prehistoric PIT and compliance projects. A few pieces of Depression Era glass, ditches, and other historic features had been recorded by a Forest Service crew north of the lake. I had noted a single piece of Carter-era glass on the hillside west of the dam and parking area. On more than one occasion, we speculated the camp was under the current dam or reservoir and beyond hope of being located.

Weicks encountered a journal entry by Captain John Bourke for July 14, 1882 that described the Carter Creek camp setting. Captain Bourke was a longtime aide-de-camp of General Crook and a part of a quartermaster's detachment that, along with General Crook, traveled the Carter Road in 1882, paying the troops and inspecting the road. The journal entry reads as follows:

> 18 miles out from last night's camp (Burnt Fork), a slight descent in the grade and a sudden turn in our line of march revealed through the tracery of the ever graceful and now thickly growing pines, a lovely little amphitheater, walled in by halting crags of sandstone and granite, where, amid all that was exquisite in the way of mountain scenery, rest the bivouac of 2 companies of the 4th Infantry, engaged in road construction and repair.

This journal entry seemed to offer some hope the camp could still be found, since no rock ledges are immediately adjacent to the lake. A crew of PIT volunteers spent nearly a day searching for the camp. They began their search near the top of the hill near the dam and continued for more than a quarter mile to the west and then at least a half

Figure 7. The stone amphitheater noted by Captain Bourke at the Carter Creek Camp.

mile to the south into Carter Creek Canyon, but found nothing of significance. As they returned toward the reservoir somewhat discouraged, one of the volunteers decided to metal detect a small cove area of high grass near a stream crossing. He immediately started getting metallic signals almost everywhere. He recovered several .45-70 brass cartridges. Others in the group started searching just after having crossed the stream, and they likewise started to get all kinds of metal signals. Although they searched widely, the vast majority of artifacts were in a relatively compact area. The complete artifact assemblage of cartridges, buttons, cut nails, glass fragments, tin cans etc. leaves no doubt this was the missing camp (Figure 7). The high grass made it difficult to operate the detectors and to locate sub-surface artifacts and even surface features. Considering some of the unique artifacts and earlier cartridges found by the crew, Weicks has proposed this site may have also been occupied by an 1881 civilian construction crew.

Lodgepole

This was one of the more straightforward camp identifications. Forest Service personnel were not aware of any historic camp along Lodgepole Creek. However, during a discussion with Weicks, I remembered a prehistoric site recorded during a proposed timber sale that contained some historic artifacts. Located in a meadow along Lodgepole Creek, 42Da173, was recorded as a prehistoric site with a few historic artifacts. The site form revealed a number of historic artifacts including brown bottle glass and lead soldered cans of the Carter Era. Once on the site, the crew knew they had found the military camp. Prehistoric artifacts were found on most of the sites, but this camp had the most abundant evidence of a prehistoric occupation. Glass fragments, tin cans, .45-70 cartridges, horseshoes, cut nails, and other items typical of the Carter Road camps, along with the partial insignia from a 9th Calvary trooper's hat, were

located. Buffalo Soldiers of the 9th Calvary made a quick trip along the Carter Road in 1886 to establish Fort Duchesne. Finding evidence of their trip and single overnight stay was a highlight of everyone's summer.

Key Artifacts Identified the Carter Road Military Occupation

Military Artifacts

No single artifact identified an army camp, and we had to consider the entire artifact assemblage. However, during the course of our project, we learned that particular historic artifacts clearly defined the occupation as a military camp as opposed to artifacts found at herder's camps, sawmills, and other civilian occupations. Large metal military buttons with an eagle motif from great coats as well as smaller similar buttons typically found on the cuffs of overcoats and other garments were found at nearly every site. The military trouser buttons also have a distinctive weave pattern that we learned to recognize. We also found a few insignia pieces from uniforms and hats. A handful of coins helped place the soldiers at our camps with a variety of quarters, dimes, half dimes, pennies, and even an 1835 half cent.

The military items and clearly dated artifacts were the best, but we soon learned that other artifacts were more common and just as diagnostic of a military occupation. For more than a decade, including the period the Carter Road period was in use, the military used a unique shoe soul design with "French screws." The soldiers declared these shoes "a menace to their health." One officer wrote, "many a man is discharged . . . a cripple for life, from having been forced to wear the things called shoes now furnished by the government" (Coffman 1986:343). The long screws conducted heat or cold, so standing on a hot or cold surface for very long, such as during guard duty, was miserable. Doctor Tilton, accompanying the Yellowstone Expedition in 1876, wrote, "the cable screwed shoes would have a deposit of frost around each piece of metal on the inside of the sole, every cold morning. Many of the boots and shoes would be coated with a cake of ice inside when they were not dried out in the night" (McChristian 2006:165). We found several examples of these shoes at the camps. The numerous screws protruding from the desiccated leather resembled some sort of torture device (Ann Bagne 2006) (Figure 8).

The experienced volunteers on the project identified a number of other items that were clearly military. When I was foolish enough to question their conclusions, they would quickly run to their vehicle and produce several books with detailed pictures of the suspected item. Canteen stoppers, saber buckles, and the small ventilators from campaign hats were identified this way. Pieces of suspenders, buckles, and small pieces of insignias were sometimes less certain.

We found hundreds of .45-70 cartridges which were issued to the soldiers, including a few that were unfired. Many of the head stamps were still legible with the year, month, and arsenal of manufacture visible (Figure 9) (Ed Bagne 2006). Although civilians might use .45-70 cartridges, the abundance and dates of manufacturing were unique to the military camps. We also found other calibers of ammunition, like the Colt .45 mentioned earlier. We found several Henry shells, another common manufacturer from the period. While not a military issue firearm, Henry rifles were a popular rifle among the general public. Military officers often carried their own personal firearms. Hunting and fishing were popular after hour activities for the troopers according to their officers' diaries.

However, the most mundane of artifacts became the classic camp marker for the crews. The cut or square nail clearly signaled to us that we were on a military camp long before we found the more official military items. We literally encountered thousands of nails in all shapes and sizes. Most of the nails were bent, as though they had been used for something. We speculated about the many possible reasons for the vast number of nails. Perhaps the soldiers were building tent platforms

Figure 8. A desiccated army boot soul with the long screws exposed.

or temporary buildings. At the Fort Thornburgh sawmill site, along the road, dense concentrations of nails we suspected formed the outline of buildings. Friel (2008:68) made two interesting observations, "the benefit nails have in a spatial study is that they were small enough to quickly get lost in the grass where they would likely remain with little disturbance to provenience." He also hypothesized, "the large quantity of nails in these linear patterns are probably the result of opening crates around the tents." We remain uncertain if the 2- to 3-inch cut nails, the size most commonly recovered at the camps, were really used for wood container construction, but Friel's hypothesis has some logic.

Glass and lead soldered cans

Although not located by their metal detectors, our crew members found several examples of another artifact type that was extremely useful in verifying occupation dates. During the late 19th century, glass manufacturing companies frequently changed ownership and the location of factories. The ownership (maker's mark) was often embossed on the side or bottom of the bottle which allowed precise dating of some of the glass fragments.

At Ashley Forks Camp, we recovered several bottle bases with either complete or partial makers' marks, which provided some tentative conclusions as to identification and dating. The analysis was completed by one of the project volunteers. Makers' marks include a "D S G Co" made by the De Steiger Glass Company of La Salle, Illinois, circa 1879-1896; a "L G Co" mark probably made by the Louisville Kentucky Glass Works, manufacturers of a wide range of glass containers who were in operation between 1873 and circa 1886; a partial maker's mark that includes "C. V. C…" and "MI," which was likely made by the Chase Valley Glass Company of Milwaukee, Wisconsin, between 1880 and

1881; two bottles marked "WIS G CO" and "MILW" made by the Wisconsin Glass Company of Milwaukee, Wisconsin (the successor to the Chase Valley Glass Company) between 1882 and 1886; and a final base with a partial mark which was used between 1867 and 1882, possibly from the Consolidated Fruit Jar Company of New Brunswick, New Jersey, (Toulouse 1971) (Altzier 2007). The very narrow date range of the Chase Valley mark and the single year of overlap for the Consolidated Fruit and Wisconsin Glass marks indicate an 1882 or 1883 occupation for this site, even without any additional information.

Although it was not a focus of our study, we decided to gather information on a variety of tin can characteristics from the Icy Brook site, where 238 cans were noted, in an effort to demonstrate the types of information that could be gleaned from the large artifact data that could be generated at some of the Carter Road sites. These sites represent a snapshot in time. They have a very brief occupation, during a very dynamic period in the development of the United States and several critical industries. For instance, the tin can industry was experimenting with various techniques and approaches, which would eventually lead to the development of the sanitary or modern can. At Icy Brook, we found examples of hand-soldered, machine-soldered, and crimped side seams, sometimes two techniques on the same can. Hole-in-Cap cans include cans with double holes, hand-soldered or machine-soldered holes, and other patterns.

We completed a standard recording form for each of the can fragments, but there are a number of problems and caveats with the data. Rather than elaborate upon every one of them in this article, a single direct example is typical of what we discovered. One straightforward comparison is hand-soldered versus machine-soldered cans. We counted 79 hand-soldered cans (59%) and 55 machine-soldered cans (41%). We know this camp was occupied in 1882 and percentages like these can help archaeologists date Western historic sites of unknown age. The percentages of the various soldering techniques will change

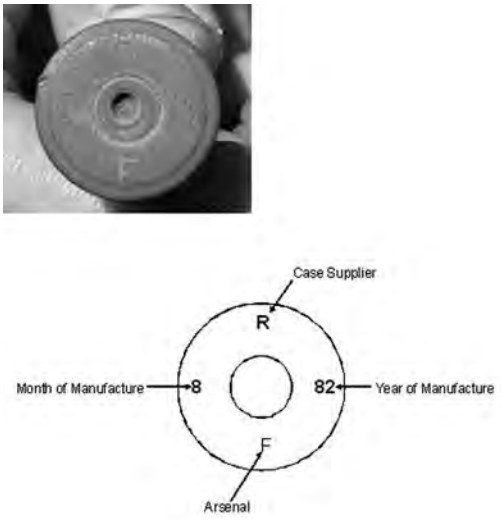


Figure 9. The base of a .45-70 cartridge with the year and place of manufacture coded.

depending on whether the occupation was earlier or later because of the improvements in technology that were constantly occurring. In other words, a historic site with 55% machine-soldered cans and 45% hand-soldered would have been occupied just after 1882. The quartermaster's records show the soldiers had access to an incredible array of canned items, a wide variety of fruits, meats, and other items. The five shapes of cans and range of sizes we noted at this site confirm the records. Volunteers were also enthralled that the troops seem to have had access to the most recent technology and products. A particular ox shoe found along the road, which was only patented in the spring of 1882, is just one example (Odekirk 2006).

Tent stakes

One of the relatively more common type of artifacts located at the sites, tent stakes, provided some interesting insights. We found metal tent stakes at many camps. In some instances, more than five were found at an individual camp. Several stakes were still vertical in the ground, and in at least two instances, multiple stakes appeared to have been used for the same tent. This

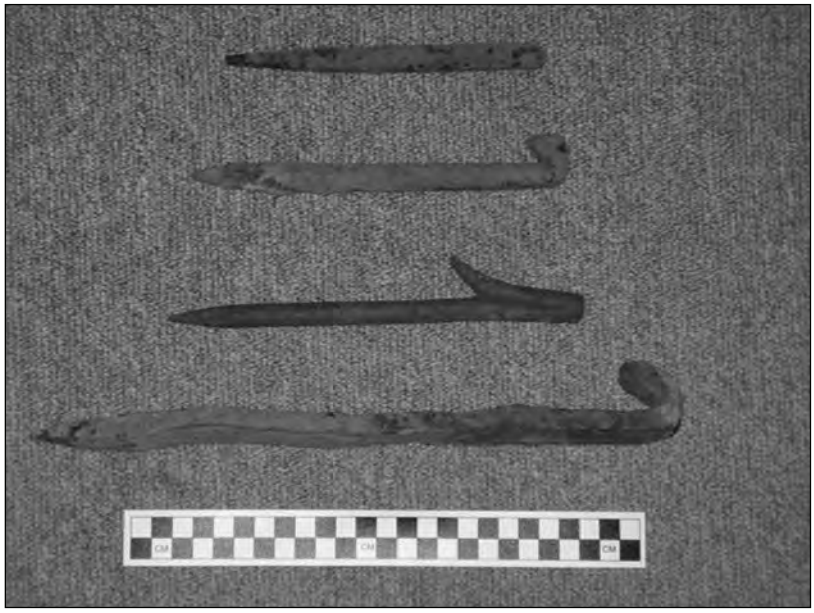


Figure 10. Some of the tent stakes found at the camp sites. The bottom stake is made from a used horseshoe.

patterning may provide opportunities to identify tent size, arrangement, and camp organization, although Weicks recently suggested some of these might also be picketing stakes for horses. The surprising aspect of the tent stakes is that each one was unique (Figure 10). Many of them appeared to have been hand forged or modified from other items. Some of the stakes were created from well-worn horseshoes or relatively new bar stock. We wondered why the military had not issued standard stakes. Subsequently, we learned that the regulation tent stake of the period was a hardwood dowel or pin, and that "In areas where hard or rocky soil prevailed, company commanders often had the blacksmiths make up tent pins of iron" (McChristian 2006:102-103). Anyone that has camped in the Uintas knows that the shallow rocky soil destroys weak tent stakes. It appears that the metal stakes were the troopers' efforts to overcome the shortcomings of their official equipment. In addition, 21 of the 22 metal stakes were found at camps occupied by Fort Bridger troopers. Apparently, the Fort Thornburgh commander had not ordered or allowed substitute metal stakes.

Other Data Generated by the Project

Site distribution and organization

We accomplished our research objective of identifying camps and road segments. However, we also identified other potential research topics, most of which we were unable to fully explore. Friel (2008:60) noted the artifact distribution at Ashley Forks (Soldier Park), like many of the other camps, was statistically significant. It is not surprising that a military camp would be patterned and organized. Unfortunately, understanding the patterning is not always straightforward. For instance, kitchen-related items were scattered throughout this camp, which Friel (2008:56) argues indicates cooking took place throughout the camp and not in company kitchens.

While understanding camp organization and patterning was not a focus of this project, one aspect of the Ashley Forks camp drew our attention. Our GPS map (Figure 11) clearly shows three artifact concentrations. At the

Strawberry Encampment (Thompson 1993), the commanding officers' tents and camp were located in the single grove of trees in the valley, while the enlisted men and noncommissioned officers were camped out in the meadow. Could a similar practice have occurred at Soldier Park? One strong correlation Thompson (1993) found was between the color of glass and rank. Enlisted men areas were dominated by brown glass from beer and ale bottles, while officers' areas had more green glass from wine and champagne bottles. Friel (2008:54) noted that 85% of the glass in the Ashley Forks meadow is brown glass. Meanwhile, over half of the glass in the artifact cluster in the trees south of the meadow was green glass. This pattern seems to suggest the officers were camped in, or immediately in front of, the trees. We noticed a similar, but less robust pattern at Davis, Lodgepole, Icy Brook, and other camps.

Combining History and Archaeology

Having a skilled historian and experienced metal detecting operators on the project was incredibly productive. The volunteers were able to identify a wide range of artifacts such as campaign hat ventilators and pieces of canteen stoppers. They also provided information on the .45-70 cartridges and how to read the head stamp, besides providing information on coins and many other items. Our historian, Gary Weicks, provided all sorts of interesting anecdotes, including the diary entry for the Carter Creek camp noted earlier. Another example from the Icy Brook site highlights the synergy of combining history with archaeology.

In the dense Lodgepole forest beyond the southwest corner of the site is a large, flat Uinta quartzite boulder that rises a few inches above the ground. On the boulder, we noticed the desiccated remains of two army boots (Figure 12). It appeared that a trooper had sat down on the boulder, removed his shoes, and walked away. This seemed odd to us. Although the boulder appeared to be beyond the edge of camp, the nonexistent understory in the dense forest and elevated hillside meant the boulder was visible for a considerable distance. Why would someone simply leave his boots on the boulder? Instead of being lost in the woods, it was almost like the boots had been left as a memorial or placed on an altar. Several other leather boot scraps were found on the drainage slope on the south edge of Icy Brook camp. These pieces looked like they were taken to the edge of camp and thrown away. We found almost as many pieces of boot leather and soles at this camp as we did on the rest of the project.

Weicks found in the historical records that on June 16, 1882, Captain William Bisbee, the Fort Bridger post commander, wrote a letter to the Chief Quartermaster for the Department of the Platte in Omaha requesting that 12 pairs of long rubber boots sizes 8 and 9 be immediately sent out by express for soldiers involved in building bridges along the route, particularly across Sheep Creek. This cold-water torrent was the widest and largest stream the soldiers crossed in the Uintas. Captain Bisbee wrote two additional telegrams to the quartermaster in June, stressing that he feared sickness for the water-wading, bridge-building soldiers unless the rubber boots were supplied soon. No further word on the status of the boots was contained in the post correspondence, but the battalion next moved onto temporary station at Carter Creek and later arrived at Camp Icy Brook on July 22. It may have taken some time for the requested supplies to reach the troops stationed in the wilderness. Captain Bisbee's frantic demands for rubber footwear in the weeks prior to the Icy Brook encampment are noteworthy because there are no subsequent requests to the Quartermaster. There is no official word, but we strongly suspect the requisitioned boots arrived for the men during, or just prior to, their arrival at the Icy Brook camp. We can only imagine the troopers' joy in discarding their water-rotted, worn, and warped boots.

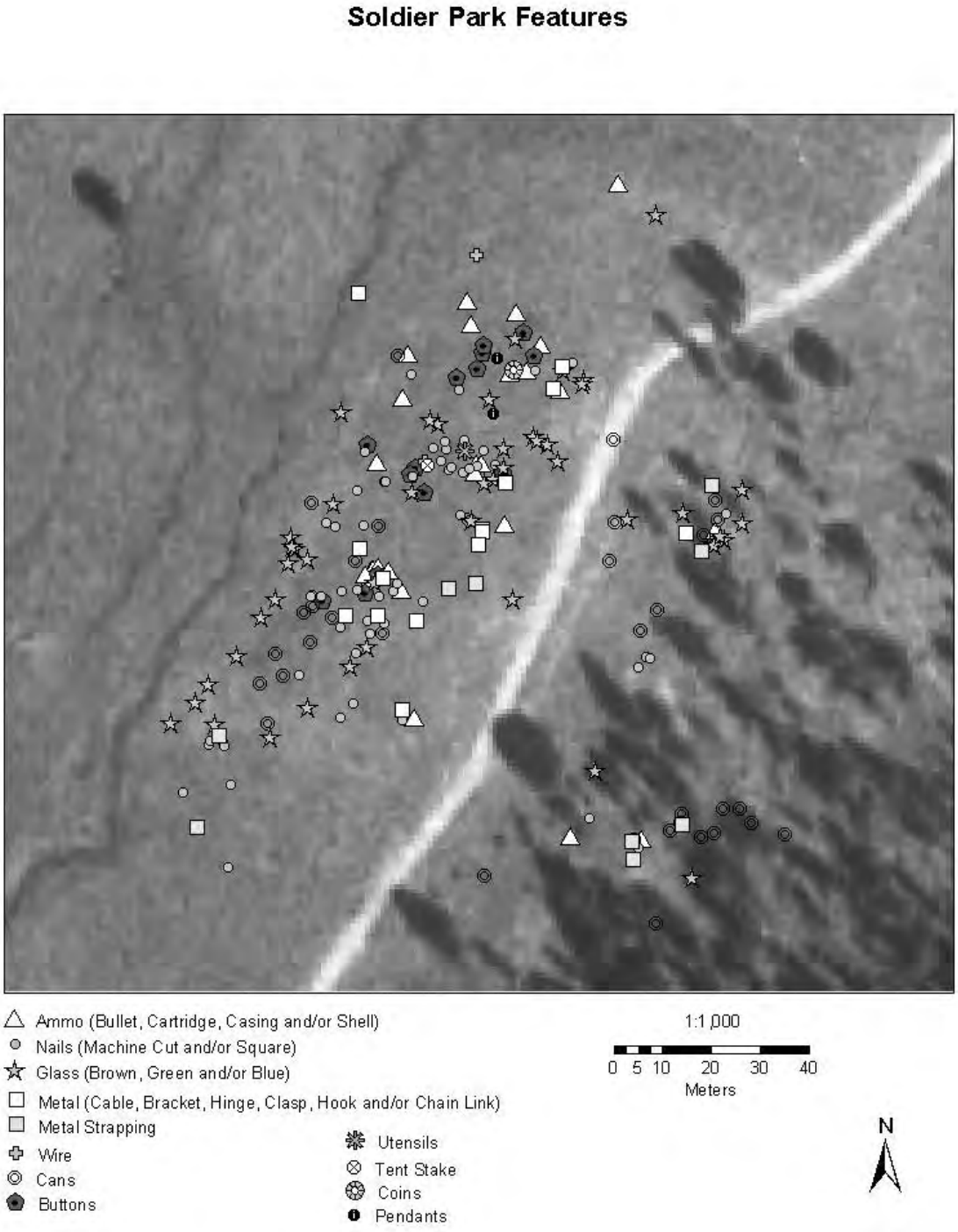


Figure 11. Example of the GPS maps that have been created for some of the sites we explored. Note the artifact clusters in the trees and another in the meadow.

Figure 12. Boots abandoned at the Icy Brook camp.

Features

Our intensive survey of these sites revealed a number of features that had not been documented previously. We found evidence of stone cache boxes at a handful of sites, including one adjacent to the main road at Sheep Creek Park, which had been unobserved until our project. We also found depressions and rock piles at some sites. The stone cache boxes are especially intriguing and noticeable. Usually, there is just one or two per camp, although an isolated one was found alongside a steep section of the road. About two feet wide by four feet long, the cache boxes were almost always made of stacked, native Uinta quartzite slabs. Only the one at Icy Brook has an intact roof. The others are three sided, partially buried bunkers. The USAS group called the one at the summit a "powder magazine" in their discussions, but we have scant information about their purpose (Figure 13). Almost no artifacts have been found in association with these features, and no excavation has been conducted in one. A small burned area with small nails was noted just outside the summit cache. The boxes are only found at the summit and down the north slope. It appears the Fort Bridger soldiers constructed these caches.

A small latrine excavated at the Ashley Forks camp illustrates the tremendous potential these features have to reveal information about the soldiers who spent time in the Uintas. We believe many more of these features remain unidentified. A small depression was located at the southern edge of the site, just inside the tree line. Jim Klein, a detecting volunteer, had found the feature during the summer 2007 PIT project, and there appeared to be an abundance of tin cans and glass in the feature. Once excavated, the feature was noted to have clearly defined walls and very dark fill. Tin cans, glass fragments, and large pieces

Figure 13. The stone cache box at Icy Brook.

of charcoal were noted in the shallow privy fill (about 40 cm deep). Essentially, the entire fill of the privy was artifacts. The artifacts have not been carefully analyzed at this point, but consist of approximately three bottles and nearly twenty tin cans. Pollen and macrofossil samples were taken from the bottom of the pit. The pollen samples from a surface control sample and the latrine were very similar, indicating the forest composition is comparable today to what it was at the time the soldiers occupied the meadow.

A macrofossil sample suggests the privy users ate raspberries/blackberries, but no other food remains were present. Branches of local lodgepole pine were probably burned to account for the charcoal. We suspect the charcoal may have been dumped in the privy to help control odor. An FTIR scan for protein residue was conducted on the remains from the privy. Although this technique shows great promise, it is relatively new to the lab and the results have to be interpreted even with a fully developed library of samples (Cummings 2008). The presence of several possible generic plant signatures or local plants was noted, but these do not tell us much about the soldiers. More interestingly, the protein residue reveals red meat was consumed at the site. The analysis indicates the occupants consumed a bovine, either cow or bison, which have close protein signatures. The taphonomic signature for wild rice was noted as well, but the lab staff conducting the analysis is unsure which

cereal crop this may represent. They suspect it could possibly be rice or wheat. There was also evidence of nut use from proteins and oils. The signature matches several nuts, but the lab suggested it may represent pine nuts. This latrine data does not appear to support the idea that the troops, nor the officers, were supplementing their diet with wild game and plants. Although the soldiers loved to hunt and fish while they were in the Uintas, except for potentially the raspberries, the other items represented in the latrine were brought from lower elevations and were probably military fare.

Because we conducted very limited excavations and spent a relatively brief amount of time on each camp, there are a number of lingering questions: why were the rock piles constructed? Do they represent debris from construction of a garbage pit, a flag pole support, a camp entrance marker, or other ideas that have been suggested? It also seems that Fort Bridger troopers built the rock piles. Although the piles only occur at south slope sites, they are at locations occupied by Fort Bridger troops. Why do there appear to be many more cut nails at the south slope sites? And finally, why were there so many tin cans at Icy Brook? The occupation was not any longer than at other camps. Although the US Army and even some of the same officers were responsible for all of these camps, there seems to be considerable variability for each camp's layout and features.

Current Activities

The Carter Road project continues under the able leadership of current Forest Archaeologist, Jeffery Rust, and assistant, Clay Johnson. Smaller volunteer crews in 2008, 2009, and 2010 identified and collected GPS data on road sections. The crews used the historic trail classification scheme developed by the National Park Service to document and categorize portions of the trail. A significant amount of Carter Road remains unaltered and representative of its original condition. Even more of the Road retains its original character, although subsequently used by motor vehicles. Much of the road has not been bladed, graded, crowned, or otherwise improved, and typically remains as a two-track road following the original Carter Road route. One area of particular interest to the volunteers is the telegraph line that was rapidly placed by military crews along the Carter Road route during the same period as the road construction. Gail Carbiener and his wife, Muriel, developed an interpretive exhibit that is now available on the Ashley National Forest's website. Gary Weicks (2009) continued his research and produced a book on the telegraph and telephone lines the military built in northeastern Utah. His manuscript primarily focuses on the Carter Road line, but also includes a history of the lines to Fort Duchesne (the successor to Fort Thornburgh), including the section through Nine Mile Canyon.

Conclusion

Over the course of seven years, experienced metal detecting volunteers and Forest Service personnel were able to identify and map several road segments, nine construction camps, a government sawmill, two civilian occupations, and other features of the Carter Military Road. This was the first formal road through the Uinta Mountains of northeastern Utah. This article has focused on a variety of information that was obtained from site observation and extensive metal detection of the military construction camps of 1882-83. In addition, the project found evidence of thousands of years of travel and activity, including continued use today. Our investigations revealed remarkable insights into the men and their activities in this remote and difficult environment. A tremendous amount of data still remains scattered along the route for those hardy souls capable of investigating this hidden corner of the state. The energy, knowledge, skills, and equipment the dedicated volunteers contributed immeasurably to our understanding of this remarkable piece of Utah's history. The road remnants and artifacts we encountered are

a powerful symbol of the Western frontier and its legacy. The enthusiastic volunteers, multi-disciplinary investigation, creative strategies, and new technologies we employed on this project hopefully are a harbinger of the way archaeology can be conducted in the West in the future. ■

Acknowledgements. Ann and Ed Bagne, William Altizer, Jim Klein, Donn Ivey, D. Andrew Stertz, Jerry Odekirk, and Gary Weicks wrote artifact analysis or historical accounts that were summarized or noted in this article. Their full accounts are available at http://www.fs.fed.us/r4/ashley/heritage/histories/ or in the Carter Road Project report now under development.

I give special thanks to Gary Weicks, Gail Carbiener, Jim Klein and the four anonymous peer reviewers for their extremely helpful reviews of early drafts of this manuscript. Alison Leick prepared the GPS map used in this article. Jeff Rust prepared the road overview maps from his recently collected GPS data.

All photos are courtesy of the Ashley National Forest. Thanks to Jeffery Rust for his cooperation and continuation of the Carter Road preservation efforts.

Byron Loosle
Utah State Archaeologist
Bureau of Land Management
Utah State Office
P.O.Box 45155
440 West 200 South Suite 600
Salt Lake City, Ut 84145-0155
E-mail: bloosle@blm.gov

References

Altizer, William
2007 Glass. Electronic document, http://www.fs.fed.us/r4/ashley/heritage/histories/carter-military-road-pit-2007.shtml, accessed May 13, 2010.

Bagne, Ann
2006 Shoes. Electronic document, http://www.fs.fed.us/r4/ashley/heritage/histories/carter-military-road-pit-2006.shtml, accessed May 13, 2010.

Bagne, Ed
2006 Ammunition. Electronic document, http://www.fs.fed.us/r4/ashley/heritage/histories/carter-military-road-pit-2006.shtml, accessed May 13, 2010.

Burton, Doris Karren
1996 *A History of Uintah County: Scratching the Surface*. Utah Centennial County History Series. Utah State Historical Society, Salt Lake City, Utah.

Coffman, Edward M.
1986 The Old Army: a portrait of the American Army in Peacetime, 1784-1898. Oxford University Press, New York.

Friel, Breton D.
2008 *Short-Term Military Camps on the Carter Road: A Functional Analysis.* Master's thesis, Department of Anthropology, Brigham Young University, Provo, Utah.

Lindsey, Bill
n.d. Historic Glass Bottle Identification and Information, Electronic document, http://www.blm.gov/historic_bottles/examples.htm, accessed March 13, 2007.

Loosle, Byron and Clay Johnson
2002 Fort Thornburgh Project: Field Investigations at the Possible Site of Fort Thornburgh 1882-1884. Electronic document, http://www.fs.fed.us/r4/ashley/heritage/site-reports/fort-thornburgh.pdf, accessed June 1, 2010.

McChristian, Douglas C.
2006 The U.S. Army in the West, 1870-1880: Uniforms, Weapons, and Equipment. University of Oklahoma Press, Norman.

Odekirk, Jerry
2006 Animal Shoes. Electronic document, http://www.fs.fed.us/r4/ashley/heritage/histories/carter-military-road-pit-2006.shtml, accessed May 13, 2010.

Standing, A. R.
1967 Through The Uintas: History of the Carter Road. *Utah Historical Quarterly* 35(3)256-267.

Stertz, D. Andrew
2005 A Look Along the Uinta Mountain's Carter Road: A History, the Development of the Region, and Current Research. Electronic document, http://www.fs.fed.us/r4/ashley/heritage/histories/a-look-along-carter-military-road.pdf, accessed May 13, 2010.

Thompson, Charmaine
1993 Connecting Artifacts and Behaviors: Period Photos and the "Tin War" Site in Northwestern Utah. Paper presented at the 58th Annual Meeting of the Society of American Archaeology, St. Louis, Missouri.

Toulouse, Julian Harrison
1971 *Bottle Makers and Their Marks.* Thomas Nelson Inc., New York.

Walker, Gary Lee
1992 *A History of Fort Duchesne, including Fort Thornburgh: The Military Presence in Frontier Uinta Basin*. Ph.D dissertation, Brigham Young University, Department of History, Provo, Utah.

Whitten, David
n.d. Glass Factory Marks on Bottles. Electronic document, http://www.myinsulators.com/glass-factories/bottlemarks.html, accessed March 13, 2007.

‘Entertainment By John D. Lee’: Excavations and History at Fort Harmony, Utah

David T. Yoder*, B. Jacob Skousen†, and Deborah C. Harris‡

**William Self Associates, †University of Illinois Urbana-Champaign,* ‡Cardno *ENTRIX*

The establishment of Fort Harmony in 1854 created an outpost that helped contribute to the settlement of southern Utah. The primary residence of John Dee Lee during the Mountain Meadows Massacre, the fort stood for eight years until its collapse due to wet weather in January of 1862. In 2007, the Office of Public Archaeology at Brigham Young University, with help from local volunteers, performed preliminary test excavations at the site. The comparison of historic records to the archaeological data offers interesting insights into the construction and use of the fort.

In the late 1840s and early 1850s, Mormon leaders began an extensive effort to colonize areas outside of the Salt Lake Valley. Colonization provided the dual benefits of expanding Mormon territories while simultaneously propelling natural resource extraction. Fort Harmony, an important settlement in southern Utah, was established during this colonization effort (Figure 1). For a time, Fort Harmony served as the base for the Southern Indian Mission as well as an outpost for travelers, government officials, and settlers traveling to Nevada, Arizona, and California.

In 2007, the Office of Public Archaeology (OPA) at Brigham Young University, with help from local volunteers, performed preliminary test excavations at the fort with two general goals. The first was to document the remaining archaeological features and artifacts through surface mapping, excavation, and analysis. The second goal was to assess the nature of the fort’s remains so that plans for future preservation and stabilization could be initiated. The project also provided an excellent opportunity to engage the public in archaeological field research and analysis.

In this paper we recount the history of Fort Harmony, including its founding, construction, daily life at the settlement, and its collapse and abandonment. Much of this history involves John D. Lee, one of the primary founders of the fort, and part of whose residence (identified through oral tradition) was excavated during the testing project. We also discuss how archaeological excavations at the fort have helped clarify the historic record and have provided additional information on previously undocumented features.

Fort Harmony

In April 1850, Brigham Young (president of The Church of Jesus Christ of Latter-day Saints) appointed George A. Smith and Ezra T. Benson to establish settlements and an iron industry in southern Utah (Seegmiller 1998:45). Later that year, when a call for volunteers to assist in this effort went largely unheeded, 150 individuals were selected to labor for twelve months “in the neighborhood of Little Salt Lake where we want to plant a colony” (Seegmiller 1998:45). Young personally chose John D. Lee, a businessman in Salt Lake City, to join the party, and Lee reluctantly conceded (Brooks 1961:153-154). In December 1850, Lee, two of his polygamous wives, and a band of settlers began the journey to southern Utah (Bleak 1928:5-7). The company arrived on the banks of Center Creek on January 13, 1851, and established a community that would eventually be known as Parowan (Seegmiller

Figure 1. Location of Fort Harmony.

1998). Lee returned to Salt Lake City in late 1851 to settle his affairs and move the rest of his family to southern Utah (Cleland and Brooks 1983:1).

During his trip to Salt Lake City, Lee was directed to establish a settlement at the junction of the Rio Virgin and Santa Clara rivers (Prince 2004:172). On January 27, 1852, Lee and 11 men left Parowan and traveled south to explore the area and find a location for future settlement (Cleland and Brooks 1983:1; Deseret News, 3 April 1852). The band eventually settled at Ash Creek, about 22 miles south of Cedar City (Bleak 1928). In the spring of 1852, Lee, Elisha H. Groves, and at least 15 other men began to build a fort at this location, which they called Harmony. The construction of the fort continued throughout that year and into the next. By the spring of 1853, the fort was either completed or near completion, as on March 6 Lee wrote to Brigham Young, "Our fort and corral is snugly enclosed, and our dwelling houses comfortable finished off with the exception of Father Chamberlain. I have built 6 houses for my family, besides helping on every other building in the fort. We have a school taught in the 2nd building erected in this place, in answer to Brother George A. Smith's expectations, as expressed in the Deseret News" (J. D. Lee to B. Young, letter, 6 March 1853, in the Journal History of The Church of Jesus Christ of Latter-day Saints, Harold B. Lee Library, Brigham Young University, Provo).

In October of 1853, Young called 50 men to serve proselytizing missions among Native Americans in southern Utah and the surrounding states (Prince 2004:175). The Southern Indian Mission, as it was later called, was led by Rufus C. Allen. Thomas D. Brown was appointed as the mission clerk and recorder and he kept a detailed journal of the missionaries' travels. The first party of missionaries left Salt Lake City on April 14, 1854, and arrived at Fort Harmony on May 2 (Brooks 1972:4,18; Prince 2004:175). Disagreements arose almost immediately between Lee and the newly arrived missionaries. The missionaries did not approve of the area Lee had chosen for settlement, and the parties soon clashed over leadership. In recording

the debate, Brown wrote in his journal, "After exchange of thoughts and much candor of speech desiring to maintain our present organization till our president came, and Bror Lee desiring that [there] should be but one head and that this was his place though there had been no organization, it was agreed that we should co-operate" (Brooks 1972:18).

On May 19, 1854, Brigham Young, Heber C. Kimball, Parley P. Pratt, and their entourage arrived at the fort. Young immediately declared that the current fort was inadequate, stating "This, I call no fort" and that the settlers should "go up and build a new fort farther north" (Brooks 1972:30-31). The next day, Young broke ground for the new fort and gave directions for its construction. During the next several years, Lee and the missionaries cleared land for farming, dug irrigation works, built a corral for livestock, and constructed the new fort. The original Fort Harmony was abandoned and became known as Kelsey's Ranch or Old Fort Harmony (Bradshaw 1978:130-131; Dalton 1962:186; Cleland and Brooks 1983:1:311).

The construction of the new fort progressed relatively quickly, and by November 25, 1854, Thomas Brown wrote in a letter to Brigham Young, "The foundation of the fort is mostly laid & the adobie work Commenced" (Brooks 1972:92). On February 21, John C. L. Smith wrote to George A. Smith:

> Fort Harmony is built according to the pattern given by Pres. Young last spring. The walls are carried up from six to nine feet high. A good gate is hung and the inhabitants have all moved into the fort and built themselves places of shelter for the winter. A vast amount of work has been done here the past season and a good spirit is among the people [J. C. L. Smith to G. A. Smith, letter, 21 February 1855, in the JHCJCLDS, H.B. Lee Library, BYU, Provo].

The construction of the fort continued for at least another year, however, as by April of 1856 the residents of Fort Harmony were still raising money and laboring to finish the public works (Harmony Branch Meetings 1856-1860:6-7). Once completed, Fort Harmony served as the headquarters for the Southern Indian Mission for several years. In 1857, the headquarters were relocated to a new community on the Santa Clara River because there was not sufficient water for a large population at the previous location (B. Young to J. Hamblin, letter, 1857, in Jacob Hamblin Papers, 1857-1885, H. B. Lee Library, BYU, Provo).

During its existence, Fort Harmony served as a rest stop for people traveling through the area. John D. Lee was frequently engaged in entertaining both local and state authorities, travelers passing through Utah on their way to California, and individuals traveling from northern to southern Utah. Although many of these visitors (particularly local and state officials) were fed and housed at Lee's expense, others contributed to a thriving business. Along with many examples, Lee recounted this one in his journal:

> About this time the unitd States Teamst [ers] commenced passing to california by 100s. As high as 76 Persons has put up at My Mansion of a night. On 11th & 12th I with some of my Family, Namely Emma, Agga, Mary Leah, & Terresa, never undressd ourselves but kept cooking & waiting on travler[s] all night. On the 12th I took in Some 75$ in gold. I chargd them 31 cts. Per meal, & the Same for horse feed. My building were commodious & well finishd & would entertain a thousand Persons comfortably. About the middle of Nov., 1858, I had the sign of an Eagle with the inscription on it, Entertainment by J.D. Lee, paintd & placd in frount of my Mansion, level with the 2nd storry [Cleland and Brooks 1983:1:183].

Life at the Fort

As in most early pioneer communities, life at Fort Harmony was often challenging. Difficulties included relations with the local Native Americans, life under theocratic rule,

lack of necessities, health care, and other issues. Relations between the fort's inhabitants and the local Paiutes were generally good, although conflicts emerged occasionally. Often conflicts revolved around livestock, which the Paiutes would run off (steal) or kill (Cleland and Brooks 1983:1:164-165). Relations with the Utes in the area could also be problematic, with settlers sometimes buying or trading Paiute children that the Utes had captured. Lee himself 'owned' at least four Native American children, and, as with most settlers, felt that he was saving them from lives of destitution.

Pioneer life in the Utah territory was heavily influenced by the Mormon church, and this sometimes led to difficulties. Local political and religious leaders were almost always one and the same, leaving individuals who did not agree with leaders little recourse if problems arose. On one such occasion, Lee recorded that a committee for the 24 of July celebrations wanted him to contribute four of his cattle for a planned feast. Despite Lee's unwillingness to offer the cattle, the committee took the animals and butchered them under the consent of Cedar City's stake president, Isaac C. Haight. Although he felt wronged by these actions, Lee was afraid to question the religious authority, as he stated, "In return my feelings were much Mortified at Such unJust act & requirements. Still I felt that I would rather Suffer wrong then to do wrong or make any disturbance & even expose them" (Cleland and Brooks 1983:1:177).

The residents of Fort Harmony were not immune to disease and sickness; their aliments included toothaches, fevers, headaches, sore throats, coughs, pregnancy and birth issues, heat exhaustion, and others. Disease spread quickly in the close quarters of the fort. One such example was recorded in January of 1858, when an inhabitant of the fort wrote, "this weeke the disease callad north 'the Horse distemper' has taken many of the brethren very sudenly and severely which causes Great Pain in the head and a soreness through all the body. But thank God our heavenly Father it is abating" (Harmony Branch Meetings 1856-1860:54). Despite the author's optimism, a week later they wrote, "Thare was meeting held in the forenoon but owing to the Distemper thare was but few present" (Harmony Branch Meetings 1856-1860:54).

The personal relationships and temperaments of individuals and couples living at the fort often clashed due to power relations, disagreements over land or water rights, marital problems, or simple dislike between individuals. Two prominent people at the fort who had a strong disdain for each other were Lee and Thomas D. Brown. Harsh feelings between the two began almost immediately in 1854 with a disagreement regarding Lee's assumed authority over the missionaries of the Southern Indian Mission. Later arguments grew over the allotment of agricultural land that was given to missionaries, space in the fort, and water rights. Eventually their contempt for one another grew to the point that in December of 1854 Brown was writing poems disparaging Lee in his journal, and stated of one meeting that Lee conducted, "Such a meeting! Government so absolute, power so despotic I have not witnessed in the kingdom of God. How long will this people endure, to be suffered to [be] humbugged?" (Brooks 1972:98-99). The animosity between the two was mutual; Lee prophesied on one occasion that someone in the company was trying to "pull him and Bror Allen down," that evil resulted from disunion, and "one asp in our midst did or would destroy all!" (Brooks 1972:116-117). Despite their intense dislike for one another, Lee and Brown could work together when necessity required (Brooks 1972:126).

Interpersonal problems also took place in marriages, with polygamy sometimes contributing to the strain. At the time polygamy was openly practiced in Utah, and some women were unhappy with their allotted arrangements. One such example is Lee's marriage to Mary Ann Williams. Mary Ann and Lee had apparently written at least three letters to President Young asking for advice on their marital problems (Cleland and Brooks 1983:1:176, 323).

Eventually Mary Ann divorced Lee and married his eldest son John Alma Lee in 1859, with John D. Lee's blessing. In discussing Mary Ann's unhappiness with their marriage, Lee offered insight into married life at the fort when he wrote, "in fact near ½ the women in Fort are alienatd in their feelings from their Husband" (Cleland and Brooks 1983:1:176).

Despite these difficulties, life at Fort Harmony could also be one filled with happiness and revelry. Lee recounts the celebrations of July 4, 1858 in his journal and recorded that the day consisted of a parade, music from a brass band, speeches by local authorities, public feasts, drinking, singing, and dances (Cleland and Brooks 1983:1:171-174). Local inhabitants often sponsored dances at the fort and participated at those in Cedar City, Washington, and St. George. Christmas was also a celebrated occasion, as Lee wrote in 1858:

> Chrismas. About 3 in the morning I was aroused from my slumber by the firing of Guns, hailing the birth day of the Mosiah. At 10 O'Clock morning I attend a scholastic Exhibition the Social Hall…At 2 P.M. I gave the Scholars a Dinner in my Family dining Hall & at early candle light a Social Party in the Social Hall…The Music was Melodius & sprightliness on every countenance, & never did children enjoy themselves more then they did. At 12 night the party broke up [Cleland and Brooks 1983:1:186].

Between holidays and parties, Fort Harmony residents found other ways to amuse themselves. Beer and hard liquor were present at almost all major celebrations and were consumed throughout the year. Although the Mormon church officially adopted the Word of Wisdom (a health and spiritual code which forbids the consumption of certain items, alcohol included) as a commandment in 1851, many members of the church continued to use alcohol, tobacco, and other 'forbidden substances' for some time. Other activities are only briefly mentioned in the historic record, yet help to humanize the past. One such example comes from the Harmony Branch Meetings, where the author recorded that during a Quorum meeting on October 5, 1857, "the time was occupied in righting some of the Teachers and Deacons alma Lee and Sml E Groves confesed their faults in playing and cuting up in the way they did one Eveing in the Carrel in runing about in a state of nudity &c" (Harmony Branch Meetings 1856-1860:49).

Spirituality also played a critical role in life at the fort. Church meetings were held regularly on Thursdays and Sundays, and in 1856 a 'reformation' was instigated by Mormon leaders to increase the 'spirituality' of church members. The reformation increased the religious fervor of fort residents, motivated many of them to be rebaptized, and led them to refrain from administering the Sacrament of the Lord's Supper for a time (Harmony Branch Meetings 1856-1860). Spirituality was also exhibited through belief in miracles and heavenly interventions. The act of administering to sick individuals by male members of the church was often believed to have instantaneous healing effects. Other forms of spirituality were recorded at the fort, including dreams and visions, prophecies, speaking in tongues, and possession by evil spirits. Lee recorded multiple dreams and visions he believed were sent to him by God to help him better govern the community and to warn him about spiritual and temporal danger (Cleland and Brooks 1983:1:151–153, 164, 180, 203, 205). Lee and other members of the community spoke in tongues when they felt inspired by the Holy Ghost (Brooks 1972:116; Harmony Branch Meetings 1856-1860:28, 59). Interestingly, this practice seemed to be accepted by Lee when he was the one interpreting, yet was discouraged when others attempted to do so. Thomas D. Brown recorded in his journal on March 11, 1855:

> When the choir was singing at the close of the meeting Bror Wm. Young, overcome by the power of the spirit & being unwilling to quench it, arose and spoke in a mellifluous unknown tongue, much resembling the Greek in its terminations—'on' &c. apoliston—episton -&c. and afterwards interpreted it: 'Wake up oh my

> people, purify yourselves and prepare for coming events' for which interruption he was rebuked by J.D. Lee – 'God's house is a house of order'. [Brooks 1972:116]

The historic records note at least three purported cases of possession by evil spirits at Fort Harmony, all of which were believed to have been dealt with through the priesthood authority of local male members (Harmony Ward Record 1861-1870:3, 7). One incident occurred on January 4, 1862:

> This evening Harvey A Pace came running to Prest Lee for help; said that Geo Sevys wife and children were all lying speachless frothing at the mouth as tho they were poisoned: their jaws locked. I felt that Satan had prostrated them. I told the father not to be alarmed for none of them would die just yet. as I entered the Tent the Father sat upon the ground. He attempted to arise but fell back. I called upon Elder Harvey A Pace to lay on hands with me: We laid hands upon all 4 rebuking the powers of darkenss in the name of the Lord Jesus Christ and immediately they all recovered and raised up. Prest Lee then laid hands upon Elder Sevy before he could sit upright. In the absence of Prest Lee Satan entered Emma and Agatha Ann his wives and tried to strangle them to death. Also Louisa his daughter, but through the prayer of faith through the administration of Elder S. D. White and R. Woolsey they were relieved. [Harmony Ward Record 1861-1870:3]

Collapse and Abandonment

On May 31, 1861, Brigham Young claimed that Fort Harmony "was the best Fort that had ever been built in this territory" (Cleland and Brooks 1983:1:313). Seven months later, however, the fort was destroyed by a severe winter storm. John D. Lee was chosen as president of the Harmony branch on December 22, 1861, and sponsored a feast and party on Christmas Day. Rain likely started to fall on December 25, and the storm (alternating between rain and snow) continued almost unabated for nearly 40 days thereafter. The severity of the storm was expressed eloquently by Lee. On December 29 he wrote, "Through the week the storms still raging; prospects dark and gloomy; the Earth is a sea of water and thus closes 1861" (Cleland and Brooks 1983:2:5). The new year brought no relief, and Lee wrote on January 1, "Begins with a storm. The face of the country is deluged in water" (Cleland and Brooks 1983:2:5). Because the fort was made of adobe, the constant wet and damp environment quickly began to have deleterious effects on its architecture, as Lee recorded on January 4, 1862, "Fort Harmony is almost decomposed and returned back to its native element" (Cleland and Brooks 1983:2:5).

To escape the decomposing fort, Lee and some of his family tried to weather the storm in partially completed structures on his farm to the west. However, this site also flooded as Lee recorded, "the water in their underground rooms raised to the depth of 3 feet. Bailing night and day, but unable to keep it out and were at last compelled to abandon them and take the storm in shantys made of planks" (Cleland and Brooks 1983:2:5).

Portions of the fort appear to still have been usable, however, as on January 5 a noon meeting was held in Lee's upper family hall. As the storm continued, Lee moved more of his family out of the fort, writing on January 13, "The storm still raging, spreading a mantle of gloom over Harmony, the walls of which are constantly crumbling down, rendering the houses actually dangerous . . . instead of meeting, Prest. Lee sumoned another portion of his family to the upper place. About 9 at night a dreadful snow storm on them" (Cleland and Brooks 1983:2:5). The continuing degradation of the fort is expressed as Lee wrote on January 14:

> The Pres. removed the remainder of his family on the west line and spent another night of gloom and darkness: parts of walls constantly falling. This was a time of watching as well as praying, for there was a prospect of being buried up in masses of ruins; about midnight a part of the South wall fell with an awful crash…at length daylight came. Storm still raging. [Cleland and Brooks 1983:2:6]

On January 18 or 19, Lee moved the rest of his family out of the fort (except for Sarah C. Lee and her children). But a few weeks later, on February 6, 1862, tragedy struck when two of Lee's children (George A. and Margarett Ann) were killed by a collapsing wall. Lee describes the event:

> The President had all his family removed except Caroline Wagons and Teams were all got ready to remove them on the 7th. They would have been removed before had not Sarah Caroline insisted to remain a few days longer to finish up her spinning. Felt there could be no danger as the roof was removed and the rain ceased. Yet the President said that it was not agreeable with his feelings for them to remain there. About dark the mother felt impressed to leave the room. While in the act of making up her bed, leaving the clothes in a chair, took Terressa with her and the 2 older children, leaving the youngest in. When a few paces from the door, a sudden gust of wind dashed from the N., through [threw] down a single partition wall into the floor and broke through to the lower floor, killing of the children, little Geo. A. and Margarett Ann. The other two each was at the feet of the two that was killed. A shocking and sad occurrence–the father and mother had both been warned of it previous. [Cleland and Brooks 1983:2:7]

Fort Harmony was uninhabitable after the storm, and the remaining settlers moved to New Harmony or Kanarraville. The fort was mentioned a few more times in various documents. During the spring or summer of 1862, Lemuel Redd was reported to have gathered rocks and adobe bricks from the fort for his new chimney (Hatch 1964:21), and in April of 1868, Emma (one of Lee's wives) received a fictitious letter supposedly from Major Burt of Camp Douglas stating that Lee was to be "hung up in that old Fort Harmony" for his involvement in the Mountain Meadows Massacre (Cleland and Brooks 1983:2:100-101). This suggests that by 1868 at least a part of the fort was still standing or intact to some degree.

Comparing History to Archaeology

Two areas within the fort were chosen for test excavations in 2007 (Figure 2) (Yoder et al. 2007). The first was a 1 by 1 m test unit near the center of the fort that was excavated in an attempt to locate the original use surface of the interior courtyard. Excavation revealed relatively clean stratigraphy, with a 5 to 10 cm thick stratum likely associated with the fort's occupation, roughly 20 to 30 cm below the modern ground surface. The other area tested was a 2 by 7 meter block located in the southwest corner of the fort. This is the area that local historians and oral tradition suggest was occupied by one of John D. Lee's wives, possibly Sarah Caroline Lee. Excavations in this corner of the fort were conducted to determine whether intact deposits still existed within the rooms of the fort, the extent and function of the corner rooms, and the nature of the floor.

Numerous descriptions of the dimensions and features of Fort Harmony have been recounted by first, second, and third hand accounts (Alter 1944; Bradshaw 1978; Brooks 1961, 1972; Cleland and Brooks 1983; Church Historian's Archive: Microfilm CR 1,2,3,4, 1 reel 86_Box 74, folder 36; Dalton 1962; Englestead 1979; Grant 1995; Harmony Branch Meetings 1856-1860; Harmony Ward Record 1861-1870; Packer 1990; Prince 2004) (for a more complete discussion of these different 'versions' of Fort Harmony see Yoder et al. 2007); however the two most reliable seem to be given by Thomas D. Brown and Trueman O. Angell. Brown recorded that during his visit to the original Harmony settlement, Brigham Young gave instructions on how the fort was to be built, and afterwards stated, "We shall send you down by mail a more correct plan" (Brooks 1972:31). Accordingly, Trueman O. Angell (the church architect) drew up detailed plans for Fort Harmony (the written portion of which is in the Church archives in Salt Lake City, however we were unable to locate the corresponding architectural drawings) (Church

Figure 2. Aerial photo of Fort Harmony in 2007, facing west.

Historian's Archive: Microfilm CR 1,2,3,4, 1 reel 86_Box 74, folder 36). In the remainder of the article we discuss what was found in the archaeological record, and how this compares to how the fort has been described historically. The excavations also provided knowledge about features not mentioned in the historic records, further emphasizing the utility of combining archaeological fieldwork with historic research.

Fort Dimensions

There are two basic accounts of the size of Fort Harmony. The first describes the fort as being 200 feet square (Alter 1944:54; Brooks 1961:181; Church Historian's Archive: Microfilm CR 1,2,3,4, 1 reel 86_Box 74, folder 36; Prince 2004:175) while the second describes the fort as being 100 yards, or 300 feet, square (Bradshaw 1978:130; Dalton 1962:186; Englestead 1979:2; Packer 1990:X-11). None of the accounts that describe the fort as being 300 feet square give any references as to where they acquired this information, but all of them postdate 1936. This is when the Daughters of the Utah Pioneers (DUP) erected a plaque on the site that reads in part, "The wall was 300 feet square." It is likely that the later references used this information as their basis for the dimensions of the fort, although where the DUP obtained their information is unknown. Surface and subsurface mapping by OPA in 2006 and 2007 demonstrated that the foundation of the fort is in fact 200 feet square.

Foundation

Neither Young's directions or Angell's plan describe the foundation of the fort, but other firsthand accounts suggest it was built of rock. In November of 1854, Brown wrote, "Hunting Rock

for foundation & most missionaries & settlers engaged Building Rock and adobies" (Brooks 1972:91). Later Brown recorded that "The foundation of the fort is mostly laid & the adobie work Commenced" (Brooks 1972:92), implying that the foundation was done with a material other than adobe. Finally, in December of 1854, Brown mentioned, "Laying the rock foundation of my house in Fort" (Brooks 1972:100). Excavations revealed that the foundation of the outer fort wall (as well as the interior house foundations) in the southwest corner of the fort was indeed made of stone as Brown claimed.

Walls

The historic record clearly indicates that the fort walls were to be made of adobe. Brigham Young stated that the adobe bricks should measure 12 by 6 by 4 inches (Brooks 1972:31), while Thomas Brown, in discussing the construction of the fort's outer wall, mentioned that one course of adobe bricks was 10 inches thick (Brooks 1972:98). Firsthand accounts record making, hauling, and using "adobie" bricks for fort construction (Brooks 1972:90-92, 97-98, 102). During excavation, adobe bricks and brick fragments were found throughout the general fill in the southwest corner of the fort, and uncovered walls were also constructed of adobe bricks. For the most part, the bricks within the fill were fragmented and weathered, but two nearly complete examples were recovered. One measured 10 ½ by 4 7/8 by 3 ½ inches and the other measured 10 ¼ by 4 ¾ by 3 ¼ inches. These bricks are somewhat smaller than the dimensions given by Young and better fit those given by Brown.

The thickness of the walls were discussed by both Young and Angell, who stated that the inner wall (walls of the houses) should be 18 inches thick and the house partition walls 12 inches thick. However, the two accounts disagree on the thickness of the outer fort wall, as Young stated it should be 2 feet thick (Brooks 1972:31) and Angell stated 3 feet (Church Historian's Archive: Microfilm CR 1,2,3,4,1 reel 86_Box 74, folder 36). In the quote below, Brown suggested the wall was 40 inches thick (3 1/3 feet).

One of the most interesting accounts dealing with the walls at Fort Harmony was given by Brown in 1854. While attending the Sunday meeting at the fort on December 3, Brown wrote:

> in the evening went to meeting, sat in much pain hearing J.D. Lee hammering whaling or lampooning some unknown person, telling a dream about some one cutting his hair short & what woes would befall him, who should interfere with the head - "wither - wilt and be dammed"! It came out that some of the building committee had interfered to prevent Bror Lee putting his rotten adobies, rubbish in the centre of the outside wall, which should be 40 inches of solid adobies; instead of which he put 1 course of adobies 10 in. outside & inside and filled up the centre 20 in. with rotten adobies, not so good as damp clay would have been, this was the "interfering with the head." This committee was appointed by the people to see that this Fort was built as required by Prest. B. Young's plan. Bror Atwood requested that the Building Committee be released from their duties & responsibilities as a building Committee, as bror Lee had said this Committee had exceeded their bounds. J.D. Lee said he had appointed Lorenzo Roundy - the bos-workman & reserved to himself the right of being his counsellor and if said Roundy did not interfere - the building Committee had no right. Bro Atwood then wanted to know what the duties of the Building Committee were? This was not satisfactorily answered, but the Committee were still to be a Committee, they were to do as they were told & the responsibilitiy should not rest upon them, he was appointed to build this Fort and he only was responsible [Brooks 1972:98].

This entry gives us an important insight into the structural nature of the fort. Lee was building the outer wall of the fort by laying two thin adobe brick walls and then filling the space between them with 'rotten adobies' which Brown felt were as bad as wet clay. Although we have no further references to this incident, the finality of Lee's statement suggests that the

building of the fort continued after this manner. A wall constructed using a rubble core (in this case filled with soft adobe brick fragments) is not as structurally sound as a wall built using solid construction throughout. Therefore, the cracking of the fort's wall during the earthquake in 1860 and the rapid decomposition of the structure during the storms in 1862 becomes much easier to understand. Although it is impossible to know what may have happened had the wall been built with a solid core, the possibility exists that Lee's building technique may have contributed to the collapse of his home and subsequent death of his two children.

This is currently only supposition, as none of the outer fort wall was intact in the areas where test excavations took place, and we were unable to confirm or deny whether the outer wall was built of solid adobe bricks or with a rubble core. Excavation did reveal information about the interior walls, with the partition wall between Rooms 1 and 2 being roughly 8 to 10 in wide (two bricks thick laid lengthwise on an east/west axis) and seven extant courses tall (Figures 3 and 4). Although this disagrees with Young and Angell's instructions for the interior walls to be 12 inches thick, it matches Brown's description of the size of the bricks used in construction.

Houses/Rooms

There is relatively little information about the dimensions and nature of the houses/rooms from historical accounts, although Young ordered the rooms to be 15 feet square (Brooks 1972:31). Lee's journals and notes from the Harmony Branch Meetings make clear that at least some of the houses had plastered walls (Cleland and Brooks 1983:1:154; Harmony Branch Meetings 1856-1860:18). Exterior surface treatments were also employed, as Lee mentions using roughcast (a plaster made of lime, cement, and gravel) on the exterior of his buildings (Cleland and Brooks 1983:1:178). In addition, some of the rooms may have been painted or wallpapered. On June 29, 1858, Lee wrote "I also was buisily engaged with 12 hands Painting, Papering & fitting up My Mansion to receive the company" (Cleland and Brooks 1983:1:171).

Two rooms were partially excavated in 2007, but complete dimensions are not possible given the small area tested. It appears, however, that the length of Room 1 (F500) is approximately 20 ft (6.1 m). If correct, this would be at odds with Young's directions for each room being 15 ft square. Fragments of plaster found throughout the fill of Room 1 support descriptions that some of the rooms were plastered. Other cultural materials found in the fill of Room 1 included bricks and brick fragments, ceramics, glass, wood, faunal bone, and metal (including a monocle) (Figure 5).

Fireplaces

The only description of fireplaces within the rooms comes from Angell's plans that noted their internal dimensions: "The fireplaces are arranged in their proper stations; they may be made common size say 3 feet 4 inches long, 2 feet 8 or 10 inches high, 15 or 18 inches deep and on either side you have a first rate place cupboards" (Church Historian's Archive: Microfilm CR 1,2,3,4,1 reel 86_Box 74, folder 36). A possible fireplace was discovered in Room 1, and a fireplace and chimney were discovered in Room 2. In the southwest corner of Room 2 a portion of the fireplace was uncovered; it was composed of at least four large, flat stones arranged in a rectangle. On top of the stones and near the center of the feature was a light colored ash deposit with flecks of charcoal interspersed (Figure 4). To the south of the fireplace, and separated by a brick archway, was the chimney for Room 2 (Figures 4 and 6). The archway measured approximately 19 in high by 15 in wide and was filled with ash, charcoal, and structural debris. The chimney box measured 40 in east to west and 20 in north to south. A thimble and eggshell fragment were found directly on the floor of the chimney box, and the fill included many small burned brick fragments as well as ash and charcoal.

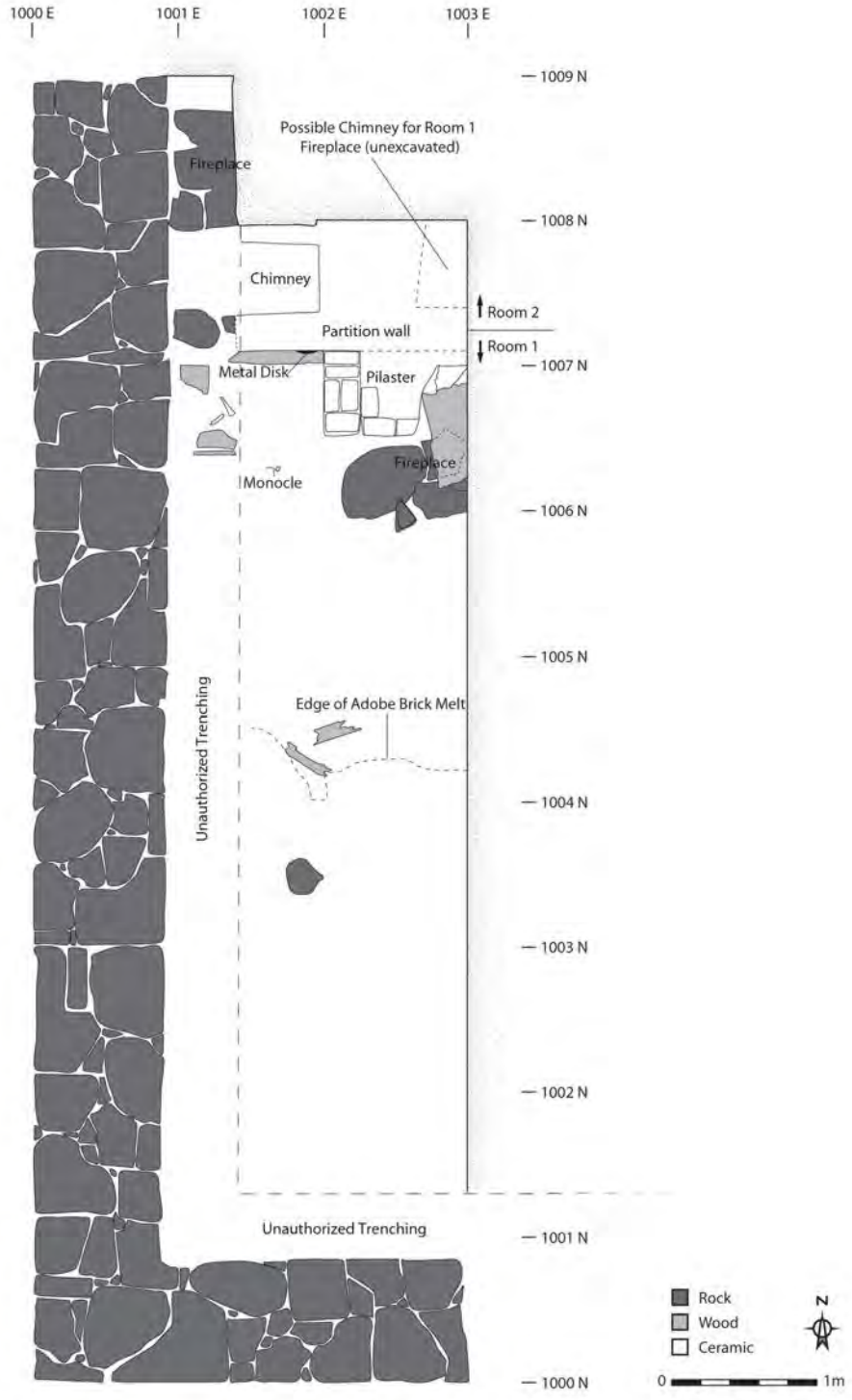


Figure 3. Plan view of excavation in southwest corner of fort.

Figure 4. Northern portion of Room 1 (on right) and southern portion of Room 2 (on left), facing east. Features are as follows: a) fireplace, b) brick archway, c) chimney, d) partition wall dividing Rooms 1 and 2, e) possible pilaster, f) possible fireplace.

A concentration of large angular stones lying near the base of the northern wall in Room 1 was likely the remains of another fireplace, however the area seemed to have been disturbed by post-depositional processes (Figures 4 and 7). As the features were not completely excavated, we are unable to compare them to Angell's instructions for fireplace construction.

Other Features

The historic record provides limited information on a number of other features and aspects of Fort Harmony (including a gate or gates, a porch or patio, privies, guardhouse, well, guard walk, a pool in the center of the fort, windows, various "halls," carpenter shop, corral, etc. [Yoder et al. 2007]). While the test excavation did not find any of these other features, it did identify a limited number of features not mentioned in written sources. The chimney in Room 2 is one such example, but two others are worthy of discussion: a possible pilaster and floor.

A roughly square column of bricks built against the north wall of Room 1 measured approximately 28 in east to west and 20 in north to south (although original dimensions may have been greater) (Figure 7). This feature may have functioned as a pilaster used to support the second story of the fort, or alternatively, may have acted as a support for a mantle or some

Figure 5. Monocle from fill of Room 1.

type of coping or finishing for the opening of the fireplace (although these interpretations seem unlikely given its relative thickness and bulk).

In Room 1, along the base of the partition wall that separated Rooms 1 and 2, remnants of wood planks were found lying lengthwise in a general north/south direction (Figure 8). Additional plank fragments were also found in the fill of the room. It is possible that the planks along the base of the wall were the remains of a floor, although a layer of bricks was found below these wood fragments. Unfortunately, the excavation was terminated before they could all be removed.

Conclusion

From roughly November of 1854 to February of 1862, Fort Harmony served as one of the primary communities in southern Utah. Historic records paint an interesting picture of the fort, its inhabitants, and their everyday experiences. Combining archaeological evidence with historic documentation provides a more accurate picture of the fort itself, and suggests that while the builders of Fort Harmony followed the general outline prescribed by church and government officials for constructing their community, they also adjusted the specifics in ways that presumably better suited their needs. Archival

Figure 6. Curved archway in northern wall of chimney in Room 2 (unexcavated), facing north.

Figure 7. Possible pilaster (a) and fireplace (b) in Room 1, facing north.

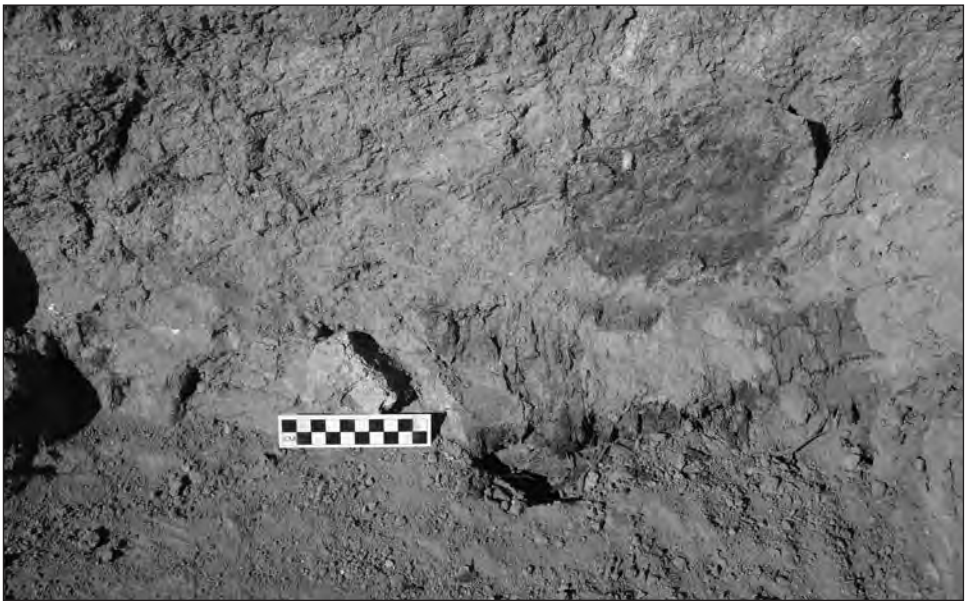


Figure 8. Metal disk (likely can lid) along base of north wall of Room 1; below disk are wood plank remnants.

research and test excavations by the Office of Public Archaeology at Brigham Young University in 2007 found that the actual wall and room dimensions differed from those prescribed by Mormon church leaders, and in the case of the construction of the fort's exterior walls, this deviation may have actually contributed to the fort's collapse and subsequent abandonment. The excavations also helped confirm other aspects of the historic record, such as the plastering of interior rooms, the presence of fireplaces, and the thickness of partition walls; they simultaneously revealed new information not explicitly found in the historic record, such as the placement of the fireplaces and associated chimneys within rooms and the possible nature of the floors. Additional work, including more expansive excavations, is warranted, and could greatly increase our knowledge of this fascinating piece of Utah history. ■

David T. Yoder
William Self Associates
1579 North Main St., Suite 106
Cedar City, UT 84720
davidtyoder@gmail.com

B. Jacob Skousen
University of Illinois Urbana-Champaign
Department of Anthropology
109 Davenport Hall
Urbana, IL 61801
Email: bskousen@illinois.edu

Deborah C. Harris
ENTRIX
807 East South Temple, Suite 350
Salt Lake City, UT 84102
Email: dharris@entirx.com

References

Alter, Cecil J.
1944 The Mormons and the Indians: News Items and Editorials, from the Mormon Press. *Utah Historical Quarterly* 12:54-68.

Bleak, James G.
1928 *Annals of the Southern Utah Mission*. Manuscript on file (photocopied reproduction created in 1928), Harold B. Lee Library, Brigham Young University, Provo.

Bradshaw, Hazel (editor)
1978 *Under Dixie Sun: A History of Washington County By Those Who Loved Their Forebears*. Daughters of the Utah Pioneers and Garfield County News, Panguitch, Utah.

Brooks, Juanita
1961 *John Doyle Lee—Zealot, Pioneer Builder, Scapegoat*. Utah State University Press, Logan.
1978 Chapter II: The Southern Indian Mission. In *Under the Dixie Sun: A History of Washington County By Those Who Loved Their Forebears*, edited by Hazel Bradshaw, pp. 23-34. Daughters of the Utah Pioneers and Garfield County News, Panguitch, Utah.

Brooks, Juanita (editor)
1972 *Journal of the Southern Indian Mission: Diary of Thomas D. Brown*. Utah State University Press, Logan.

Cleland, Robert Glass, and Juanita Brooks (editors)
1983 *A Mormon Chronicle: The Diaries of John D. Lee: 1848-1876*, 2 vols. University of Utah Press, Salt Lake City.

Dalton, Luella Adams (editor)
1962 *History of the Iron County Mission and Parowan the Mother Town*. Parowan, Utah.

Deseret News
1852 Letter from Elder John D. Lee. 3 April. Salt Lake City, Utah.

Englestead, LaVerna T.
1979 A History of New Harmony, Utah. Manuscript on file, Office of Public Archaeology, Brigham Young University, Provo, Utah.

Grant, Sheldon
1995 Harmony, Fort Harmony, New Harmony, and the Surrounding Area. Manuscript on file, Office of Public Archaeology, Brigham Young University, Provo, Utah.

Harmony Branch Meetings
1856-1860 New Harmony Branch Record Book, 1856-1860. Manuscript on file, Harold B. Lee Library, Brigham Young University, Provo. (Alternately known as the 'Journal of Rachel Andora Woolsey Lee 1856-1860' or as the 'Minutes of Meetings Fort Harmony, Utah')

Harmony Ward Record
1861-1870 *Record of the Church of J. C. of L. D. S. in the Harmony Branch and Ward*. Manuscript on file, Utah State Historical Society, Salt Lake City.

Hatch, Nelle Spilsbury
1964 *Mother Jane's Story*. Shafer Publishing Company, Wasco, California.

Larson, Andrew Karl
1978 Chapter III: Irrigation and Agriculture in Washington County. In *Under the Dixie Sun: A History of Washington County By Those Who Loved Their Forebears*, edited by Hazel Bradshaw, pp. 35-60. Daughters of the Utah Pioneers and Garfield County News, Panguitch, Utah.

Packer, Murland R.
1990 Life History of Elisha Hurd Groves (1797-1867). Manuscript on file, Harold B. Lee Library, Brigham Young University, Provo.

Prince, Stephen L.
2004 *Gathering in Harmony: A Saga of Southern Utah Families, Their Roots and Pioneering Heritage, and the Tale of Antone Prince, Sheriff of Washington County*. The Arthur H. Clark Company, Spokane.

Seegmiller, Janet Burton
1998 *A History of Iron County: Community Above Self*. Utah State Historical Society, Salt Lake City.

Yoder, David T., Jacob Skousen, Deborah C. Harris, and Richard K. Talbot
2007 *Report of Excavations at the Fort Harmony Historical Site, Fort Harmony, Utah: 2007*. Museum of Peoples and Cultures Technical Series No. 08-1, Provo.

Pursuing Their American Dreams: The Residents of Benmore and Tintic Junction, Utah

Jennifer A. Beard

Surface data from the dry farming town of Benmore, when compared to surface and excavation data from the railroading town of Tintic Junction, give insight into how two groups of people, pursued their own American Dreams. The data suggest that the residents of Benmore sought partially to operate outside of the capitalist economy of the early Twentieth Century. This comparison provides means to evaluate the utility of householding theory when studying homestead sites throughout the American West. It identifies the extent to which the residents of Benmore were householding as a community in an effort to maintain their farms in a marginal dry farming environment rather than abandoning the town for wage labor jobs.

The American West is stereotyped as a homogenous environment in which small mining towns filled with horses and saloons played host to men seeking to make their fortunes or where open flatlands housed calloused farmers. Historical and archaeological research is illuminating a complex landscape in which many different cultural systems operated on individuals seeking their unique American dreams. The residents of the two towns addressed in this article had different American dreams (Figure 1). Tintic Junction, a railroad section station, was filled with working men earning wages. The cash gave them the freedom to purchase what they needed or wanted. Benmore, however, was composed of families whose hard work was in pursuit of freedom through land ownership and seeking self-sufficiency.

This article briefly summarizes some of my previous findings (Beard 2008), telling the story of how the desert south of Vernon, Tooele County, Utah, was settled in the tiny town of Benmore. I discuss possible reasons why a town whose residents were hopeful that their settlement would one day become large, well-established, and famous, is now little more than trash scatters and foundations barely visible beneath the sagebrush. To accomplish this goal, I compare Benmore to Tintic Junction.

Historical Background

Tintic Junction was researched extensively by Seddon et al. (2001). One of historical archaeology's strengths is the ability to combine historical records and oral histories with physical evidence to produce a more complete picture (Deagan 1996; Galloway 2006; Little 2007). Some of the historical records used for Benmore include General Land Office and Tooele County recorder's office records, which are available online and at the recorder's office, respectively. Records of the Benmore Ward of the Church of Jesus Christ of Latter-day Saints also were accessed. In addition, former residents, now residing primarily in Vernon, Utah, have both written their stories and shared them with their community and the Forest Service (Stemmons 1998; Mitchell group interview, August 2, 2005, notes on file at Uinta-Wasatch-Cache National Forest office in Provo, Utah). Another valuable source of information on Benmore was the journal of Israel Bennion (Figure 2), primary founder of the town (Israel Bennion Journal, Bennion Family Trust, Vernon, Utah; subsequent citation = [IBJ, date]).

Benmore, Utah

Benmore was settled at the south end of Rush Valley and was considered a community apart

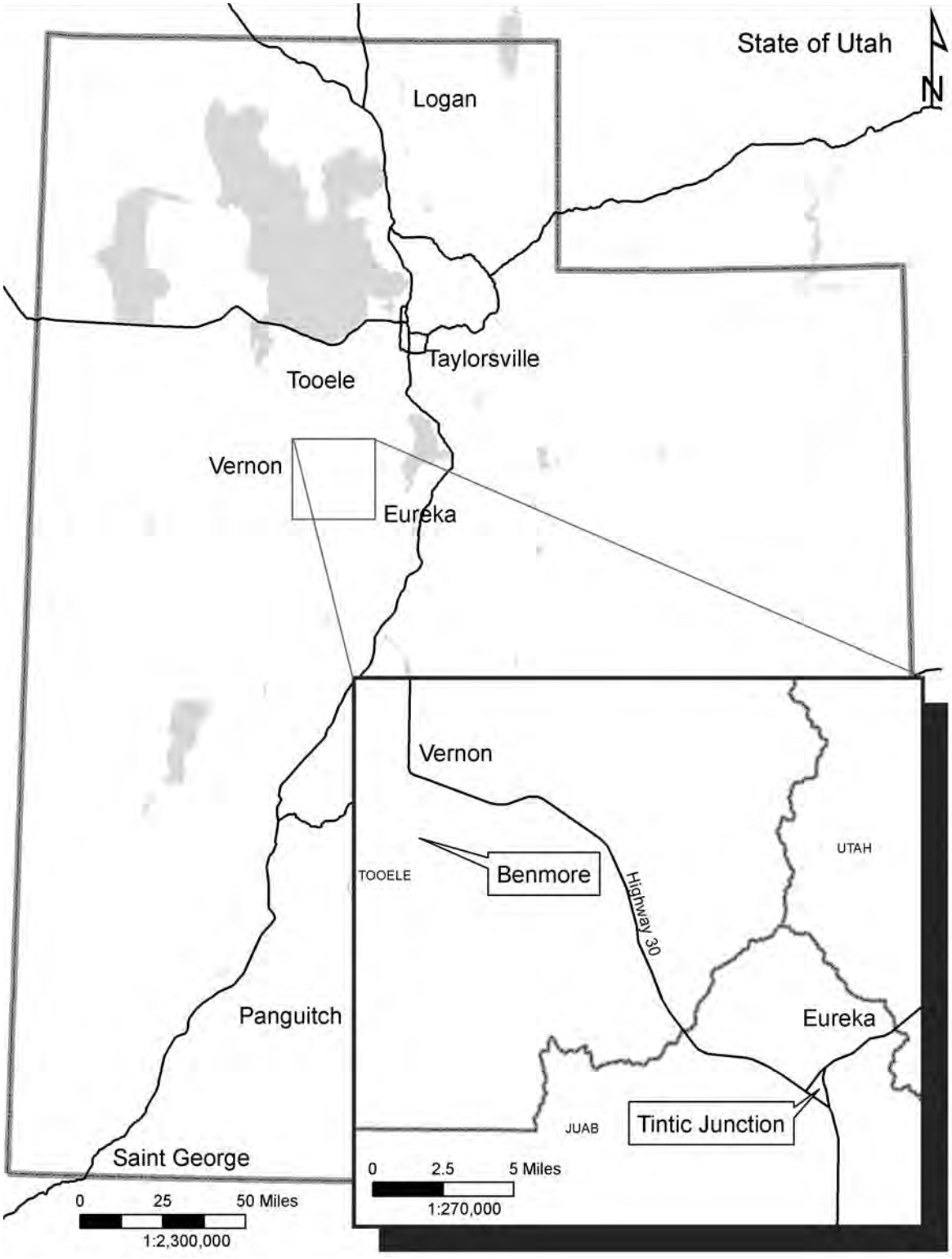


Figure 1. Location of Benmore and Tintic Junction.

Figure 2. Photograph of Israel Bennion. Courtesy of Elizabeth Mitchell.

from its sister city, Vernon, from 1914 to 1924. It was located five miles south of Vernon in order to be closer to several annual and perennial streams that run north toward Vernon out of the Sheeprock Mountains. Dry farming was the new, popular method for surviving the American West's deserts, and there were several towns besides Benmore utilizing the method in Utah during this time. Charles H. Skidmore and his brother Justin established the Rush Valley Farming Company, where they practiced dry farming on 10,000 acres of land, and others followed suit. In wet years, the wheat yielded fairly well, but in dry years, which were frequent, the crops struggled and failed. Goods and services were available to Benmore residents from multiple sources. The nearest railroad sidings Dunbar and Lofgreen were located 5.4 miles and 5.8 miles from the center of town. Goods from the east coast and international locations could be brought in on the railroad in addition to the merchandise, which could be ordered from the nearer large towns along the line. Sears Roebuck catalogs were probably common and Bennion notes that he grew weary of traveling salesmen (IBJ February 12, 1917).

By 1919, most families had realized that the area was not wet enough for dry farming and left for areas with more water. In one of many national programs designed to assist farmers affected by post-war conditions and the Great Depression, the United States government established the Agricultural Resettlement Administration, and the Benmore dry farming area was purchased by the government between 1934 and 1936. Most residents returned to homes closer to Vernon or left the area altogether. In 1954, the Forest Service began to manage most of the area associated with Benmore.

Tintic Junction, Utah

The history of Tintic Junction is tied to that of the San Pedro, Salt Lake, and Los Angeles Railroad (SP, SL, & LA) line. The town was never incorporated into more than a railroad section station for that line. The line's specific location, running just west of Eureka, was chosen for the purpose of easily accessing the rich mineral wealth of the Tintic Mining District. There were more than 30 buildings and structures associated with the Tintic Junction section station, not including section foremen houses and some other residences, making it one of the larger section stations along the line.

Residents of Tintic Junction purchased their food and other items at Eureka or ordered them through railroad commissaries at reduced employee shipping costs. Changes occurred during the 1940s, which resulted in Tintic Junction's demise. A centralized traffic control system and route changes affected the importance of the section station. By 1948, the Tintic Junction roundhouse was dismantled and employees were transferred elsewhere (Hutmacher and Lawrence 2001). The town was left to the few transient residents who would pass in and out of the area through the 1960s, and it is now little more than the location of a highway crossroads outside of Eureka.

Householding

The residents of Benmore and Tintic Junction approached the budding capitalist economy of the American West in different ways, searching for their different versions of the American dream. One social theory that can be useful when studying capitalist societies is householding.

Householding is the practice of relying on informal economic activities in order to survive on the margin of, or resist, the formal capitalist economy. Rhoda Halperin (1994:193–194) defines informal economies as "locational and appropriational movements outside of the mainstream economy." Locational movements, or changes of place, are exchanges of goods across space (Halperin 1994:58). Appropriational movements, or changes of hand, are exchanges of goods to a different user (Halperin 1994:58). These exchanges are conducted outside of the formal, most often capitalist, economy and are therefore defined as part of an informal economy that operates within, but separate from that formal economy. Householding involves utilizing extended family or community to provide mutual support, thereby allowing individuals and families to successfully survive while avoiding or limiting participation within the mainstream economy. Householding was reintroduced by Karl Polanyi (1944) from Aristotle's work. Halperin (1994) studied Polanyi's collected works and his discussion of householding provided a framework for her studies of informal economies among rural communities within capitalist societies.

Halperin (1994) tested the concept by observing a Kentucky family that spread its members between contexts she refers to as Deep Rural, Shallow Rural, and the City. The three generations of family members all worked together as a householding network, but they were spread out geographically. Householding worked for them because the kin network involved is able to tap into many different means of production in order to continue to operate outside of the mainstream economy. Halperin (1994:164) admits that "cash must be generated… for purchasing those necessities that people cannot produce or obtain in any other way." Her model Kentuckian householders actually had multiple individuals working wage jobs well away from the family crops. The need for cash, even very little, necessitated some involvement in the mainstream economy. Thus, the concept of householding is not a complete separation of a group from capitalism, but a more limited involvement therein when compared to the norm. Based on the Kentucky example, it may also be necessary to be spread out geographically in order to survive by taking advantage of multiple cash and non-cash means of production.

The informal economy established when Latter-day Saint settlers (Mormons) entered Utah relied heavily on self-sufficiency and was, in part, a product of Utah's initial isolation from the rest of the United States (Scott 2004). The Homestead Act of 1862 was the first of several settlement and land acquisition acts that increased settler awareness of lands outside Utah's growing population centers, though by the Benmore period, it was the Desert Land Act of 1877 and private sale or trade that generally were the means of land acquisition. The town of Benmore, Utah, was a small homesteading community consisting of about 20 families who all participated in farming and/or ranching. The community appears to meet the characteristics of Halperin's (1994) rural householding community because historical records and oral history suggest that the residents were largely united in an effort to support one another. Bennion writes:

> Helped David to pick potatoes. In the field were David, Owen, Archie, and I, brothers; and my three boys, Mervyn, Howard, and Glynn. Keeping the work in our own family and exchanging work is an important factor of success on the farm… [IBJ, May 10, 1914]

But does Benmore actually fit Halperin's model for rural householding? I wanted to determine whether householding might be useful in studying the archaeology of the West despite the potential

limitation of geographic spread necessary to householding.

Because householding is best identified by comparison to the mainstream economy, I also compared Benmore to Tintic Junction, approximately 20 miles away. Tintic Junction was on the same railroad supply line as Benmore but was part of a multiple-town community (particularly including the larger mining town of Eureka) with a significantly higher population than Benmore. Tintic Junction does not appear to meet the characteristics of a rural householding community largely because the town's population was constantly changing and because the majority of residents received wages and spent them actively as participants in the mainstream economy.

The primary factors used to determine whether homesteaders at Benmore used householding to remain unincorporated from the mainstream economy are most evident when Benmore is compared to Tintic Junction. These factors should be evident in the archaeological record at Benmore, but not Tintic Junction, and include:

1. Less variety in store-bought foods, such as canned goods, reflected in the variety of foodstuff containers at sites associated with residences.
2. Greater reliance on storage and utilization of home or local grown crops and other resources (Blanton 1994; Halperin 1994; Netting 1993) reflected in an increase of storage buildings and more home packaging items (i.e. canning jars) in comparison to store-bought cans and other goods.
3. Frequent instances of recycling (repair and reuse of items), both for continued original use as well as for use of a different nature (Purser 1999).

Methods

Site Documentation at Benmore

Twenty sites were recorded within the Benmore community. Most (15) are single family homesteads which can be best characterized as homesteads, and most of these can be associated with an individual or family through property records and oral history data. Additional site types include artifact scatters not associated with any feature or known individual, and a charcoal platform that may have been used by members of the community. Table 1 lists each site by type and Smithsonian trinomial site number as well as the common property name (e.g. the Jorgensen/Skidmore Homestead or the Benmore Schoolhouse). The features, artifact functions, and public school grounds at Benmore are consistent with a 1910s to 1920s farming community. The community as a whole is not necessarily homogenous, as I will discuss below, but the homesteads at least superficially resemble one another in types of structures and artifacts evident, and the non-residential sites are consistent with other activities, like trash dumping, that occur in homestead communities.

This project relied on surface data from Benmore, and was limited by preservation factors including the survival of artifacts and features, looting, and vandalism. Abandoned wood buildings are often dismantled, moved, or removed for firewood. The only standing structure documented so far at Benmore is the Skidmore/Jorgensen house (Figures 3 and 4). One other structure, the Aage Larsen home, remains on private property several miles east of Benmore's center and has not yet been documented. These sites remain because owners did not remove them in historic times and they are now protected by current owners or managers. The sites at Benmore postdate 1900, so most materials have not decomposed to any great extent. Vandalism and looting are the main threats to preservation of Benmore's surface data and is evidenced by potholes, as well as bottle-hunters and others in the act of combing the site's surface who have been encountered by U.S. Forest Service employees.

Site Documentation at Tintic Junction

In 2000–2001, the Level III Communications Fiber Optic Project resulted in archaeological compliance work at Tintic Junction, Utah

Table 1. Benmore site names and types

Site No.	Site Name	Site Type
42TO538	Charles Skidmore Homestead	Trash Scatter
42TO836	Ben Lomond Extension	Trash Scatter
42TO843	Ben Lomond I and II	Homestead
42TO893	Charles Anderson Homestead	Homestead
42TO1501	Skidmore/Jorgensen Homestead	Homestead
42TO1510	Vernon Creek Trash I	Trash Scatter
42TO2125	Vernon Creek Trash II	Trash Scatter
42TO2270	Moses Green Homestead	Homestead
42TO2373	Charcoal Preparation Site	Charcoal Preparation
42TO2376	Dog Hollow Cabin	Cabin
42TO2707	Benmore Schoolhouse	Schoolhouse/Homestead
42TO2886	Sharp/Hite Homestead	Homestead
42TO2887	Van Otten Homestead	Homestead
42TO2889	Downtown Homestead	Homestead
42TO2956	Chris Jensen Place	Homestead
42TO3197	Sherman Cadwell Homestead	Homestead
42TO3214	The Dry Farm Co-op	Dry Farm/Homestead
42TO3311	Irvin Hillman Homestead	Homestead
42TO3313	Hyrum Yates Homestead	Homestead
UN-285	Oborn Homestead/Benmore Work Station	Homestead

(Seddon et al. 2001). Tintic Junction is used as a contrast to Benmore because the city was 20 miles away, but, as suggested by the historic record, significantly differs socioeconomically from Benmore. Archaeological investigations at Tintic Junction included a detailed surface recording, surface collections, excavations, and site monitoring. The 64-acre community was recognized as an excellent potential contributor to railroad history in Utah and was made a key focus of the overall project. The research design for investigations at Tintic Junction focused on large-scale historical events and local situations particularly including mining and railroading, but the subsistence of railroading was also analyzed.

Archaeological remains at Tintic Junction include different structures and artifact concentrations. Artifacts on site include glass, cans, ceramics, and miscellaneous domestic, railroad, and other items. Three areas (Areas A, B, and C), not including the entire site, were identified as representative of the several activities that occurred at Tintic Junction and were further divided into specific contexts (such as Depression 5 or Historical Privy 1; see Table 2). A portion of Area A includes the early period construction encampment and lacks domestic artifacts and structures. The remainder of Area A, along with Areas B and C, represent the primary period of occupation at Tintic Junction when the site operated as a railroad section station. Seddon (2001) suggests that Section B is associated with railroad workers (gandydancers). Area C is associated with section foremen and includes four section foreman houses. Although investigations at Tintic Junction were conducted primarily through excavation, the data collected through analysis of artifacts is generally

Figure 3. Photograph of the Skidmore/Jorgensen Homestead main house. Courtesy of Nathan Rasmussen.

comparable to that collected from surface artifacts at Benmore. This is due to the extremely meticulous recording methods at Benmore, but also to the well-defined analysis methods used by SWCA at Tintic Junction.

General Methods of Data Analysis

Several statistical and archaeological methods were used to analyze the data at Benmore and Tintic Junction. Ceramic paste ratios, correspondence analysis, and resampling are discussed individually below, but more generally, chi-square statistics were used in several instances. Chi-square statistics are tests used to evaluate relationships between two categorical variables (i.e., white ware and porcelain). The chi-square statistic is never reliable when the expected frequency value is below one. Expected values below five (a traditional cut-off point) but above one are included here in order to keep as many of the smaller sites as possible. Wherever a chi-square statistic is used, I give the chi-square value, degrees of freedom, and p-value in parentheses.

Ceramic Paste Ratios and Correspondence Analysis

Ceramic paste ratios at historic sites are commonly used to examine socioeconomic differences (Spencer-Wood 1987; Henry 1987). Historically, porcelain ceramics were generally display items while white earthenware (whiteware) ceramics were more often used for utilitarian purposes. At Benmore, the ratio of whiteware to porcelain should indicate socioeconomic differences since porcelain and whiteware prices differed from one another during the Benmore period. This method is somewhat limited by the fact that it was originally designed by eastern U.S. historic archaeologists working with assemblages from the 1700s (Majewski and O'Brian 1987; Miller 1980). Henry (1987)

Figure 4. Modern condition of the Skidmore/Jorgensen Homestead main house (Photo taken in 2002).

suggests that using a decoration-based approach is preferable with later assemblages, like those at Benmore and Tintic Junction, however, the small sample sizes made such an analysis impossible. Comparing ceramic paste ratios, while not the ideal measurement of socioeconomic variation, should at least indicate whether or not Benmore really was socioeconomically homogeneous.

To compare ceramic paste ratios, I used correspondence analysis (CA), which Shennan (1997) describes briefly as analogous to principal components analysis for categorical data. The method utilizes chi-square distances. CA graphs are useful when data demonstrate high chi-square values, indicating that differences in the data are large enough to suggest that discrepancies are not a matter of chance.

Resampling

Kintigh (1984; 1989) proposed resampling methods by which sample size is controlled to allow more useful investigation of diversity, and here it is used to look at dietary variety as an indication of householding. Resampling, as used by Kintigh, is a statistical method for estimating the sampling distribution by sampling with replacement from the original sample. Kintigh's computer programs, written for resampling methods, utilize the composition of the sample population to generate a number of random samples based on the frequency distribution of the provided data, which indicate the richness (i.e., number of categories) of the data. A 90 percent confidence interval is plotted around the mean of the richness and evenness values. I used

Kintigh's resampling methods and computer programs to generate graphs which control for sample size while calculating the relative diversity of the data provided. Each site/context is represented by a data point, with richness along the Y-axis. Items which are only identified to the general food level (for example canning jars which held any number of foods or cans identified as holding an unspecific type of fruit or vegetable) are excluded.

Results

Evidence of Socioeconomic Differences

If Benmore residents were householding, the data would show that the community was homogeneous in the type and expense of their ceramics. At Benmore, only twelve of the sites have enough ceramic paste data (i.e. high enough chi-square values) to be used in a CA. The sites whose expected frequency values are too low are typically the smaller homesteads and other non-residential sites, although Vernon Creek Trash I does have enough ceramic data to be used. At the Charles Skidmore Homestead, a large number of what are probably yellowed whiteware fragments were recorded as yellowware, which skews the percentage of other paste ceramics. This misidentification was corrected, though with the possibly erroneous assumption that all of the yellowware fragments, rare at Benmore, are actually whiteware. The data from this particular site should, therefore, be treated with some hesitation. Figure 5 is a graph of a CA using the twelve site and illustrates an interesting dichotomy among Benmore residents. The twelve sites are split evenly between those whose inertia pull most toward porcelain and those that pull most toward the whiteware and other paste categories. While the two clusters are not split far apart, they are still distinctly divided. This suggests that there is not as much homogeneity among the homesteaders as was expected.

The occupants of the Sharp/Hite, Moses Green, Chris Jensen, and Hyrum Yates homesteads, as well as the unknown individuals associated with Vernon Creek Trash Scatter I and the Benmore Schoolhouse, with its two domestic zones, seem to have greater access to or preference for porcelain than the rest of the community. This suggests that the residents of those sites may have had more cash than other residents at Benmore since Benmore was a small farming community isolated from populated areas where socioeconomic class division is a factor. These individuals may have been in different businesses or were otherwise more involved in the capitalist economy which would have supplied such products. The Moses Green family was involved in mineral prospecting in addition to raising cattle and conducting other agriculture-based activities. Other socioeconomic tests generally supported the difference visible in the ceramic paste ratios (Beard 2008).

Since Benmore isn't as homogeneous as expected, the possibility that they were householding decreases; however, there were many householding indicators to test, including dietary variety, canning local foodstuffs versus buying cans of food, and repair/reuse versus replacement. Additional factors are discussed in my thesis, including reliance on storage and utilization of home-grown crops, and lag or absence of "trendy" styles in goods (Beard 2008). Householding is best identified by comparison to the mainstream economy, so the Benmore data are compared to Tintic Junction's.

Evidence of Householding

Dietary Variety

A comparison of dietary variety between the two towns uses artifacts associated with diet that are identified to a specific function and appear to be store-bought, particularly cans. Canning jars were also store bought, but would have been used for many different foods over their lifetime. Items which were only identified to the general food level (for example, canning jars because they cannot be placed in specific food categories, or cans identified as having held an unknown type of fruit or vegetable) are excluded.

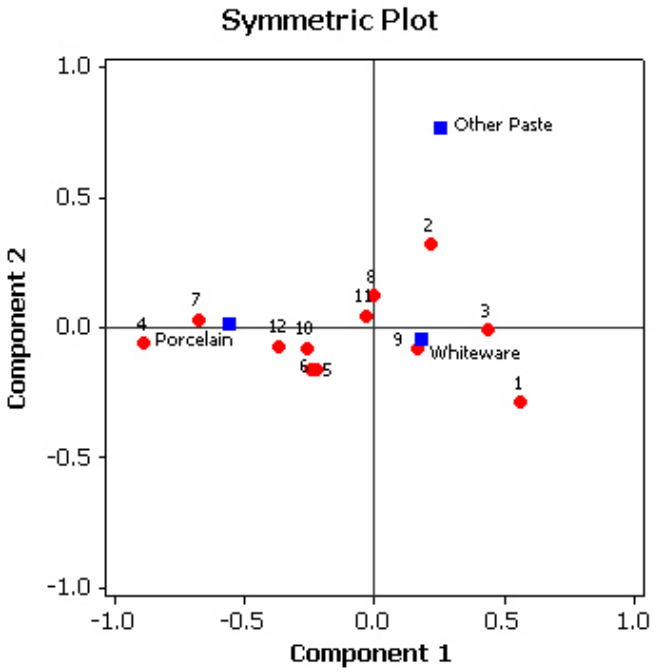
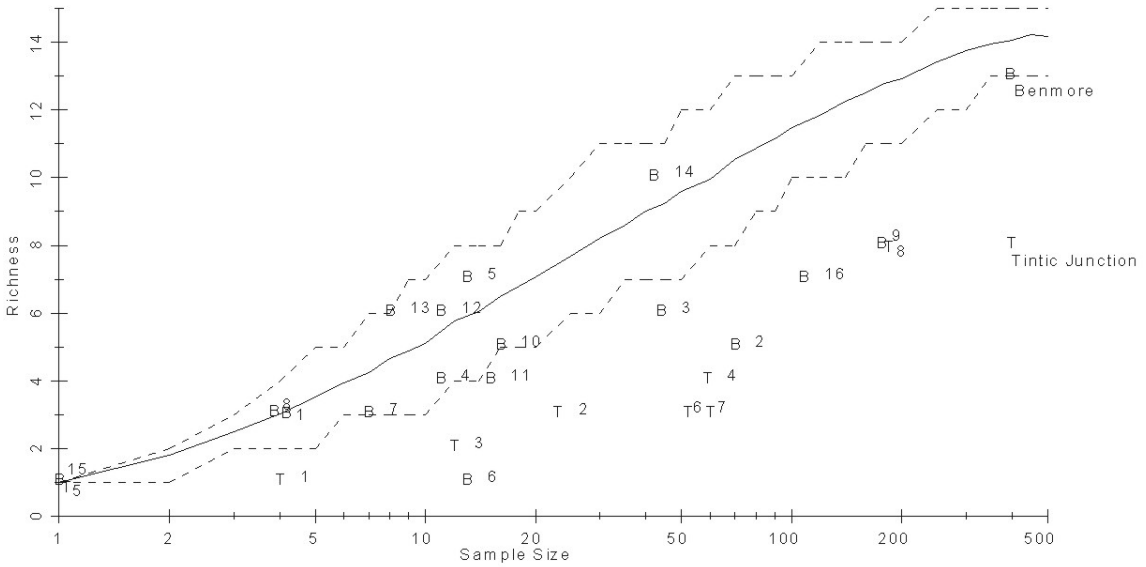


Figure 5. Correspondence analysis plot of Benmore ceramic paste ratios (1: Charles Skidmore Homestead; 2: Ben Lomond I and II; 3: Jorgensen/Skidmore Homestead; 4: Vernon Creek Trash I; 5: Moses Green Homestead; 6: Benmore Schoolhouse; 7: Sharp/Hite Homestead; 8: Van Otten Homestead; 9: Downtown Homestead; 10: Chris Jensen Homestead; 11: The Dry Farm Co-op; 12: Marvin Yates Homestead).

Figure 6 is a graph of the Benmore and Tintic Junction store-bought food item data with both individual Benmore sites and Tintic Junction areas or contexts, as well as the two communities as a whole, utilizing Kintigh's (1984; 1989) resampling methods. Figure 6 illustrates that Benmore is more diverse in diet than is Tintic Junction, with the combined Benmore data plotting much higher in richness than Tintic Junction. This result directly contradicts the expectation that Benmore, if participating in householding, would have less dietary variety of store-bought food than communities participating in the mainstream economy. Figure 6 is also interesting because both towns are below the expected diversity. Since the expected richness is based on the data from the archaeological sites, the towns most likely plot below the expected diversity because there are specific food categories at one location, but not at the other. In fact, there are seven food categories identified at Benmore that were not present at Tintic Junction (including milk, syrup, spice, meat, sardine, tuna, and lard) and three found at Tintic Junction that were not identified at Benmore (including club sauce, soda/mineral water, and catsup). The Tintic Junction analysis did not identify as many cans to specific food groups since it was beyond the scope of their investigation.

There are two possible explanations for Benmore's greater variety. First, Benmore may have been tied into the formal economy more than Tintic Junction. Second, the limited identification of store-bought goods to specific functions at Benmore and Tintic Junction may have limited the utility of the test. Given the



B 1: Ben Lomond Extension; B 2: Ben Lomond I and II; B 3: Charles Anderson Homestead; B 4: Jorgensen/Skidmore Homestead; B 5: Moses Green Homestead; B 6: Charcoal Preparation Site; B 7: Dog Hollow Cabin; B 8:Benmore Schoolhouse; B 9: Sharp/Hite Homestead; B 10:Van Otten Homestead; B 11:Downtown Homestead; B 12: Chris Jensen Homestead; B 13: Sherman Cadwell Homestead; B 14: The Dry Farm Co-op; B 15: Irvin Hillman Homestead; B 16: Marvin Yates Homestead.; T 1: Depression 1 and HM 1; T 2: Depression 5; T 3: Historical Privy 1; T 4: Refuse Disposal Areas; T 5: Foundation 8; T 6: Foundation 9; T 7: Foundation 10; T 8: Refuse Disposal Area.

Figure 6. Relative dietary diversity of Tintic Junction and Benmore.

additional evidence for householding discussed below and the fact that none of Benmore's sites lie higher than the 90 percent confidence interval, with nine sites lying below the mean, I argue that the second explanation is more likely. If the store-bought food artifacts were better preserved, and thus more specifically identifiable, a more reliable comparison might have permitted a better argument.

Reliance on Storage and Home/Local Resources

Since the residents of Tintic Junction were sometimes transient and did not own their own land, large-scale food production is highly unlikely. This contrast to the agriculturally-based Benmore should be visible in the kinds of food containers found at each location. Storage buildings should illustrate the differences between the two communities. Figure 7 illustrates the percentages of canning glass to the total number of food cans and canning glass in the two communities. There is a clear difference between the two communities, with Benmore sites exhibiting generally higher canning glass ratios despite consistently small sample sizes (χ^2=1569; df=20; p<.001). At Tintic Junction, a few contexts do have quite high canning glass ratios, such as Depression 5 and Historical Privy 1, but there are also two sites with very low canning glass ratios despite high sample sizes. Preservation of cans and the difficulty inherent in identifying small glass fragments as canning jar fragments make the data tenuous, but the residents of Benmore were clearly using more home-canning items and purchasing fewer canned foods than were their railroading neighbors down the road.

The nine storage features at Benmore include dugouts and a few frame structures, while at Tintic Junction only two storage buildings, a tentatively identified underground storage room, and a dugout root cellar or ice house were identified. The ratio of these storage features to residential

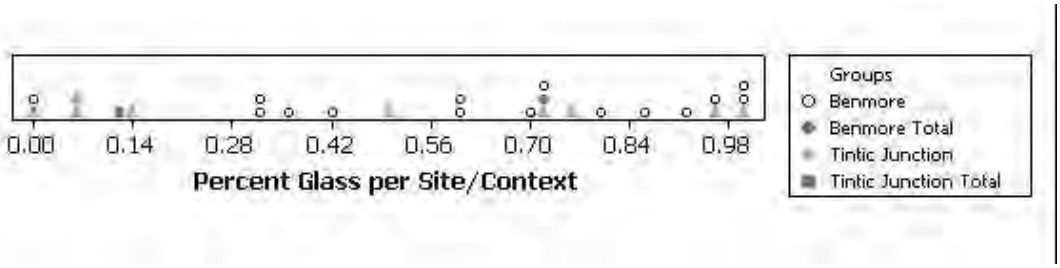


Figure 7. Dotplot of the canning glass ratios of Tintic Junction and Benmore.

features in the two towns (Table 3) provides a standardized measure of the degree to which storage features were used. When adjusted for sample size, the difference in number of storage features is not significantly different between the two sites ($\chi^2 = 0.258$; df = 1; p = .611). Like dietary variety, the similarity of storage features to residences at the two sites is surprising.

Recycling

Since reuse and repair, or recycling, is a relatively new area of study in historic archaeology, the data presented herein may be incomplete and less reliable than most of the Benmore and Tintic Junction datasets, and some Benmore sites were documented before recycling was recognized. Still, the data that are available are telling. Recycled artifacts include those which were clearly reused in some way. At Benmore and Tintic Junction, this included items that had punched or cut holes, rolled edges, cut-off ends, flattening, items remade as something else, or otherwise modified. The ratio of reused artifacts to the total assemblage is 2.57 percent at Benmore and .03 percent at Tintic Junction. When compared in a two-way table of reused and not reused artifacts, there is a significantly higher presence of recycled artifacts at Benmore than there is at Tintic Junction ($\chi^2 = 994$; df = 1; $p < .001$). Added to other results, this statistic can be utilized to draw conclusions about the residents of Benmore and Tintic Junction despite the limitation of incomplete Benmore data.

Discussion and Conclusions

The primary question addressed in this article is whether or not Benmore was utilizing householding in order to operate outside of the mainstream capitalist economy. To answer this question, I considered socioeconomic and householding data. First, the data gathered suggest that the community of Benmore was less united than expected, but still more homogeneous than Tintic Junction. The ceramic paste ratios, in particular, indicate a dichotomy among residents—with some families having greater access to cash. Dietary variety, used here primarily as an indication of householding, also suggests that some families may have had more cash to purchase canned foods and other non-local items. The extent to which families sought additional sources of income beyond their farms, like the Greens' mining activities, may hint at which families were more tied to the mainstream economy and had access to more cash.

The following summary reports the results of my evaluation of the primary factors used to determine whether homesteaders at Benmore used householding to remain unincorporated from the mainstream economy. First is the expectation that Benmore would have less dietary variety than Tintic Junction because of the limited use of store-bought goods. Benmore's sites are, however, much more diverse than are Tintic Junction's contexts, though I suspect that this is due in large part to limited identification made on a can-by-can basis at Tintic Junction. Since more than half of Benmore's sites are less diverse than the estimated mean, there is some

Table 2. Comparison of non-storage and storage related features at Benmore and Tintic Junction

	Non-Storage Related	Storage Related	Total
Benmore Features	8	9	17
Tintic Junction Features	4	2	6

suggestion of householding. Second, if Benmore was householding, there would be evidence of a greater reliance on home storage and utilization of home and local grown crops and other resources. Benmore does have significantly more home-canned items than Tintic Junction, although there are comparable numbers of storage structures. The number of commercially canned food items is less at Benmore even though the variety of commercially canned food types is higher than expected.

Third and finally, I expected to see frequent instances of reuse and repair at Benmore when compared to Tintic Junction if Benmore was practicing householding. Although the data is limited by the fact that some Benmore sites were recorded before recycling was recognized, there is still enough data to demonstrate that the Benmore community shows more recycling than does Tintic Junction.

Given the results, I argue that Benmore, though not as united as was expected, does show evidence of an emphasis on self-sufficiency and evidence of householding. The community was trading and sharing more among each other than outside of the community (with the possible exception of nearby Vernon where many of Benmore's residents lived both before and after the Benmore settlement).

At Benmore, a non-kin network was organized in which labor and goods were exchanged, but each family in that network also maintained separate cash sources, land, and other possessions. Particularly in light of the socioeconomic variation visible in the archaeological record, it is clear that although the town's residents were indeed assisting each other in order to contribute to the town's survival, this was not a communal group that would either fail or succeed together. Benmore's residents were not so invested in householding that they forgot they were separate families.

Still, using Halperin's concept of householding at Benmore provided possible explanations for the town's failure. Halperin (1994) notes several deathblows for householding groups: they must be able to sustain direct access to a means of production whereby they can earn a living, the extended family (the entire group) must remain intact, and some cash must be generated, as stated above. Following World War I, wheat prices plummeted and Benmore's main cash crop no longer provided the cash necessary to maintain the community. Bennion (IBJ January 1921[1919]) reported that "in the stress of war… the crops were not good…and all the while the easier life…and bigger pay of the city, was an irresistible lure." It seems, then, that all of Halperin's indicators of householding failure are clearly evident at Benmore. Their means of production and cash were tied in the same crop which could not provide enough success to keep the younger generation working on the farms and the community intact.

In addition to the explanations for Benmore's failure based on householding, I also suggest that there is an environmental explanation. Given the marginal dry farming environment in which Benmore lies and the larger historical context in which the settlement occurred, I argue that Benmore did not fail simply because they were unable to successfully operate outside of the mainstream economy, rather it was the limitations of marginal dry farming lands, small land parcels, and intermittent water that proved the town's ruin. Had crops been large enough and the environment supportive, the families might have been able to be even less involved in

the mainstream economy, avoiding the economic difficulties that arose following the first World War. It is their perseverance and desire to survive that allowed the town to last as long as it did despite these difficulties. Those who survived, like the Bennions, did so using means such as wage labor and military service. Thus, it was their inability to actually household apart from the mainstream economy that ultimately made it necessary to transition fully into that economy.

Unfortunately, householding appears to require a much wider geographic range than is reasonable for Benmore—this is due to the need to access natural resources or wage labor opportunities that may not all exist in a single location, but is also an important way of risk buffering (if the Benmore householders had grown crops in multiple environments, the marginal rainfall at Benmore wouldn't have devastated the entire crop). The residents would most likely have had to be kin in order to be committed to such an approach. If they had participated in householding, the town's residents would have had to be far more united. A co-op like the Dry Farm Co-op organized by the Skidmore brothers, for example, might have been organized as a means of generating a cash crop in order to allow other homesteaders to devote their land entirely to food crops for the community's needs. The residents would have had to seek additional ways of maintaining long term access to means of production and given its marginal environment, Benmore would certainly not be the ideal place to attempt such a communal effort.

Halperin's concept of householding did provide a number of expectations that were useful in evaluating the homesteading community of Benmore, but in the end, it is a combination of explanations including the historical context and environment in which the town existed in addition to the town's failure to meet the requirements for successful householding that explains its demise. In the historic archaeology of the fairly recent homesteading movement in the American West, historical context and environmental data are readily accessible. Therefore, application of the concept of householding to such communities may be less useful than in other situations. Considering the differential participation in the mainstream economy, the comparison of Benmore to Tintic Junction was certainly useful. Had a different theoretical stance been taken, the marked differences within and between the communities may not have been recognized and Benmore might have continued to be viewed as a largely homogeneous community. I therefore recommend that looking at evidence of householding in homesteading communities and other American West sites is useful in order to gain a clear picture of a community's composition and involvement in the mainstream economy, but argue that such investigations should be made as a part of a larger theoretical approach. By doing so, the concept of householding will provide valuable support to research without limiting the scope of analysis.

The two towns considered here both represent typical Utah and American West communities—united by their will to survive and live their American dreams despite differences in those dreams. At Tintic Junction, the railroad was king and survival meant hard work for minimum wage. At Benmore, the means of survival was hard work, but the dream was at least partly one of independence and freedom from the capitalist requirements of wage labor. ■

Jennifer A. Beard
E-mail: jenniferabeard@gmail.com

References

Astroth, Kirk A. and Neil C. Frischknecht
1984 *Managing Intermountain Rangelands—Research on the Benmore Experimental Range, 1940-84*. General Technical Report INT-175. Intermountain Forest and Range Experiment Station, Ogden, Utah.

Beard, Jennifer A.
2008 Late Homestead Period Householding at Benmore and Tintic Junction: Comparing Rural and Sub-Rural Communities in Tooele and Juab Counties, Utah. Unpublished Masters thesis, Department of Anthropology, Brigham Young University, Provo, Utah.

Blanton, Richard E.
1994 *Houses and Households: A Comparative Study.* Plenum Press, New York.

Deagan, Kathleen
1996 Avenues of Inquiry in Historical Archaeology. In *Images of the Recent Past: Readings in Historical Archaeology*, edited by Charles E. Orser, Jr., pp. 16-41. AltaMira Press, Walnut Creek, California.

Galloway, Patricia
2006 Material Culture and Text: Exploring the Spaces Within and Between. In *Historical Archaeology*. edited by Martin Hall and Stephen W. Silliman, pp. 42-64. Blackwell Publishing, Oxford, United Kingdom.

Halperin, Rhoda H.
1994 *Cultural Economies: Past and Present*. University of Texas Press, Austin.

Henry, Susan L.
1987 Factors Influencing Consumer Behavior in Turn-of-the-Century Phoenix, Arizona. In *Consumer Choice in Historical Archaeology*, edited by Suzanne Spencer-Wood, 359-381. Plenum Press, New York.

Hutmacher, Sonia and Ken Lawrence
2001 Tintic Junction. In *History and Prehistory Along the San Pedro, Los Angeles, and Salt Lake Railroad: Archaeology of the Level (3) Communications Fiber Optic Line from Salt Lake City, Utah to the Utah/Nevada Border,* edited by Matthew Seddon, Ken Lawrence, Sonia Hutmacher, and Krislyn Taite, pp. 46-410. SWCA, Inc. Environmental Consultants, Salt Lake City.

Kintigh, Keith
1984 Measuring Archaeological Diversity by Comparison with Simulated Assemblages. *American Antiquity* 49(1):44-54.
1989 Sample Size, Significance, and Measures of Diversity. In *Quantifying Diversity in Archaeology*, edited by Robert D. Leonard and George T. Jones, pp. 25-36. Cambridge University Press, Cambridge.

Little, Barbara J.
2007 *Historical Archaeology: Why the Past Matters*. Left Coast Press, Walnut Creek, California.

Majewski, Teresita and Michael J. O'Brian
1987 The Use and Misuse of Nineteenth-century English and American Ceramics in Archaeological Analysis. In *Advances in Archaeological Method and Theory, Volume* 2, edited by Michael B. Schiffer, pp. 97-209. Academic Press, San Diego.

Miller, George L.
1980 Classification and Economic Scaling of 19th Century Ceramics. *Historical Archaeology* 14:1-40.

Netting, Robert McC.
1993 *Smallholders, Householders: Farm Families and the Ecology of Intensive, Sustainable Agriculture.* Stanford University Press, Stanford.

Polanyi, Karl
1944 *The Great Transformation.* Holt, Rinehart and Winston, New York.

Purser, Margaret
1999 Ex Occidente Lux? An Archaeology of Later Capitalism in the Nineteenth-Century West. In *Historical Archaeologies of Capitalism*, edited by Mark P. Leone and Parker B. Potter, Jr., pp. 115-142. Kluwer Academic/Plenum Publishers, New York.

Scott, Donald
2004 Mormonism and the American Mainstream. Electronic document, http://nationalhumanitiescenter.org/tserve/nineteen/nkeyinfo/nmormon.htm, accessed October 14, 2010.

Seddon, Matthew T.
2001 Section Foremen and Gandydancers: Domestic Life on the Salt Lake Route. In *History and Prehistory Along the San Pedro, Los Angeles, and Salt Lake Railroad: Archaeology of the Level (3) Communications Fiber Optic Line from Salt Lake City, Utah to the Utah/Nevada Borde*. edited by Matthew T. Seddon, et al., pp. 46-410. SWCA, Inc. Environmental Consultants, Salt Lake City.

Seddon, Matthew T., Ken Lawrence, Sonia Hutmacher, and Krislyn Taite
2001 *History and Prehistory Along the San Pedro, Los Angeles, and Salt Lake Railroad: Archaeology of the Level (3) Communications Fiber Optic Line from Salt Lake City, Utah to the Utah/Nevada Border.* SWCA, Inc. Environmental Consultants, Salt Lake City.

Shennan, Stephen
1997 *Quantifying Archaeology*, 2nd edition. University of Iowa Press, Iowa City.

Spencer-Wood, Suzanne M.
1987 Miller's Indices and Consumer-Choice Profiles: Status-Related Behaviors and White Ceramics. In *Consumer Choice in Historical Archaeology*, edited by Suzanne Spencer-Wood, 321-358. Plenum Press, New York.

Stemmons, John D (compiler)
1998 *The Yates Family*. Manuscript on file, Family History Library, Salt Lake City, Utah.

Cactus Processing in the St. George Basin, Washington County, Utah

Suzanne Eskenazi and Heidi Roberts
HRA Inc., Conservation Archaeology

In April 2009, HRA conducted data recovery investigations at site 42Ws4832, located on land owned by the State of Utah, School and Institutional Trust Lands Administration near Bloomington, Utah. The site contained eight slab-lined thermal features, which were visible on the surface only as fire-cracked rock scatters. The site is situated in an area containing few resources except cactus. HRA hypothesized that cactus species were the likely subsistence focus of the site's prehistoric occupants, and the pollen record suggests that cholla, prickly pear, grass seeds, and Cheno-ams were processed in the features. Radiocarbon samples returned dates of 990±15 BP and 1175±15 BP. HRA conducted experimental cholla roasting in the fully excavated features and sent the roasted cholla for nutritional analysis. This paper discusses the findings of the data recovery, the cholla roasting, and the nutritional analysis.

In 2007 and 2009, HRA conducted data recovery at prehistoric site 42Ws4832, which is located in the southern portion of the St. George Basin in Washington County, south of the town of Bloomington and less than one mile east of the Virgin River (Figures 1 and 2). The site is located on land owned by the State of Utah, School and Institutional Trust Lands Administration, and the project was funded by that agency. At the State of Utah's request, data recovery was implemented in two phases.

During the survey, HRA recorded this site as a large but sparse scatter of 50 flakes and 17 ceramic sherds associated with seven fire-affected rock scatters. The ceramics included plain gray ware, corrugated, and decorated Hildale Black-on-gray bowls. The site is located near the northern end of the flat upper portion of a prominent hill, and the features were situated in an area that appeared to have the greatest soil depth. The surface fire-affected rock scatters (Figure 3) were made of limestone and sandstone cobbles that are common everywhere.

Because the site is located high on the top of a large hill where no visible resources occur other than cactus species, HRA's research design focused on cactus bud-flower procurement, prickly pear fruit procurement, and processing activities. To understand how these resources were processed prehistorically, HRA first examined the relevant literature for the region's Southern Paiute occupants.

Research Design: Cactus Processing

Different species of cactus were collected, processed, and eaten by the Southern Paiutes who occupied southern Utah and Nevada when the first Euroamericans settled the region. John Wesley Powell (Fowler and Fowler 1971:47) reported that "the fleshy stalks of several species of cactus and especially the leaf-shaped stalks of the *Opuntia* are often roasted in the coals or boiled for food." Powell described the Southern Paiutes use of *Opuntia* fruit as follows:

A species of cactus (*Opuntia*) is very abundant in some parts of the country and it bears a beautiful crimson apple; very juicy and quite luscious. The fruit is beset with minute spines which are barbed. In gathering this fruit great pains are taken to divest them of their armature, and a little brush is made of a bundle of wire grass for this purpose. When the spines are carefully brushed off the fruit is gathered into a basket and carried into camp where the juice is expressed from the pulp which is afterwards formed into rolls or

Figure 1. Overview photo showing density of cholla cactus at site 42Ws4832.

large lumps and sometimes dried for winter use. (Fowler and Fowler 1971:42).

Powell also found that fermented drinks were made of prickly pear cactus. He described the process as follows:

> I have mentioned that the Indians made wine of the cactus apples. For this purpose they are gathered in great quantities. When the women have brought in perhaps a dozen bushels, a large flat stone or slab is selected, and in this a little groove is etched; handfuls of fruit are placed upon it, and the juice is expressed by a grinding motion. The wine is collected in basket jars and sometimes preserved for a length of time until it has fermented. (Fowler and Fowler 1971:42).

Figure 3.4 is a photograph of a ground stone slab studied by HRA during the Kayenta Testing project for SITLA (Ahlstrom et al. 2000). The slabs contain unusual grooves that fit Powell's description of the grooves made on sandstone to express prickly pear juice and collect it in a basket, jar, or other vessels.

Isabel Kelly (1976) reported that cactus was eaten by the Kaibab band of Southern Paiutes and other bands. She (Kelly 1976:45) noted the "blossoms of certain cacti, fruit of others, and fleshy core of still others considered edible" and cactus were important foods in the winter and spring. Blossoms of *Opuntia whipplei* were eaten, and possibly boiled. The fruit of Desert Prickly-pear (*Opuntia engelmannii*) and Hedgehog cactus (*Echinocereus engelmannii*) were eaten when they ripened in the summer (Kelly 1976:45). The flesh leaves of *Echinocereus engelmannii* were eaten after the spines and skin were burned off. Kelly (1976:45) noted that the Kaibab roasted and ate leaves of *Opuntia*

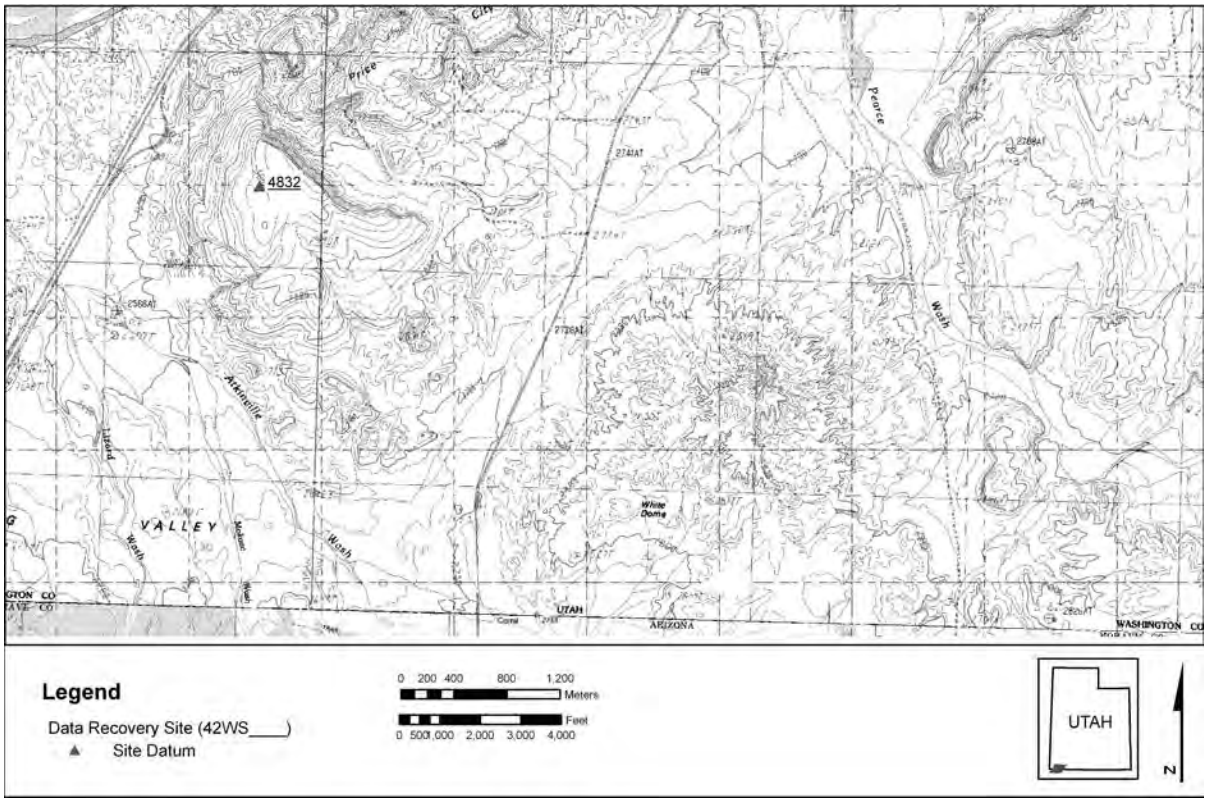


Figure 2. Location of site 42Ws4832.

rhodantha throughout the year. The core of *Coryphantha arizonica* was eaten after it roasted on the fire and large quantities of *Phellosperma tetrancistra* were eaten raw or roasted.

Cactus procurement systems used by the Native Americans of Arizona have been studied extensively by ethnographers, archaeologists, and botanists. Detailed ethnographic accounts describe processing methods for the Tohono O'odham (Papago) and Akimel O'odham (Pima) in far more detail than the descriptions provided for the Southern Paiute region. In 1975, these cactus procurement systems were the focus of Albert Goodyear's (1975) data recovery for the Hecla Mine data recovery project on the Tohono O'odham Reservation in southwestern Arizona. In a classic cultural ecology study, Goodyear used archaeological correlates to identify cactus systems at prehistoric sites. Drawing on ethnographic accounts, Goodyear defined six procurement subsystems. Two of these, the bud-flower and prickly pear subsystems, and possibly a third involving winemaking, are relevant to the present project area. Both the ethnographic observations and Goodyear's archaeological correlates are described below.

Bud-Flower Procurement Subsystem

Goodyear's bud-flower procurement subsystem involved the procurement of the buds and flowers of cacti of the genus *Opuntia* (both cholla and prickly pear), as well as buds and flowers of the ocotillo. In the St. George Basin, only *Opuntia* species are found; however, we know from ethnographic accounts (Fowler and Fowler 1971; Kelly 1976) that the buds of cholla, hedgehog, and prickly pear were eaten by the Southern Paiute during the historic period. In southern Arizona and in the St. George Basin, the bud-flower subsystem was important in the spring, specifically during the months of April

Figure 3. Photo of surface fire-affected rock scatter at 42Ws4832.

and May. The fruit may also have been pit baked later in the summer (Castetter and Underhill (1935:23).

Nutritional studies of cactus buds and flowers suggest these foods are high in carbohydrates and also are good sources of vitamins and minerals such as calcium (Goodyear 1975:58). The buds ripen during a time of the year when other foods are scarce. Castetter and Underhill (1935:15) described the processing of cholla buds by the Tohono O'odham as follows:

> The branches of the chollas are composed of easily detached joints; the flower buds which develop at the tips of the branches are gathered as they come out in May. Whole cholla joints, as well as the buds, are pit-baked and dried. Women go out in parties to gather the crop, this being done with wooden tongs made of a length of giant cactus rib (*Carnegia gigantean)*, split in two. The buds or joints are collected in coiled basket bowls and brought to the central point where an old woman directs the baking. When the picking is ended, a pit is dug, stones placed in it and heated with a mesquite fire . . . . When the stones are hot they are removed and the pit lined with ink weed (*Dondia nigra*) or with grass. Next a layer of buds or joints is placed in the pit, [then] the hot stones, [and] then the pit is filled with alternate layers of ink weed or grass and buds and covered with earth. They camp all night while the project is baking, and roast in the campfire ashes that portion of the product which has been reserved for their evening meal. [Castetter and Underhill 1935:15]

Based on his ethnographic research, Goodyear (1975) deduced that archaeological evidence of these activities may consist of evidence of pit cooking (fire-cracked rocks, cooking pits with a diameter of approximately a meter and associated with fire-affected rocks, and cholla pollen) associated with artifact scatters and indications of camping activities (hearths). Ground stone would not likely be present at these sites.

In HRA's project area, cactus species (including prickly pear, hedge hog, and cholla), are plentiful on the hill tops where soils are rocky. Part of HRA's Phase I data recovery plan was to identify the species of *Opuntia* that occurred in the project area and evaluate their distribution and density.

Goodyear predicted that cactus procurement sites would contain small roasting features with evidence of short term camping activities. If cactus bud procurement activities were the focus of prehistoric activities at our site, then there would be evidence of thermal features. The deep sand across the site would have been an excellent location for the digging and building of pit features. The site is also surrounded by dense stands of cholla and prickly pear cactus.

Prickly Pear Fruit Subsystem

The prickly pear fruit subsystem as defined by Goodyear (1975) involves the processing of the large and nutritious fruit of the prickly pear cactus—*Opuntia engelmannii*. The fruits are available between July and August, and they are a good source of carbohydrates and calcium (Goodyear 1975:120). The fruit lasts on the plants for two to three months. The Tohono O'odham studied by Castetter and Bell (1935) considered them important wild foods, and the cactus provided at least four types of food products: the flowers (treated in the previous bud flower subsystem), the young leaves or pads eaten raw or cooked, the fruit eaten raw, and lastly the fruit boiled and made into syrup. Unfortunately, the archaeological evidence for fruit collection is less tangible than in the bud-flower procurement subsystem.

In his Arizona studies, Goodyear hypothesized that ceramic vessels, particularly jars, would be present at fruit-gathering camps for the purposes of scalding, boiling, and syrup storage and transportation. He expected that acute-angled cutting tools would be used for slicing prickly pear leaves and for making cooking utensils. He did not anticipate the presence of grinding tools, and he expected that sites with these types of evidence would correlate with densities of prickly pear cactus. Although he demonstrated a correlation between prickly pear biomass and this extraction technology, he had difficulties distinguishing different cactus procurement activities, such as saguaro fruit processing versus prickly pear fruit processing.

We suspect that Goodyear's correlates may not apply to southwestern Utah because Powell noted that ground stone was used by the Southern Paiute to extract juice from prickly pear fruit. Also, prickly pear fruit and stems were eaten with minimal or no processing. According to Kelly and Powell, the Southern Paiute ate prickly pear fruit, and the leaves were roasted or boiled. A second cactus species common in southern Utah and Nevada, the hedge-hog cactus (*Echinocereus engelmannii)*, was also an important Southern Paiute food. Like the prickly pear, both the fruit and body of hedge-hog cactus were consumed. Although prickly pear fruit were not fermented in Arizona (the Tohono O'odham preferred Saguaro fruit), Powell reported that the Southern Paiutes made a fermented beverage out of juice from the fruit. Powell's description of juice extraction indicated that the juice was expressed and collected with a grinding motion using ground stone implements.

Because of these differences, HRA modified Goodyear's expectations for southern Utah cactus species and methods with regards to prickly pear processing sites. Pottery jars and grooved grinding slabs may have been present along with hearths and/or cultural deposits containing discarded prickly pear seeds (Figure 4). Prickly

Figure 4. Groove in a sandstone slab recorded by HRA near the Santa Clara River in the St. George Basin that may have been used to extract prickly pear juice as Powell described.

pear seeds are generally not eaten (Goodyear 1875:123) and would have been discarded during processing. Acute-angled cutting tools or possibly other similar cutting tools may also have been present at sites and at IOs across the landscape where prickly pear cactus stands are dense. IO and site densities should be higher where prickly pear cactuses are more prevalent.

Phase I Data Recovery

In summary, HRA's research design predicted that cactus buds would have been cooked in thermal features and prickly pear fruit may have been made into wine or eaten raw. To address the specific research questions, HRA excavated units near the concentrations of fire-cracked rock clusters to determine if thermal features lay buried (Figure 5). HRA also intensively collected artifacts in artifact concentrations along with all temporally or culturally diagnostic artifacts located outside the sample units. Radiocarbon, pollen, macrofloral, and FTIR (Fourier Transform Infrared Spectroscopy) samples were also collected from the features.

Six features (Features 1–3, 5, 6, and 8) were investigated during Phase I investigations, and five of these (Features 1–3, 5, and 6) contained subsurface deposits consisting of slab-lined thermal features. (Feature 8 was a surface rock cairn.) The thermal features were limestone slab-lined pits (Figures 6 and 7), most of which also had slab lined floors. The features were excavated in 10 cm arbitrary levels, and they were initially exposed in units placed over the surface scatters that measured 2 m by 0.5 m. Fill in the thermal features was sandy silt, often stained dark with charcoal. The purpose of Phase I investigations was to collect enough information from the features to determine their function and obtain a

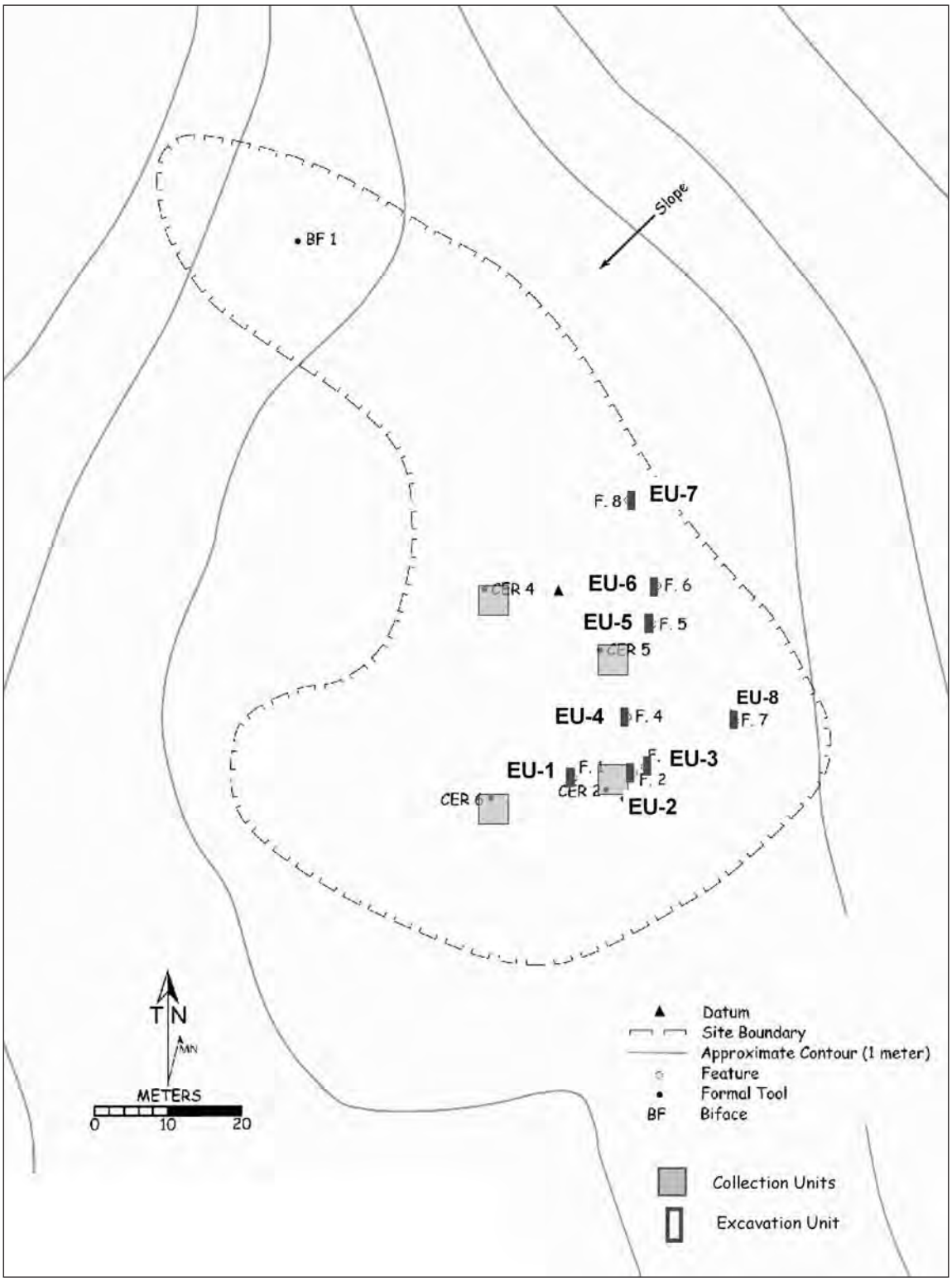


Figure 5. Site map showing the Phase I excavation units and identified features.

date and/or macrobotanical information on what was processed within them. Macrobotanical and radiocarbon samples were sent to PaleoResearch, Inc. for analysis (Puseman et al. 2009). Three radiocarbon dates were returned from charred cholla stems collected from Features 1, 2, and 6 (Tables 1 and 2).

Phase II Data Recovery Research Design

Phase I data recovery resulted in the discovery of small thermal features that supported the research design expectation for the bud-flower procurement activities. Soil samples from thermal features provided pollen and macrobotanical evidence of cooking cholla and other plant species, including maize. The prickly pear wine model was not supported. Our expectation that the archaeological evidence at cactus roasting sites would consist of evidence of pit cooking (fire-cracked rocks, cooking pits with a diameter of approximately a meter and associated with fire-affected rocks, and associated cholla pollen) associated with artifact scatters and indications of camping activities (hearths) were supported. The expectation that there would be no ground stone artifacts and only a small assemblage of debitage and pottery was also supported.

Radiocarbon dates from these features suggested that Features 1 and 2 were contemporaneous and were made and used around A.D. 980. Feature 6 appeared to have been made and used 200 years earlier. The lack of ground stone and hunting related tools was predicted in the cactus procurement model.

Although we addressed many of the key research questions outlined in the Phase I research design, we suspected that the site contained additional buried cultural deposits, features, and artifacts that had the potential to address new research questions. The large number of thermal features discovered during Phase I hinted that additional features were present, such as activity surfaces or ephemeral habitation features. Since our excavations were confined to the surface scatters of rock, excavation units placed in the artifact scatters and in the vicinity of the features had the potential to provide important information on the site structure, intensity of use, and frequency. Furthermore, we wondered why this particular area was the focus of cactus procurement activities at this time in prehistory. Why would Puebloan farmers travel to this out-of-the-way location to forage for cactus? It seemed more likely that the site locale would have been favored as a resource patch by Archaic foragers.

In our report of the Phase I investigations, which included a revised research design, we proposed three possible reasons why the cactus resource patch surrounding 42Ws4832 was the focus of subsistence activities during the Formative period, rather than the Archaic period. The first scenario involved the nutritional value of cactus buds—they are good sources of calcium. Questions relevant to this topic were as follows.

- Are cactus buds a high or low-ranked source of calcium?
- Did the Puebloan farmers make cactus bud procurement forays specifically because this was the best source of required nutrients?
- Do cactus species satisfy other nutritional needs besides calcium?

The second scenario has to do with population pressure. At first glance, site 42Ws4832 seems to be located in an area that would have had few resources other than cactus species. The site is on the top of a large hill located over a mile from a water source and known habitation sites. Were the cactus resources present in the vicinity of 42Ws4832 more or less productive than in other areas of the St. George Basin? Between A.D. 770 and 1160 (1180–790 B.P.), when 42Ws4832 was occupied, the region's Puebloan farmers lived in settled villages and practiced maize farming. Populations peaked and settlements reached their largest size during the Pueblo II period (A.D.

Figure 6. Feature 1, as excavated during Phase I data recovery.

1000–1150) (Lyneis 1995; Roberts and Ahlstrom 2003). Were marginal resource patches utilized more intensively when populations reached their greatest density? The fact that one feature predated A.D. 1000 and two features post dated A.D. 1000 tends to support this idea; however, since only three features were radiocarbon dated during Phase I, this could simply have been a sampling problem. If a large number of these features were present at site 42Ws4832, and their radiocarbon dates suggested increased use through time, then these data would support the resource intensification hypothesis developed by Talbot and Richens for the St. George Basin in their Sand Hollow research design (Talbot and Richens 2002).

The third scenario relates to population pressure and climate. Talbot and Richens (2002: Figure 11.3; Figure 8) modeled the mean summer and mean winter precipitation for the St. George Basin and combined this with the total number of radiocarbon dates recovered from the region throughout prehistory. Their graph of this model shows that when radiocarbon dates are most prevalent, around 1000 B.P., the mean summer precipitation dropped dramatically and the mean winter rainfall increased. If the Puebloan farmers depended on the summer rains, it is likely that altered rainfall patterns would have resulted in crop failures. When crops fail, farming cultures in the Southwest often survive by switching to foraging. If crops failed when population densities were high, even low ranked species in less productive resource patches may have been important. Did winter rains favor cactus bud production more than summer rains? Perhaps cactus flowers were harvested and stored to buffer against summer crop failure. Cactus flowers also ripen during late spring when few other wild plant sources are available (i.e. grass

Figure 7. Feature 2, as excavated during Phase I data recovery.

seeds and mesquite beans), and crops may not have yet ripened.

Methods

To address these research questions, HRA proposed a second phase of fieldwork investigations. The goal of fieldwork was to understand site structure, securely date the site's components, and understand cactus nutrition and return rates. HRA proposed to conduct additional excavations during the spring when cactus buds ripen. While at the site, HRA archaeologists proposed to collect ripe cactus buds and cook them in the fully excavated and documented prehistoric features for nutritional analysis and to calculate the caloric return.

Specific methods used during Phase II to answer the research questions included complete excavation of Features 1–3, 5, and 6 to obtain data on the feature's construction and contents. In addition, HRA excavated shallow shovel trenches across the area where the known features were located to determine if other similar features or different types of features were present. In order to determine if habitation features were present on site, HRA excavated 33 shovel test units west of the features, in the area where surface artifacts were concentrated.

Results

Features 1–3, 5, and 6 were relocated and completely excavated during Phase II, and three additional thermal features (9–11) were discovered and excavated during Phase II (Figures 9 and 10, Table 3). The features ranged in diameter from 62 cm (Feature 1) to 88 cm (Feature 11), and depth ranged from a shallow 13 cm (Feature 10) to a much deeper 48 cm

Table 1. Radiocarbon Results for Phase I Samples from Site 42WS4832

F No.	Material	Sample No.	2-sigma Calibrated Date	
6	Opuntia (cholla stems)	PRI 08–34–177	1180–1050 B.P.; 1030–1010 B.P.	770–900 A.D.; 920–940 A.D.
1	Opuntia (cholla stems)	PRI 08–34–24	960–900 B.P., 860–820 B.P., 810–800 B.P.	990–1050 A.D., 1090–1130 A.D., 1140–1150 A.D.
2	Opuntia (cholla stems)	PRI 08–34–52	940–900 B.P., 870–790 B.P.	1010–1050 A.D., 1080–1160 A.D.

Table 2. Radiocarbon Results for Phase I Samples from Site 42WS4832

Feature #	Analysis	Results
1	Pollen	Prickly pear, Cheno-ams
1	FTIR	Saltbush fruits, cholla fruits, rose hips, berries, yucca
1	Macrobotanical	Cholla stems, creosote, greasewood (fuel)
2	FTIR	Maize?
2	Macrobotanical	Cholla stems (fuel)
5	Pollen	Cholla, grass seeds, Cheno-ams
5	FTIR	Cholla, grass seeds, prickly pear cactus pads
5	Macrobotanical	Cholla stems (fuel)
6	FTIR	Environmental signature only
6	Macrobotanical	Cholla stems (fuel)

(Feature 6). Feature 3 was an anomaly: this spiral alignment of stones measured 1.23 m by 1.26 m, and the bases of the stones were at 29 cm below the ground surface. Its purpose remains a mystery (Figure 11). All but one of the features was located in the central site area; Feature 11 was located to the west. We also obtained two additional radiocarbon dates from cholla cactus. Burned cholla stems from Feature 9 returned a date range of 770–890 A.D., and burned cholla stems from Feature 11 returned date ranges of 1010–1050 A.D. and 1080–1160 A.D. As in Phase I, all samples were analyzed by PaleoResearch, Inc. (Puseman et al. 2009).

No habitation structure was identified during the course of the project, despite the excavation of nine hand trenches and 33 shovel test pits. McFadden (personal communication 2010) noted that these kinds of storage features are often found on residential Puebloan sites, date to Pueblo I, and seem to be confined to the St. George Basin, rather than in upland areas.

Artifacts

A total of 252 flakes were collected from the site. The most common raw material present was chert, followed by chalcedony, quartzite, and obsidian. General percussion flakes dominated the debitage types. The lithic assemblage from both phases of data recovery contained 15 tools, including four bifaces, one battered implement, four choppers, five scrapers, and a utilized flake. No diagnostic tools were recovered from the site. Only two ground stone fragments were collected from the site.

The ceramic assemblage consisted of 73 sherds. This small assemblage represents a locally made collection with few irregularities in the temper. Seventy-three percent of the analyzed assemblage was composed of Tusayan

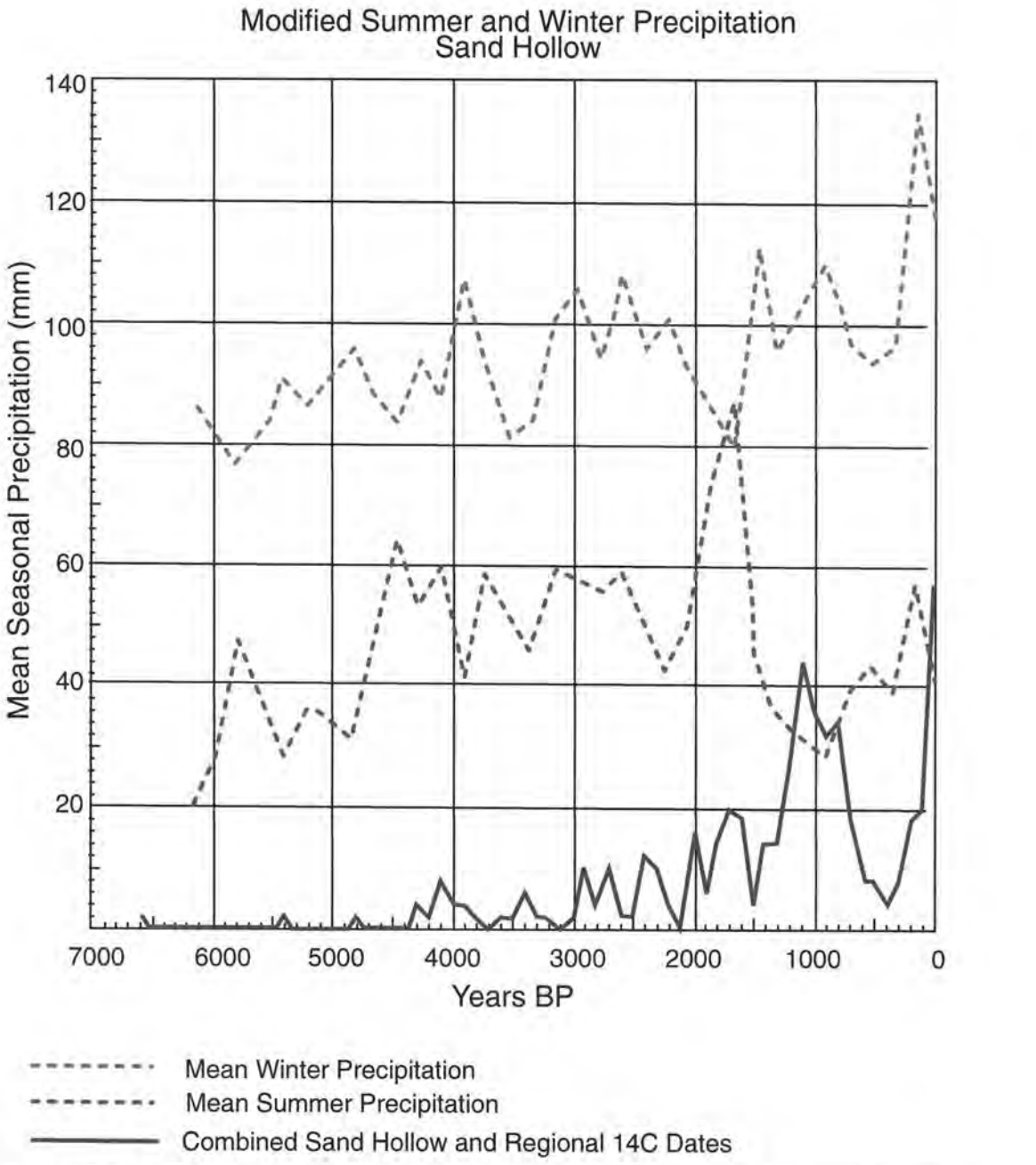


Figure 11.3. Regional radiocarbon dates (including Sand Hollow), with modeled summer and winter precipitation trends.

Figure 8. Regional radiocarbon dates with modeled summer and winter precipitation trends (from Talbot and Richens 2002: Figure 11.3).

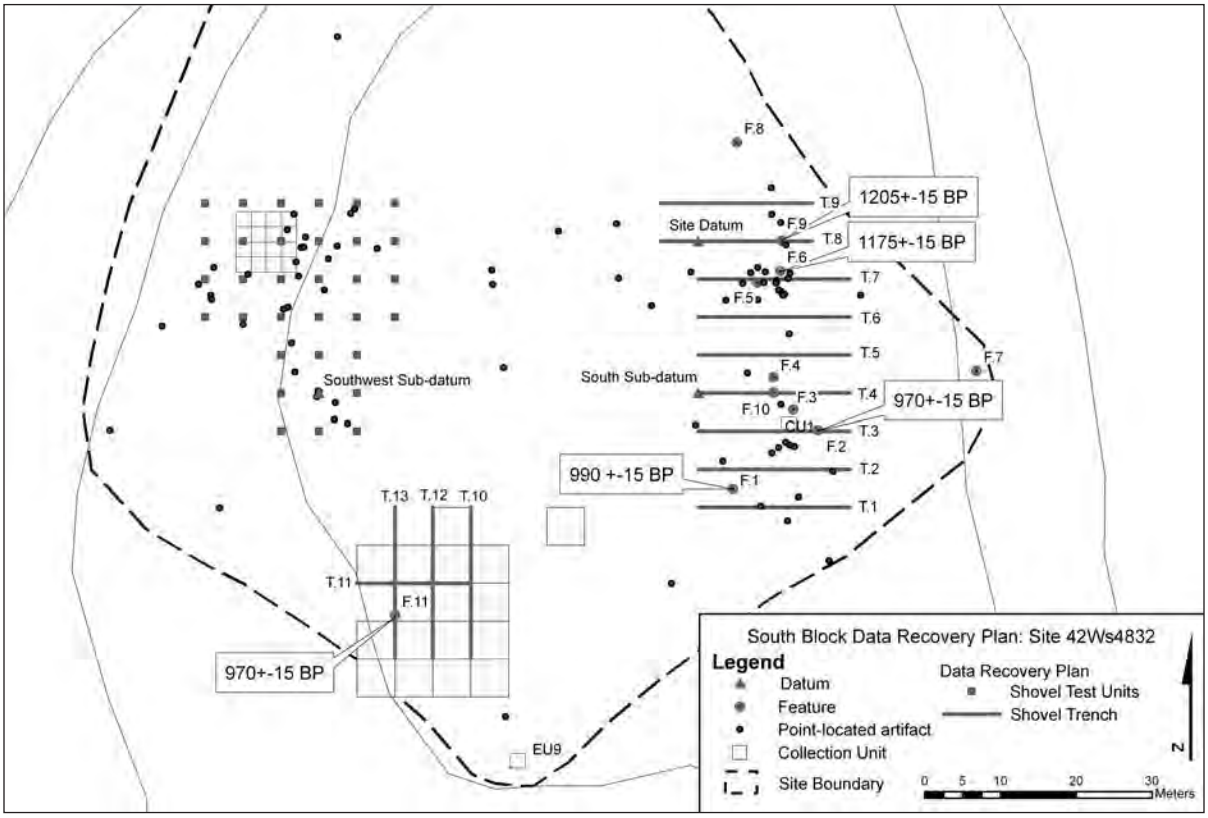


Figure 9. Map of site 42Ws4832, showing feature locations, point-located artifacts, collection units, and hand unit/trench locations.

Gray Ware, Virgin Series, North Creek gray sherds. The 15 painted wares were all Tusayan White Ware, Virgin Series. Both the plain and painted wares are typically found north and west of the Colorado River in the southwest Utah Virgin Anasazi area. The designs suggest that the site was occupied during late Pueblo I through Pueblo II, or from about A.D. 900–A.D. 1250. It is difficult to draw broad conclusions on such a small assemblage, but this assemblage combined with others in the project area and in the region in general helps to give a better understanding of the general periods of use.

Experimental Roasting

Cactus buds and flowers are high in carbohydrates and are a good source of calcium, and their buds ripen during a time of year when other foods are scarce. In 1975, Albert Goodyear deduced that the proof of these activities may consist of evidence of pit cooking (fire-cracked rocks, cooking pits with a diameter of approximately a meter and associated with fire-affected rocks, and associated cholla pollen) associated with artifact scatters and indications of camping activities (like hearths). The botanical and archaeological evidence at 42Ws4832 supports this hypothesis.

Greenhouse et al. conducted cholla roasting with the Pima, and their 1981 *Kiva* article provided the methods and results of the roasting along with the archaeological implications of cholla bud gathering and preparation. The roasting pit was dug into sandy, disturbed soil and was lined with river cobbles (mostly basalt). The pit was round with a flat bottom and sloping sides

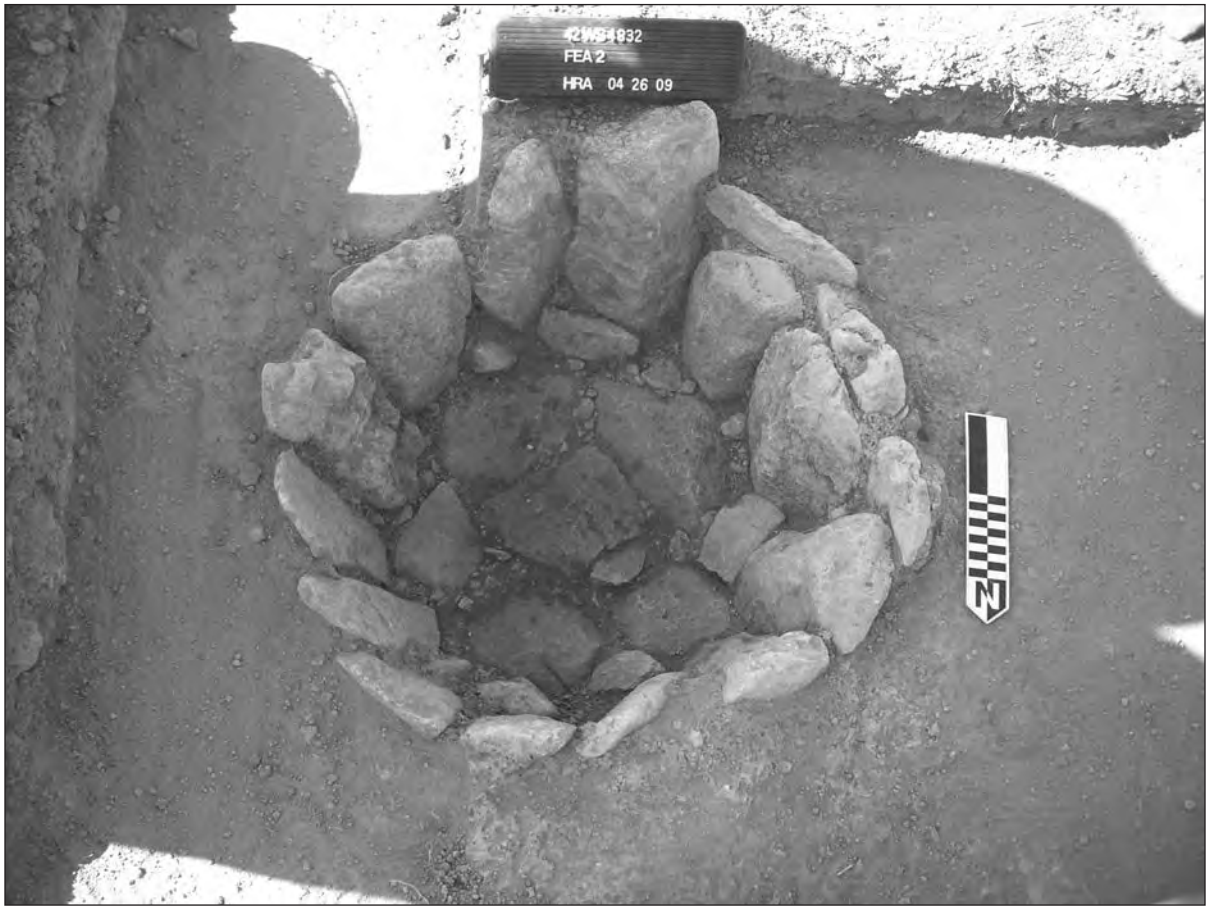


Figure 10. Feature 2, fully excavated during Phase II data recovery.

(Greenhouse et al. 1981:239). A fire built from mesquite wood was ignited and burned until it died down to burning coals; once the coals were established and the rocks were hot, a layer of seepweed was placed on the bottom and sides of the roasting pit. The buds were placed on top of the seepweed before another layer of seepweed was placed on top. A canvas and soil were used to cover the pit to prevent the steam from escaping. Seepweed served to protect, steam, and flavor the buds (Greenhouse et al. 1981:239). The roasting took about 18 hours, and cooking was considered complete when the spines were soft and turned yellow-brown in color and could be easily extracted. The buds were spread out on screens and left to dry for a period of one week. After a week, the spines were removed by rubbing the buds on the screens with sticks or stirring them in baskets, after which they were winnowed in baskets (Greenhouse et al. 1981:232).

Cholla buds were commonly ground into a meal and boiled in water with other ground meals such as corn, saguaro seed, or wheat (Curtin 1949:59, Greenhouse 1979:32-33). Greenhouse et al. (1981) noted that the cholla buds are exceptionally high in calcium, providing more per 100 g serving than eight ounces of milk. The buds also provided high amounts of other minerals such as magnesium, manganese, and selenium. Following Greenhouse et al.'s (1981) lead, we conducted our own roasting after completely excavating our thermal features and collecting cholla from plants on and surrounding the site (Figure 12).

Table 3. Excavated Features at 42WS4832

F. No.	Diameter (cm)	Depth (cm bgs)	Sample Contents	2-Sigma Calibrated Date Range
1	66 × 62	26	Prickly pear, cholla, creosote, sunflower family, cheno ams, saltbush, berries, yucca	990–1050 A.D., 1090–1130 A.D., 1140–1150 A.D. (PRI 08–34–24)
2	80 × 80	38	Cholla stems, maize?	1010–1050 A.D., 1080–1160 A.D. (PRI 08–34–52)
3	1.26 × 1.23 m	29	n/a	n/a
5	80 × 60	23	Bulrush, cholla, prickly pear, grass	n/a
6	70 × 70	48	Cholla	770–900 A.D., 920–940 A.D. (PRI 08–34–177)
9	79 × 74	37	Cholla, creosote	770–890 A.D. (PRI 09–125–269)
10	66 × 69	13	n/a	n/a
11	80 × 88	20	Creosote, cholla	1010–1050 A.D., 1080–1160 A.D. (PRI 09–125–331)

We conducted three separate roasting experiments, roasting cholla buds twice in Feature 2 and once in Feature 5. Per our data recovery plan, we used the existing excavated features in the experimental roasting. We did this because we had completed our data recovery investigations and the features would soon be destroyed by future development. The most successful roast was our initial attempt in Feature 2. We built a fire in Feature 2 using dead cholla and some dead creosote bush. The fire was lit for approximately one hour before we placed seepweed on the coals. We placed approximately one-half of a 12-quart bucket of cholla buds on top of the seepweed, before placing a wet paper bag on top of the buds. (This was to make sure that the fire didn't spread.) We covered the bag with flat stones (Figure 13) and then covered the stones with dirt. The cholla buds were left in the pit for 22 hours. After tasting the roasted buds in the field, our consensus was that they tasted like and had the consistency of artichokes. We removed the spines with our fingers just as the buds were removed from the coals (not an easy task).

The cholla was stored in the refrigerator when we returned from the field, after it was roasted. It was then laid out to dry outside of the HRA office. We placed the buds on top of a screen, and another screen was placed on top of the buds to keep the insects from getting to them. The buds were dried for five days. We also collected non-roasted cholla buds; these were left to dry for two days in the same manner. The spines were left on all of the buds.

Nutrition Data

After returning from the field, we sent a sample of dried roasted cholla buds to Midwest Labs in Nebraska for analysis (Ramig 2009). We then compared the results with those from previous experimental roasting conducted by others (Greenhouse et al. 1981). The cholla buds from HRA's roasting have higher nutrition contents in every category in which they can be compared.

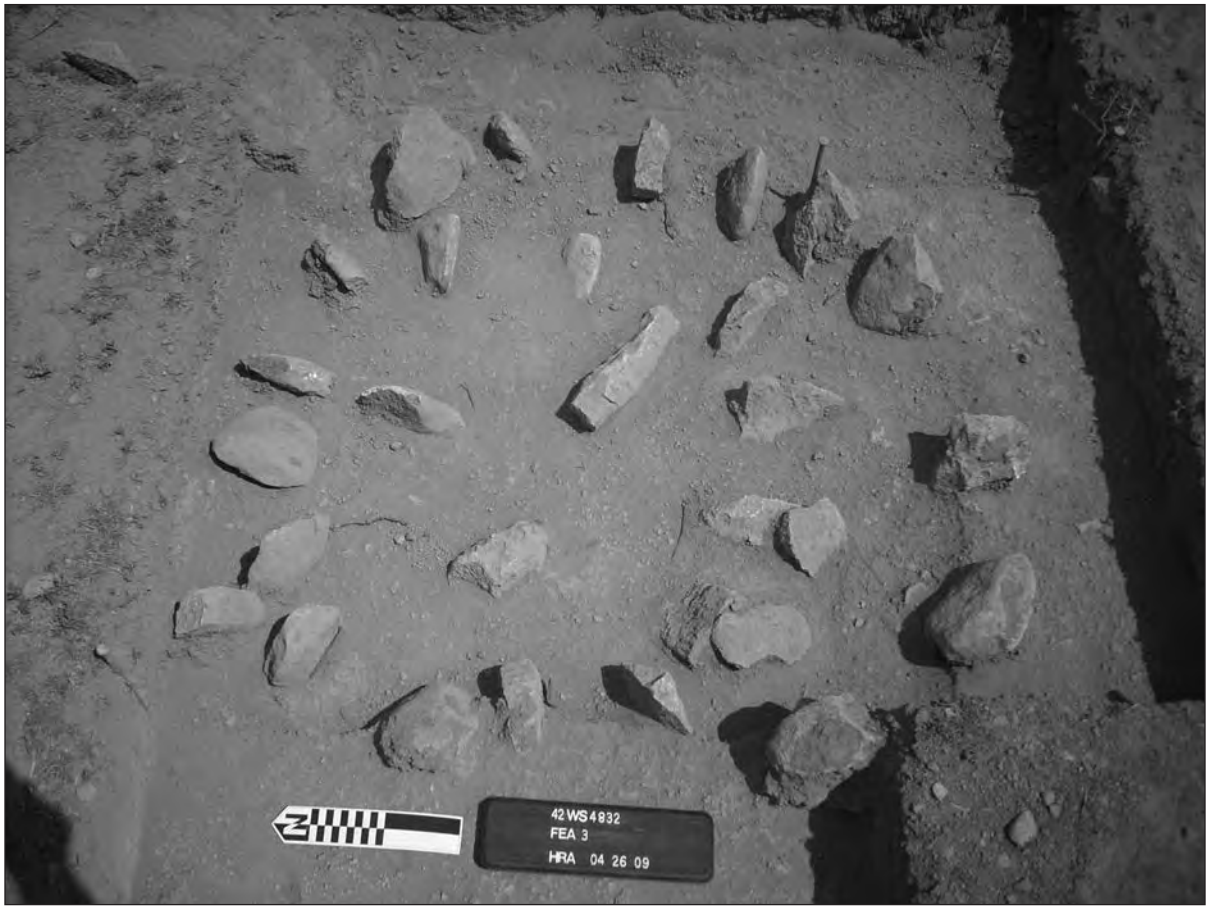


Figure 11. Feature 3, spiral alignment excavated during Phase II data recovery.

The calcium content in the cholla roasted by HRA is more than two times higher than that roasted by Greenhouse et al. One serving of the buds roasted by HRA contained nearly 38 percent of the current daily recommended intake of calcium. HRA roasted cholla is also high in fiber (31 grams) and potassium (nearly 15 percent of the RDA). Potassium may help reduce the risk of stroke and hypertension as well as prevent kidney stones and bone loss that occurs with age. Finally, one serving of HRA's roasted cholla contained 45 percent of the RDA of Vitamin A.

Cholla buds also have a high caloric return rate (Table 4). As collected by HRA, the average return rate for cholla buds was 6,960–10,440 calories per hour, per person. (We reached these numbers by computing in the following manner: An HRA archaeologist could collect and roast 4–6 quarts per hour—80–120 oz by 87 calories per ounce = 6,960–10.440 calories/hour/person.) As collected by Greenhouse et al. (1981), the return rate was 2,440–3,660 calories per hour, per person. (We do not know how they did their computing.) HRA's return rate places the cholla buds higher than pinyon nuts and/or chenopods, Indian rice grass, and wildrye, all of which fall between 300–1300 calories per hour, per person (Table 4). Cholla cactus is considered a reliable food source, since their flowering season remains the same year after year and because they easily propagate from the disjointed stems (Greenhouse et al. 1981:228). The presence of such abundant cholla cactus plants on and surrounding the site along with the eight thermal features indicates

Figure 12. Collecting cholla buds on site. Note the blooming prickly pear.

that the prehistoric occupants felt their energy was better spent processing the cholla buds nearer to the source, rather than taking them to another location where they may have been living.

HRA's methods, while similar to Greenhouse et al.'s (1981) methods, were not identical. Greenhouse et al. (1981:229) roasted their cholla buds for 18 hours and left them to dry for one week. HRA's cholla buds were roasted for 22 hours and were dried for five days. Both methods used seepweed and hot rocks, although Greenhouse et al. (1981:229) used a canvas and we used wet paper bags. All things considered, we feel that the differences in roasting and drying methods should not result in a significant difference in the nutritional value of the cholla buds.

Conclusions

To answer the questions posed in the second phase of investigations, we expanded our excavations and conducted an experimental cholla buds roast to evaluate their nutritional value. We learned that cholla buds represent a good source of both calcium and calories. Although the collection season is short, efficient processing can result in high yields. Processing the buds on site reduces the carrying costs and increases the efficiency of their processing.

Figure 13. Experimental cholla roasting at 42Ws4832.

Table 4. Return Rates for Cholla Buds and Other Resources

Resource	Calories Per Hour/Per Person
Chenopods, Indian rice grass, wildrye	300–1,300
Pinyon nuts	1,200–1,700
Cholla buds (processed by Greenhouse et al.)	2,440–3,660
Cholla buds (processed by HRA)	6,960–10,440
Mule deer	18,000–32,000
Jackrabbits	13,500–15,400

From our studies we can conclude that the site likely served as a short term plant gathering and processing camp. Cholla buds and probably other cactus species (such as prickly pear fruit) were gathered and either transported back to permanent habitations elsewhere, or they were processed on site and then transported. It is also possible that the buds were processed and consumed on site rather than transported elsewhere. If rainfall regimes shifted from summer to winter, the productivity of cactus species in terms of caloric yield would have made them an attractive supplement to maize and other cultigens.

Cactus resource patches would have been an important source of food during a time of the year when most other wild plants are not yet available. Our nutritional analysis demonstrates how important this plant would have been to growing populations who were tethered to the farming areas of the Valley and suffering from crop failure in the previous growing season.

Our work at South Block integrates new understanding of prehistoric behaviors in the area with what has already been explored in other previous investigations. By paying attention to the specific environmental conditions of a site (ie, the abundance of particular plants, like cholla) archaeologists can begin to ask interesting questions about site function. In addition, the commitment to experimental archaeology during this project yielded additional answers to questions regarding prehistoric subsistence practices and nutritional needs, and how these needs could be met through means other than agriculture. Integrating different ideas and methods into the archaeological process enables us to broaden our understanding of prehistoric use of the St. George Basin, southwestern Utah, and beyond. ■

Suzanne Eskenazi
HRA, Inc., Conservation Archaeology
520 S Jones Blvd.
Las Vegas, NV 89107

Heidi Roberts
Founder and Director
HRA, Inc., Conservation Archaeology
520 S Jones Blvd.
Las Vegas, NV 89107
Email: heidi@hraarchaeology.com

References

Ahlstrom, Richard V.N., Heidi Roberts, and J. Jeffrey Flenniken
2000 *Testing of Six Archaeological Sites in the Kayenta Development Area, Washington County, Utah*. HRA, Inc. Archaeological Report No. 00–01. HRA, Inc. Conservation Archaeology, Las Vegas.

Bryson, Robert U., and Reid A. Bryson
2002 Holocene Climatic Change in Sand Hollow. In *Shifting Sands: The Archaeology of Sand Hollow*, edited by Richard K. Talbot and Lane D. Richens, pp 219–242. Brigham Young University Museum of Peoples and Cultures Occasional Paper No. 13. Provo.

Castetter, Edward F. and Ruth M. Underhill
1935 The Ethnobiology of the Papago Indians. University of New Mexico Bulletin 275, Biological Series 4 (3).

Fowler, Don D. and Catherine S. Fowler (editors)
1971 Anthropology of the Numa: John Wesley Powell's Manuscripts on the Numic Peoples of Western North America, 1868–1880, Smithsonian Contributions to Anthropology, Number 14, Smithsonian Institution, Washington, D.C.

Goodyear, Albert C. III
1975 Hecla II and III An Interpretive Study of Archeological Remains From the Lakeshore Project, Papago Reservation, South Central Arizona. Arizona State University Anthropological Research Paper No. 9, Arizona State University, Mesa.

Greenhouse, Ruth
1979 The Iron and Calcium Content of Some Traditional Pima Foods and the Effects of Preparation Methods. Unpublished Master's Thesis, Department of Home Economics, Arizona State University, Tempe.

Greenhouse, Ruth, Robert E. Gasser, and Jannifer W. Gish
1981 Cholla Bud Roasting Pits: An Ethnoarchaeological Example. Kiva, 46(4):227–242.

Kelly, Isabel T.
1976 Paiute Ethnography, Anthropology Papers Number 69, Department of Anthropology, University of Utah, Salt Lake City.

Lyneis, Margaret
1995 The Virgin Anasazi, Far Western Puebloans. Journal of World Prehistory 9:199–241.

Puseman, Kathryn, Linda Scott Cummings, and Mona Lambert
2009 Pollen, Macrofloral, Organic Residue (FTIR), and AMS Radiocarbon Analysis of Samples from Features at Site 42Ws4832, Utah. PaleoResearch Institute, Inc. Report No. 09–125, 08–34. PaleoResearch Institute, Inc., Golden.

Ramig, Heather
2009 Midwest Laboratories, Inc. Nutritional Analysis. Report No. 09–187–2212v2. Submitted to HRA, Inc. Conservation Archaeology.

Roberts, Heidi and Richard V.N. Ahlstrom
2003 The Coral Canyon Project: Archaeological Investigations in the St. George Basin, Southwestern Utah. HRA Papers in Archaeology No. 3. HRA Inc., Conservation Archaeology, Las Vegas.

Talbot, Richard K. and Lane D. Richens
2002 Shifting Sands: The Archaeology of Sand Hollow. Brigham Young University, Museum of Peoples and Cultures Technical Series No. 01–5, Brigham Young University, Provo.

Toolstone Quarry Exploitation Decisions in the Northeastern Great Basin

Dale R. Earl
Bureau of Land Management, Salt Lake Field office

The decision that prehistoric foragers made about which toolstone quarries to exploit is an intriguing subject for archaeologists. Here, a model of behavioral ecology is modified to test the hypothesis that this decision is based on a relationship between toolstone quality and transport distance. The hypothesis predicts that higher quality toolstone will be taken preferentially to lower quality toolstone as evidenced through transportation of the higher quality stone over greater distances. The hypothesis is tested using data from sites in the northeastern Great Basin. Data was analyzed using a Geographic Information System (GIS). Results show a statistically significant relationship between distance of quarries with quality toolstone and archaeological sites.

Studies of lithic assemblages have been important to archaeological research for many years. The advantage of studying lithics is the fact that these artifacts remain preserved in the archaeological record long after other parts of the material record have been lost to taphonomic processes (Andrefsky 2009, Cotterell and Kamminga 1987). It is not surprising then, that many studies in archaeological literature are devoted to lithic artifacts. But lithic materials are not just studied because of their prevalence in the material record; lithic materials can also provide important information about prehistoric behavior.

In order to develop testable expectations for how procurement of lithic material occurred in prehistory, it is necessary to use a generalized theory of human behavior. Behavioral ecology can be seen as an effective approach due to its use of formal models which provide a framework for organizing testable hypotheses (Bird and O'Connell 2006).

Behavioral ecology seeks to explain how interactions between evolutionary forces and variable ecological conditions drive adaptations in an organism's behavior (Krebs and Davies 1993, Broughton and O'Connell 1999). The basic premise of behavioral ecology is that an organism will behave in a manner that will maximize its chances for survival and reproductive success, and that this will be best accomplished through the optimization of time and effort in various fitness activities.

Recent studies of lithic artifacts (for example, Beck et al. 2002, Beck 2008) have successfully used behavioral ecology to show that distance between toolstone quarries and residential locations should result in variable amounts of field processing in order to maximize delivery rate of toolstone.

The purpose of the present study is to test the hypothesis that the decision of whether or not to exploit a toolstone quarry will be based upon a forager's goal of optimizing their return on investment of time and energy. Optimization will be achieved by obtaining the greatest amount of high quality toolstone with the least amount of cost. This study is based on data derived from sites located in the northeastern Great Basin that span much of the Holocene (Mueller et al. 2009).

Background

To optimize toolstone acquisition, a forager must quarry stone from a toolstone source for the least amount of cost. Because toolstone has the potential to be consumed quickly, and because human foragers are dependent on tools for all of their foraging activities, a forager who can supply himself with toolstone in the most

economical manner will have a fitness advantage over other foragers. In order to accomplish this, a forager must select a toolstone source that will not only provide high quality toolstone, but also be readily accessible in order to supply future demands (Kuhn 1992).

Studies attempting to determine why a forager will select one source of toolstone over another are not entirely new. Often these studies conclude that foragers are most likely basing their decisions on the distance from sites to source locations. Taliafero et al. (2010) takes this idea a step further and builds a least cost analysis in GIS using distance and slope to determine which sources foragers in the Mimbres area of New Mexico will exploit.

However, these studies also often mention quarries within a suitable range for foragers, which are not exploited. In these cases, it seems likely that the quality of the toolstone to potentially be exploited from these quarries plays a significant role in a forager's exploitation decisions.

Looking at areas of the western United States, Andrefsky (1994) found that in areas where quality toolstone types were readily available, prehistoric groups preferentially chose these materials. He also found that in areas where high quality materials were not available, but low quality materials were, prehistoric groups would travel great distances to exploit high quality toolstone rather than use the low quality materials that were readily available. This expectation was only violated when the abundance of low quality material was extremely high, but only if abundance of high quality material was extremely low.

This type of behavior closely follows patterns predicted by optimal prey choice models of behavioral ecology. These optimal prey choice models predict that a forager should specialize in capturing higher quality prey types when they are abundant. Prey types with lower quality will then enter a forager's diet, not based on their own abundance, but rather based on the abundance of the prey types with higher quality (Krebs and Davies 1993). To put it another way, a forager will not take a low quality prey item no matter how abundant it is, unless the abundance of high quality prey is so low that taking the lower quality prey item becomes profitable.

Using Andrefsky's work as a guide, MacDonald (2008) found that the quality of toolstone would have a significant impact on tool production. MacDonald noted that prehistoric inhabitants of Skink Rockshelter in West Virginia would produce bifaces and projectile points from what he identifies as lower quality Kanawha chert, while tools made of quality Upper Mercer chert showed a higher degree of curation through retouch. MacDonald argues that this pattern shows that tools made from higher quality toolstone were curated to minimize the risk of tool failure in a place where the acquisition of more high quality toolstone was reduced.

Ethnographic data has also shown that when quality toolstone is available locally it is taken preferentially, but when it is not, effort will be made to acquire it. In central Australia, O'Connell (1977) found that the types of stone tools produced by the Alyawara were influenced by the quality of locally available lithic materials. Not surprisingly, it was discovered that Alyawara sites located near quartzite sources were marked by a higher ratio of quartzite tools to chert tools, and that the opposite pattern was seen when sites were located near chert sources.

The importance of the toolstone quality is reflected in the tools that are produced from these two types of toolstone. O'Connell (1977) reported that adzes were preferentially made out of chert because the Alyawara regarded quartzite as being too brittle. Because of this preference, high quality chert would be acquired from areas that could be over 160 km away.

Studies of ethnographic populations in the Great Basin have shown similar results. Hughes and Bennyhoff (1984) point out that throughout the Great Basin, Native American populations have used obsidian as a toolstone material to make projectile points, knives, drills, and other forms of flaked stone tools. They also point out

that among the Surprise Valley Northern Paiute, a particular form of red obsidian was favored over other types of obsidian due to its increased durability.

The Model

When trying to determine why a forager would choose a particular stone quarry as a source for toolstone, it is important to understand why such a decision is significant. Beck et al. (2002) point out that stone quarries, and the toolstone acquired from them, are essential for most prehistoric technologies. They argue that the importance foragers would have placed on obtaining toolstone would have been on the same level as the acquisition of other resources.

It is also important to understand that the acquisition of toolstone requires a forager to make certain tradeoffs. In order to quarry toolstone, a forager must shift his efforts away from other foraging activities. Even if a forager's yearly toolstone needs only amount to a few kilograms, the time required to quarry toolstone is time that cannot be spent on other foraging activities. While a forager may use a prey capture trip to get them close to a toolstone quarry, the forager must make a choice between quarrying stone and continuing pursuit of prey.

These tradeoffs are illustrated by Binford (1979) in his work with the Nunamiut. As he points out, the Nunamiut would go in search of toolstone when other food capture activities were poor enough to make toolstone quarrying a more attractive option. This example shows the tradeoff in fitness benefits that toolstone quarrying requires. While such quarrying activities will provide the eventual fitness benefit of facilitating future prey capture, it will only be pursued when the likelihood of current prey capture is reduced to the point at which toolstone quarrying provides a larger fitness benefit.

When one considers the role of technology in a forager's acquisition of food, the assertion becomes plausible that toolstone acquisition is as important to the forager as food acquisition. This assertion should also lead us to believe a forager should make technology out of the highest quality materials that he could afford to ensure it will provide the greatest service for capturing food. When viewed through the lens of behavioral ecology, a forager who is able to acquire the highest quality toolstone would have a selective advantage over a forager who is not (Elston 1992).

In recent years, studies about the foraging behaviors of hunter-gatherers setting out from central residential locations have provided archaeologists with critical information about how foragers maximize energy delivery to these locations (Barlow and Metcalfe 1996, Cannon 2003). While many of these earlier studies have mainly focused on return rates of food items, a similar pattern can be seen with return rates for toolstone.

The critical elements of foraging models are their ability to relate the utility of a resource to the overall transport costs of collecting the resource and bringing it back to the location. Studies by Barlow and Metcalfe (1996), and Bird and Bliege Bird (2000) provide examples of how the desire to increase the utility of a transport load will shape foragers' decisions on transport.

In lithic research, Beck et al. (2002), and Beck (2008) have shown that once a toolstone quarry has been located, the processing of the toolstone will follow a similar pattern as the one outlined in Barlow and Metcalfe's (1996) model for transport utility for pinyon. These studies found that the level of processing toolstone into tools at a quarry will increase as the distance from site to quarry grows. From this finding we can see that a forager's decision about transporting toolstone is extremely similar to decisions about transporting prey items. It should then stand to reason that decisions about what quarries a forager should exploit will also echo decisions about prey exploitation.

As Krebs and Davies (1993) point out, decisions that foragers make about which prey to exploit are based on measures of profitability. When determining whether or not to exploit a toolstone quarry, a forager must make decisions

similar to those outlined in optimal foraging models. The decision that a forager faces on whether or not to exploit a quarry for toolstone can be summarized by the formula:

$$U=Q/C$$

Where *U* is the utility at which a forager will exploit a potential toolstone quarry, *Q* is the potential quality of the toolstone to be quarried, and *C* is the cost that a forager must pay in order to exploit the quarry.

The exact type of cost is not specified in this model in order to remain flexible to the exploitation strategies a forager might use in order to obtain the toolstone. For instance, a forager who personally exploits a toolstone quarry may pay a cost in time spent not pursuing other fitness activities, or a cost in distance travelled from a location. At the same time, a forager who exploits a quarry through trade with another foraging group for toolstone that he did not visit will pay a cost through the price of trade. Because the model does not specify which cost must be used, the model remains flexible enough to take into account both types of quarry exploitation strategies.

In this study, cost was measured as a function of distance. There are several reasons for why this was done. While some toolstone can be acquired through trade with exterior groups, an exclusive reliance on trade as a source of toolstone procurement can place undue risk on a foraging group due to the high need for quality toolstone at all times (Daniel 2001, Elston 1992, Jones et al. 2003). Because foraging groups in the northeastern Great Basin were also in close proximity to a variety of suitable lithic sources, this study assumes that the majority of toolstone procurement in this region could have been performed by the end users of the material.

An exact definition of quality for toolstone has been difficult to pinpoint. There are many definitions that could be viewed as correct for how quality of toolstone may be assessed. For instance, one potential measurement of toolstone quality that could have been selected is the ability of a toolstone type to penetrate materials like bone or wood, which would allow a forager to use the toolstone for a broad variety of tasks.

In this study, quality is defined as the predictability with which a type of toolstone can be flaked in order to make new tools (Griffiths 2000, Justice 2002). In other words, high quality materials will flake in a highly predictable manner, while lower quality materials will flake in an increasingly unpredictable manner.

By defining quality in this manner, we see quality differences in toolstone as a way in which a forager can optimize his returns by spending less time making tools by using toolstone that allows for greater flaking predictability and ease of use. This would also allow a forager to increase the number and types of tools that could potentially be made from the quarried product (Kuhn 1994) through the use of a material that can be flaked into a greater variety of forms.

Using this definition of quality, one can begin to see how different toolstone types can be ordered by their quality. Very fine-grained, homogenous toolstone is more predictably flaked than coarse-grained and flawed materials (Andrefsky 1994; Beck and Jones 1990; Cotterell and Kaminga 1987; Griffiths 2000). This would allow the toolmaker to create extremely sharp edges and precisely shaped objects. By simplifying toolstone quality in this way, I allow quality to be measured not only between toolstone types (i.e. chert vs. obsidian), but also within toolstone types (i.e. obsidians from different source locations).

In this study I have opted to look at the variation in utility of a single type of toolstone, namely obsidian. This was done in order to take advantage of two types of information that are readily derived from obsidian. The first is x-ray fluorescence, which allows the researcher to trace obsidian artifacts back to a single source location. The second is obsidian hydration, which allows the researcher to construct at least a relative chronology of when obsidian artifacts were created.

The decision to focus on obsidian and not include other types of toolstone also allows the model to be simplified. While other toolstone material types, such as dacite, can be sourced in a manner similar to obsidian (Beck et al. 2002), adding other toolstone types would unnecessarily complicate the model at this time. If this model can be effectively used to test the current hypothesis, however, then the addition of other types of toolstone would be appropriate for study in the future.

By focusing on obsidian, I also create a model of toolstone transportation that can be tested in a variety of settings. Obsidian, when available, is used throughout the world as toolstone, and seems to be used preferentially due to the ease with which it can be flaked (Cotterell and Kamminga 1987, Griffiths 2000). This is likely due to the fact that obsidian displays a conchoidal fracture that is superior to all other forms of toolstone (Justice 2002). There are also gradients in the quality of obsidian as a toolstone (Peterson et al. 1997, Shackley 1988), making it ideal for tests of quality.

Methods

In 2009, an archaeological survey was performed as part of the section 106 requirements of the National Historic Preservation Act for a large multi-state pipeline project. As a stipulation for this project, a sample of the obsidian artifacts discovered during the survey was sent for obsidian hydration and x-ray fluorescence analysis (Landt et al. 2009, Mueller et al. 2009). The samples of archaeological obsidian collected were taken from surface contexts. In total, 71 obsidian artifacts from nine sites located in Box Elder County, Utah were submitted to Northwest Research Obsidian Studies Laboratory for testing.

All sites were surface recorded with limited shovel-probe testing performed for depth of cultural fill. Depth of these sites varied from no potential for depth on five of the sites to some potential for depth on the other five sites. As a collection strategy for this project, obsidian artifacts were collected from each site that contained such artifacts. On sites that contained less than 15 obsidian artifacts, all artifacts were collected. If a site contained more than 15 obsidian artifacts, a sample of 15 obsidian artifacts was collected (Landt et al. 2009, Mueller et al. 2009). While this sample strategy is not ideal, the results still provided useful information about obsidian obtained by prehistoric foragers.

Results of the x-ray fluorescence analysis identified two obsidian sources as the source locations for the obsidian artifacts collected from these sites. The Brown's Bench obsidian source was the source location for 42 of the recovered artifacts. The Malad obsidian source was the source location for 29 of the recovered artifacts (Mueller et al. 2009).

To ensure the results of the hydration analysis would provide more specific information about the chronology of the artifacts sampled, the rim measurements were matched to temporal data that was derived using cross-dating of diagnostic projectile points found at the sites (Mueller et al. 2009).

The fact that the obsidian at these sites comes from the Brown's Bench and Malad obsidian sources should not be surprising; obsidian from these sources is ubiquitous in the archaeological record. What is surprising, however, is the fact that there is another obsidian source in this area that seems to have been largely ignored by prehistoric foragers: The Wildcat Hills source in northwestern Utah.

When one looks closely at the obsidian from the Wildcat Hills source, it would seem plausible that the reason this stone was not taken was its low quality. The obsidian from the Wildcat Hills contains numerous phenocrysts (Jackson et al. 2009, Mueller et al. 2009). Phenocrysts are quartzite inclusions in the obsidian, making it more difficult to flake predictably than obsidians that do not contain phenocrysts (Dillian et al. 2010). This would classify the Wildcat Hills obsidian as low quality under the terms of this study.

All sites were included in a Geographic Information System (GIS) analysis to determine the travel distance between the individual sites and the source location for the obsidian artifacts recovered. Maps from the Northwest Research Obsidian Studies Laboratory (2010) were georeferenced into the GIS application in order to provide the location of obsidian sources. While each source location could have been mapped to better reflect their overall geographic extent, the decision was made to map each source as a single point to ensure that distance measurements were consistent.

With this information in the GIS application, the travel distance between these sites and the potential obsidian source at Wildcat Hills was then measured to obtain the distance from each site to the source from which obsidian was obtained. In all cases, simple linear distance between site and source was used in order to simplify the model and to minimize the distance cost for the obsidian entering the site.

When mapped, there was a distinct clustering of the sites that produced obsidian artifacts; seven sites were located toward the western edge of the study area and two sites were located toward the eastern edge of the study area (Figure 1). While the clustering of sites geographically is interesting, it should be noted that these only represent the archaeological sites from which obsidian samples have been taken to this point. Future survey of sites in this study area may increase the number of sites.

The seven sites that are located in the western portion of the study area are distinct in that all obsidian samples taken from these sites were sourced through x-ray fluorescence to the Brown's Bench obsidian source. These sites are, on average, 71.8 km away from the Brown's Bench obsidian source and 85.5 km away from the Wildcat Hills potential source. A two-tailed test of significance for these distance measurements (Table 1, Figure 2) showed that the difference in the distance to these potential quarries is significant (α=0.01, t=10.247, p<0.0001).

This is not surprising since foragers gain the greatest economic benefit by exploiting the nearest source of high quality toolstone through minimization of distance costs. This data also fits with the proposed model since the higher distance cost (*C*) for traveling to the Wildcat Hills source would further diminish the overall utility (*U*) of the stone that was quarried.

The two sites in the eastern portion of the study area also show a distinct pattern. Obsidian samples taken from these sites can be sourced to both the Brown's Bench obsidian source as well as the Malad obsidian source. These sites are, on average, 95.2 km away from the Brown's Bench source and 93.7 km away from the Malad source (Table 2, Figure 3). At the same time, these sites are only an average of 9.8 km away from the Wildcat Hills obsidian source.

While these two sites make up a very small sample size, there are statistically significant differences in the distance costs foragers at these sites would have had to pay to access these quarries. A two-tailed test for significance comparing the distance from these sites to the Brown's Bench source versus the Wildcat Hills source gives a t value of 30.84 (α=0.01, p=0.0011). The same test comparing the Malad source to the Wildcat Hills source gives a t value of 46.66 (α=0.01, p=0.0005).

With quality defined in this study as the ease with which toolstone can be flaked, the numerous phenocrysts in the Wildcat Hills obsidian (Jackson et al. 2009, Mueller et al. 2009) would make it a low quality option when compared to the Brown's Bench and Malad sources. Based on the expectations of foraging theory, the Wildcat Hills obsidian would not be based on the ease with which it could be gathered by a forager, but instead would be based on the ease with which a forager could obtain higher quality obsidians.

In order to understand how much greater the quality of the Brown's Bench and Malad obsidians would have to be to give a utility measurement high enough for a forager to justify using these sources rather than the Wildcat Hills source, the distances from the sites to the obsidian

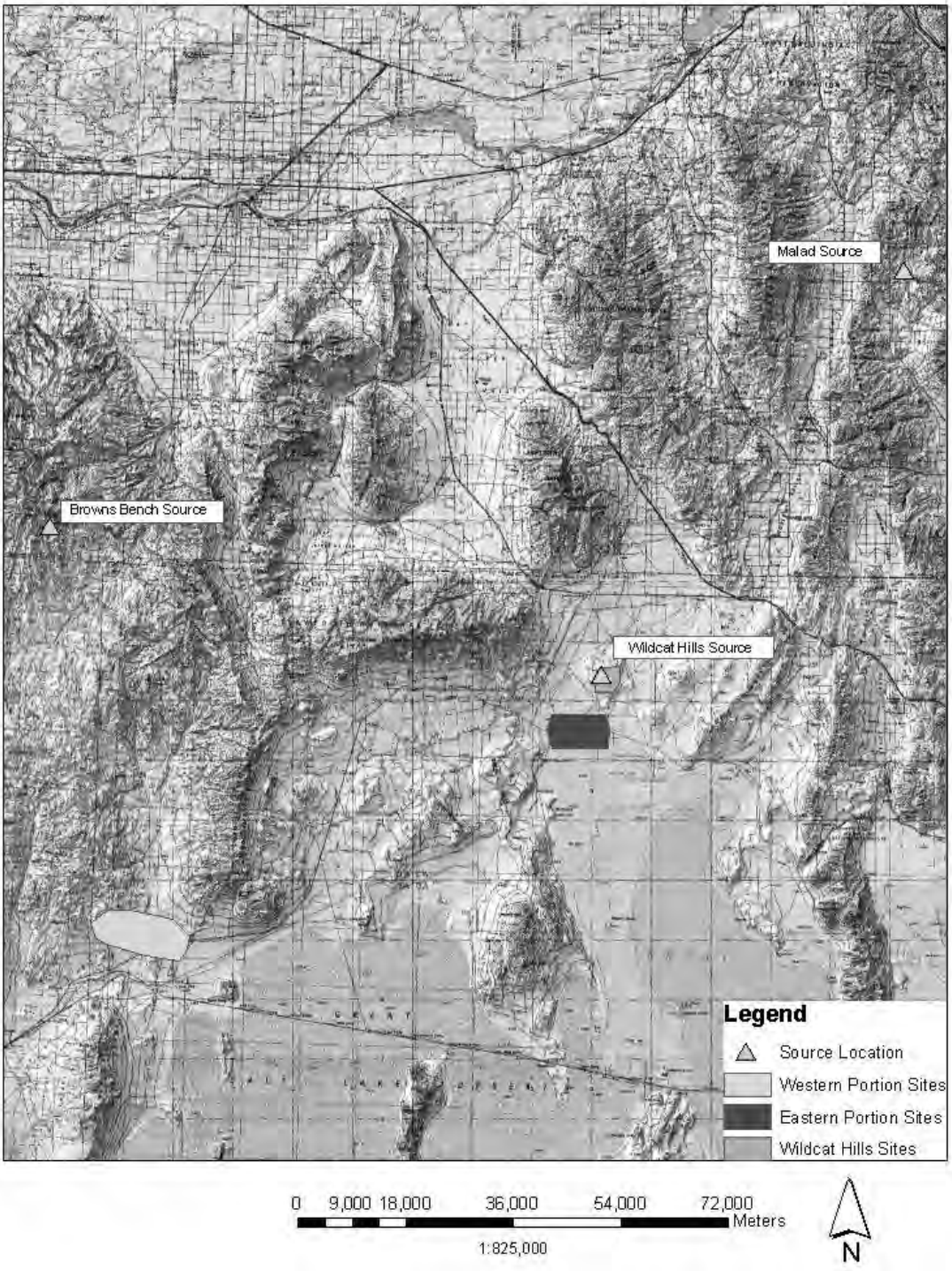


Figure 1. Map of the northern Bonneville Basin showing sites and obsidian sources discussed in the text.

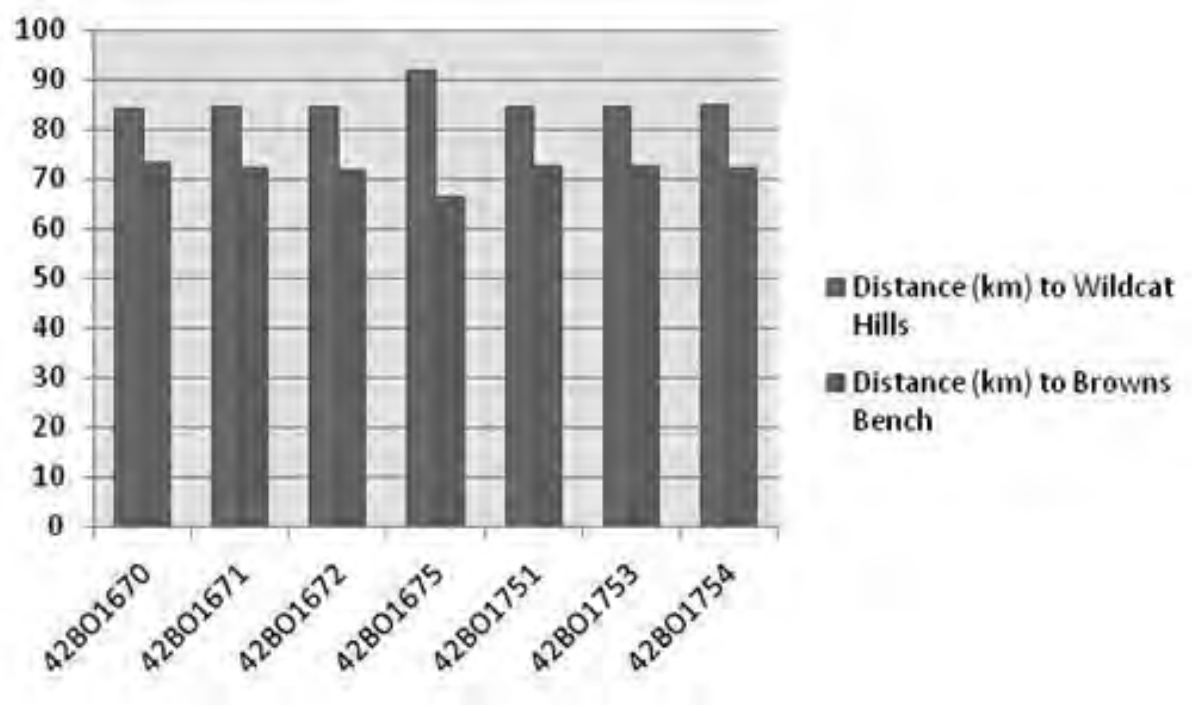


Figure 2. Chart of distance from the Western portion sites to the Browns Bench and Wildcat Hills sources.

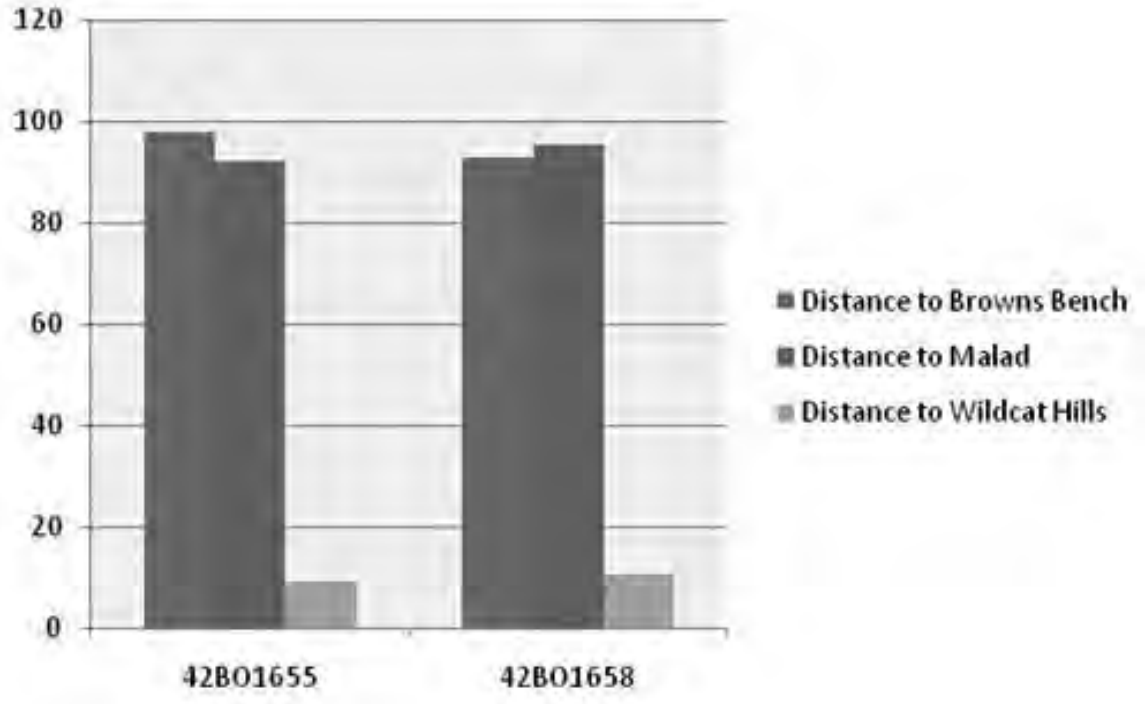


Figure 3. Chart of distance from the Eastern portion sites to the Browns Bench, Malad, and Wildcat Hills sources.

Table 1. Western portion site distance measurements

Site	Distance to Browns Bench	Distance to Wildcat Hills
42BO1670	73.32	84.27
42BO1671	72.21	84.44
42BO1672	71.96	84.61
42BO1675	66.68	92.01
42BO1751	72.57	84.48
42BO1753	72.59	84.71
42BO1754	72.48	84.98

Table 2. Eastern Portion site distance measurements

Site	Distance to Browns Bench	Distance to Malad	Distance to Wildcat Hills
42BO1655	97.83	92.1	8.96
42BO1658	92.57	95.25	10.69

sources were put back into the model equation (Table 3). Doing this showed that the obsidian quality of the Brown's Bench and Malad sources would need to be higher than the Wildcat Hills obsidian for a forager to get enough utility out of the material to justify its use (Figure 4).

This should be seen as further confirmation of the hypothesis that a forager's choice in toolstone exploitation is based on the quality of the resource being exploited. As Barlow and Metcalfe (1996) point out, even slight increases in the travel time needed to exploit a resource can have serious impacts on that resource's utility. Thus, a forager's decision to ignore a toolstone source at the cost of decreasing the overall utility of their quarry is striking.

Discussion

From the data, it would seem clear that when determining which toolstone quarries to exploit, foragers made decisions that would allow them to optimize their material procurement. This need to get the best quality toolstone for the cost, in distance, of traveling to the source meant that a forager would travel a significant distance to obtain quality toolstone while generally ignoring a much closer, low quality source.

One question that could be asked of this study is whether the Wildcat Hills obsidian was not used at the Eastern or Western portion sites because of some factor other than the quality of the toolstone. For instance, the average nodule size of the obsidian at Wildcat Hills tends to be small, as is the overall size of the quarry. These factors would be legitimate concerns if there were no cases of the Wildcat Hills obsidian ever being used for making stone tools. However, when one looks at work previously performed on obsidian sources in Utah, artifacts made of Wildcat Hills' obsidian can be found.

A review of obsidian sources in Utah performed by Jackson et al. (2009) noted two sites where the Wildcat Hills obsidian appears to have been used. These sites were subject to the same GIS analysis as the eastern and western portion sites from the study area. This analysis found that these sites were an average distance

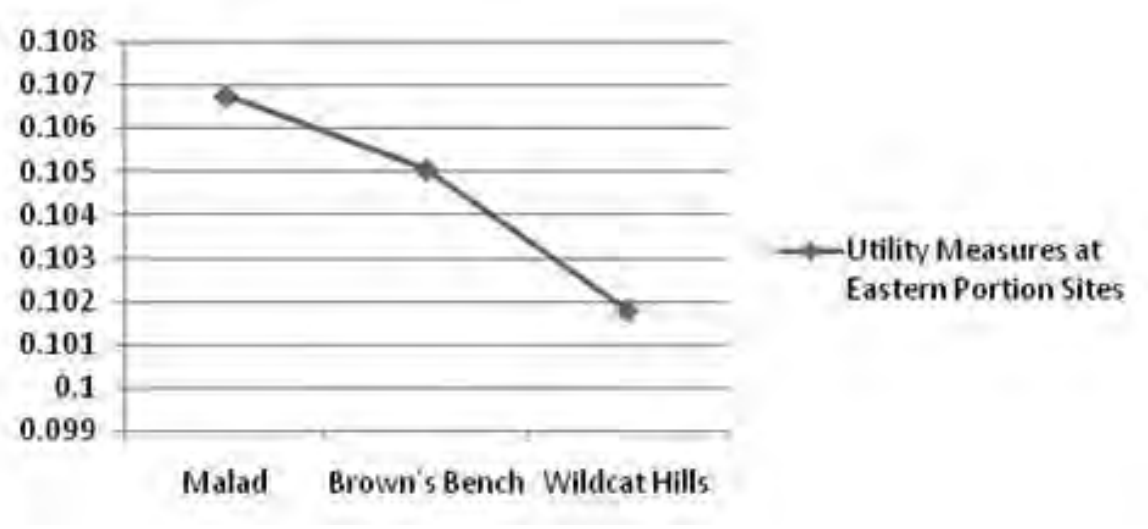


Figure 4. Utility measurements for the potential obsidian taken from Malad, Brown's Bench, and Wildcat Hills sources and transported to Eastern Portion sites.

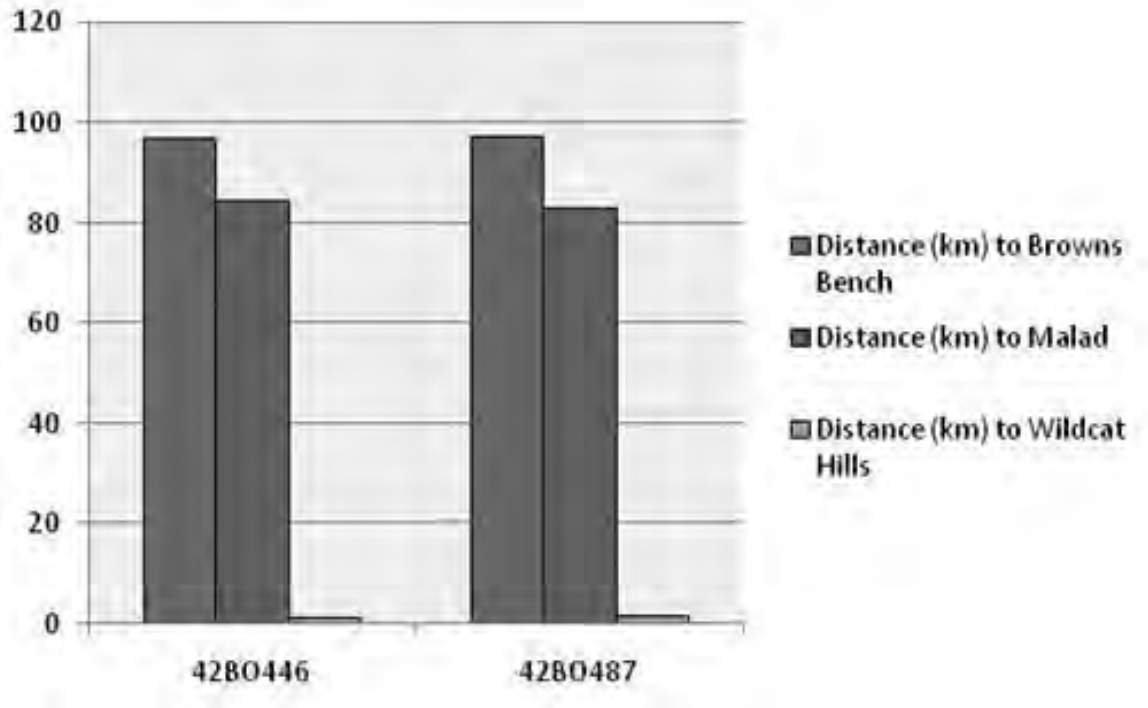


Figure 5. Chart of distance from the Wildcat Hills sites to the Browns Bench, Malad, and Wildcat Hills sources.

Table 3. Average measurements of utility (U=Q/C) needed at Eastern Portion sites for Malad and Brown's Bench obsidian to be taken

Source	Distance	Quality Measurement	Utility
Malad	93.68	10	0.107
Brown's Bench	95.2	10	0.105
Wildcat Hills	9.83	1	0.102

Table 4. Distance measurements for sites where Wildcat Hills' obsidian is found

Site	Distance to Wildcat Hills	Distance to Browns Bench	Distance to Malad
42BO446	0.99	96.88	84.35
42BO487	1.5	97.1	83.11

Table 5. Average measurements of utility (U=Q/C) needed at sites 42BO446 and 42BO487 for Malad and Brown's Bench obsidian to be taken

Source	Distance	Quality Measurement	Utility
Malad	83.73	80	0.955
Brown's Bench	96.99	80	0.825
Wildcat Hills	1.25	1	0.803

of 1.25 km from the Wildcat Hills source, an average of 96.99 km away from the Brown's Bench source, and an average of 83.73 km away from the Malad source (Table 4, Figure 5).

Site 42BO487 was recorded as a lithic scatter with toolstone material that included chert, quartzite, and natural obsidian cobbles. Site 42BO446 is composed of dense lithic scatter (maximum density of 100 flakes per m^2) groundstone, a sandstone biface, and an Elko series projectile point made from non-local obsidian. The obsidian flakes found at the site contain abundant phenocrysts, as is typical of the Wildcat Hills obsidian.

Performing the same statistical analyses on these sites as on the eastern and western portion sites from the study area shows that the statistical difference between these sites and the potential toolstone quarries are even greater. At an alpha of .01, comparing the distance from these sites to the Brown's Bench source versus the distance to the Wildcat Hills source furnishes a *t* of 344.76 ($p<0.0001$). Comparing the distance from the sites to the Malad source versus the distance to the Wildcat Hills source gives a *t* of 123.04 ($p<0.0001$) (Table 4).

Just as with the Eastern portion sites, the distances from these two sites to the obsidian quarries at Malad, Brown's Bench, and the Wildcat Hills were put into the model equation to determine the quality of obsidian from Malad and Brown's Bench that would have been required for those sources to be utilized over the source at Wildcat Hills (Table 5). From these calculations, it was found that obsidian from Malad and Brown's Bench would need to have a quality much higher than that of the Wildcat Hills obsidian in order for these quarries to be selected.

From this data, it would appear that the Wildcat Hills obsidian would only be exploited if a forager was extremely close to this source. It

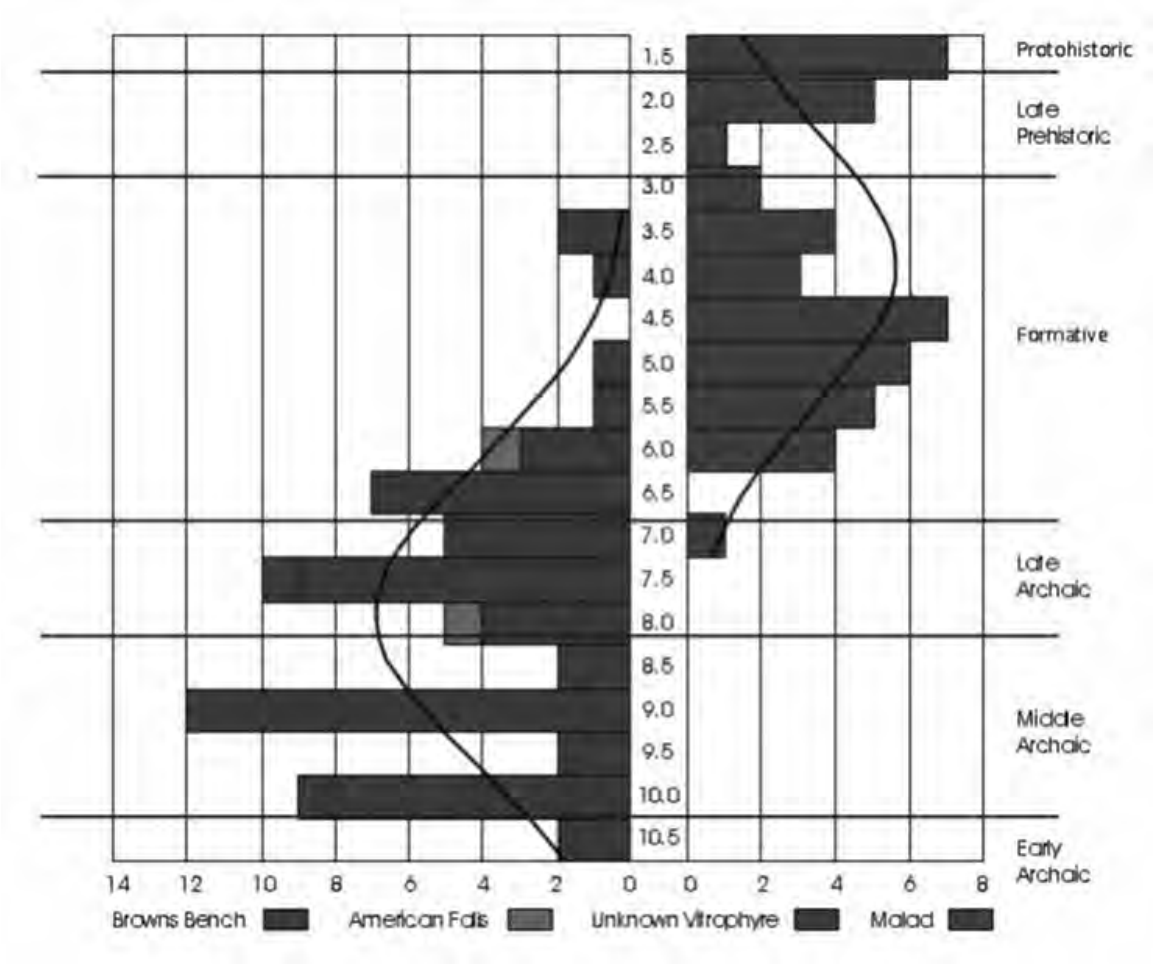


Figure 6. Obsidian hydration rim measurement histogram with normal distribution curves only for Brown's Bench and Malad obsidian measurements (From Muller et al. 2009).

is also important to note that the presence of an Elko series point made from non-local obsidian shows that foragers were likely to still prefer higher quality toolstone for more formal tools.

One must also understand that this phenomenon occurs over almost the entire prehistoric record. When obsidian hydration measures of these samples were taken, it was revealed that while a distinct shift in quarry exploitation from the Brown's Bench obsidian source to the Malad obsidian source occurred through time (Figure 6), the Wildcat Hills source was consistently ignored.

If foragers only had the Malad and Brown's Bench obsidian sources to select from, the difference in distance between the two sources would not have made a significant difference in distance traveled (α=0.01, t=0.495, p=0.668). However, the continued avoidance of a source of useable, but low-quality (by the definition of this study) obsidian shows how prehistoric foragers highly regarded quality.

Conclusion

The acquisition of quality toolstone was critical for the survival of prehistoric foragers in the Great Basin. Toolstone was necessary for creating the tools that were required for performing foraging activities. While many

studies in the past have focused on the decisions that foragers made about transporting toolstone once it had been acquired (Beck et al. 2002, Beck 2008), the decision that a forager must have made about which toolstone source to exploit has received little attention. It has been the goal of this paper to use the principles of behavioral ecology to test a hypothesis about this decision.

By using a model that examines the relationship between the quality of the toolstone at a given quarry and the transport costs of traveling to that quarry, one can test hypotheses about quarry exploitation decisions. In this paper, the decision of prehistoric foragers in the northeastern Great Basin to exploit or ignore potential obsidian quarries can be seen as a result of both the distance to each quarry as well as the quality of toolstone at each quarry.

There are potential future hypotheses that can be tested by using this model as well. For instance, decisions on which toolstone type a forager chooses to exploit can be explored. This could help explain the differences in ratios between obsidian artifacts and artifacts made of other toolstone types at archaeological sites. ■

Acknowledgements. I would like to thank Matt Landt and Alpine Archaeological Consultants for the use of the obsidian data collected for this project. I would like to thank Kelly Beck, Rand Greubel, Daron Duke, and Jack Broughton for their reviews and insights into this paper. I would like to thank Brian R. McKee and two anonymous reviewers for their notes. And finally I would like to thank the late Peter Ainsworth for his love of lithics which led to the impetus for this project.

Dale R. Earl,
Bureau of Land Management
Salt Lake Field Office
2370 South 2300 West
Salt Lake City, UT 84119
E-mail: Dale_Earl@blm.gov

References

Andrefsky Jr., W.
1994 Raw-Material Availability and the Organization of Technology. *American Antiquity* 59:21-34
2009 The Analysis of Stone Tool Procurement, Production, and Maintenance. *Journal of Archaeological Research* 17:65-103

Barlow, K.R. and D. Metcalfe
1996 Plant Utility Indices: Two Great Basin Examples. *Journal of Archaeological Science* 23:351-371

Beck, C., and Jones, G.T.
1990 Toolstone Selection and Lithic Technology in Early Great Basin Prehistory. *Journal of Field Archaeology* 17:283-299

Beck, C., A.K. Taylor, G.T. Jones, C.M. Fadem, C.R. Cook, and S.A. Milllward
2002 Rocks are Heavy Transport Costs and Paleoarchaic Quarry Behavior in the Great Basin. *Journal of Anthropological Archaeology* 21:481-507

Beck, R.K.
2008 Transport Distance and Debitage Assemblage Diversity: An Application of the Field Processing Model to Southern Utah Procurement Sites. *American Antiquity* 73:759-780

Binford, L.R.
1979 Organization and Formation Processes: Looking at Curated Technologies. *Journal of Anthropological Research* 35:255-273

Bird, D. and R. Bliege Bird
2000 The Ethnoarchaeology of Juvenile Foragers: Shellfishing Strategies among Meriam Children. *Journal of Anthropological Archaeology* 19:461-476

Bird, D. and J.F. O'Connell
2006 Behavioral Ecology and Archaeology. *Journal of Archaeological Research* 14:143-188

Broughton, J.M. and J.F. O'Connell
1999 On Evolutionary Ecology, Selectionist Archaeology, and Behavioral Archaeology. *American Antiquity* 64:153-165

Cotterell, B. and J. Kamminga
1987 The Formation of Flakes. *American Antiquity* 52: 675-708

Daniel, I.R. Jr.
2001 Stone Raw Material Availability and Early Archaic Settlement in the Southeastern United States. *American Antiquity* 66:237-265

Dillian, C.D., C.A. Bello, and M.S. Shackley
2010 Long-Distance Exchange of Obsidian in the mid-Atlantic United States. In *Trade and Exchange: Archaeological Studies from History and Prehistory*, edited by C.D. Dillian and C.L. White, pp. 17-35. Springer, New York.

Elston, R.G.
1992 Modeling the Economics and Organization of Lithic Procurement. In *Archaeological Investigations at Tosawihi, A Great Basin Quarry*, edited by R.G. Elston and C. Raven, pp. 31-47. Prepared for the Bureau of Land Management, Elko Resource Area, by Intermountain Research Reports, Silver City, NV.

Elston, R.G. and P.J. Brantingham
2002 Microlithic Technology in Northern Asia: A Risk-Minimizing Strategy of the Late Paleolithic and Early Holocene. In *Thinking Small: Global Perspectives on Microlithization*, edited by R.G. Elston and S.R. Kuhn, pp. 103-116. American Anthropological Association, Arlington.

Griffiths, D.R.
2000 Uses of Volcanic Products in Antiquity. In *The Archaeology of Geological Catastrophes. Geological Society, London, Special Publications, 171*, edited by W.G. McGuire, D.R. Griffiths, P.L. Hancock, and I.S. Stewart, pp. 15-23. The Geological Society of London, London.

Hughes R. E. and J. A. Bennyhoff
1986 Early Trade. In *Handbook of North American Indians, Vol. 11, Great Basin*, edited by W.L. d'Azevedo, pp. 238-255. Smithsonian Institution, Washington.

Jackson, R., J. Spidell, D. Kennelly-Spidell, and A. Kovak
2009 *A Historic Context for Native American Procurement of Obsidian in the State of Utah*. Prepared by Pacific Legacy Historic Preservation, Cameron Park, California. Prepared for Logan Simpson Design, Inc. Salt Lake City, Utah. Submitted to Bureau of Land Management, Salt Lake Field Office, Salt Lake City, Utah.

Justice, N.D.
2002 *Stone Age Spear and Arrow Points of California and the Great Basin*. Indiana University Press, Bloomington.

Krebs, J.R., and N.B. Davies
1993 *An Introduction to Behavioral Ecology*. 3rd ed. Blackwell Science Ltd., Cambridge, Massachusetts.

Kuhn, S.L.
1992 On Planning Curated Technologies in the Middle Paleolithic. *Journal of Anthropological Research* 48:185-214
1994 A Formal Approach to the Design and Assembly of Mobile Toolkits. *American Antiquity* 59:426-442

Landt, M.J., R.A. Greubel, and J.E. Pfertsh
2009 *Class III Cultural Resource Inventory of the Ruby Pipeline Project: Utah Segment – Rich, Cache, and Box Elder Counties*. Prepared by Alpine Archaeological Consultants, Inc., Montrose, Colorado. Prepared for EPG, Inc., Phoenix, Arizona. Submitted to Bureau of Land Management, Salt Lake Field Office, Salt Lake City, Utah.

MacDonald, D.H.
2008 The Role of Lithic Raw Material Availability and Quality in Determining Tool Kit Size, Tool Function, and Degree of Retouch: A Case Study From Skink Rockshelter (46NI445), West Virginia. In *Lithic Technology: Measures of Production, Use, and Curation*, edited by W.A. Andrefsky Jr., pp. 216-232. Cambridge University Press, Cambridge.

Mueller, J., M.J. Landt, J.E. Pfertsh, and R.A. Greubel
2009 *Addendum 1 to Class III Cultural Resource Inventory of the Ruby Pipeline Project: Utah Segment – Rich, Cache, and Box Elder Counties*. Prepared by Alpine Archaeological Consultants, Inc., Montrose, Colorado. Prepared for EPG, Inc., Phoenix, Arizona. Submitted to Bureau of Land Management, Salt Lake Field Office, Salt Lake City, Utah.

O'Connell, J.F.
1977 Aspects of Variation in Central Australian Lithic Assemblages. In *Stone Tools as Cultural Markers: Change, Evolution and Complexity*, edited by R.V.S. Wright, pp. 269-281. Australian Institute of Aboriginal Studies, Canberra.

Peterson, J., D.R. Mitchell, and M.S. Shackely
1997 The Social and Economic Contexts of Lithic Procurement: Obsidian from Classic-Period Hohokam Sites. *American Antiquity* 62:231-259

Shackley, M.S.
1988 Sources of Archaeological Obsidian in the Southwest: An Archaeological, Petrological, and Geochemical Study. *American Antiquity* 53:752-772

Taliafero, M.S., B.A. Schriever, and M.S. Shackley
2010 Obsidian Procurement, least cost path analysis, and social interaction of the Mimbres area of southwestern New Mexico. *Journal of Anthropological Science* 37:536-548

A Pioneer Settlement Period Home in Nephi, Utah: An Avocational Archaeological Investigation

Ren R. Thomas
Utah County Chapter of the Utah Statewide Archaeological Society (USAS)

Over the past twenty years, the author has remodeled and renovated his settlement-period home in Nephi, Utah. Recognizing that Utah is losing its pioneer heritage to the bulldozer and ever increasing development, it was decided to undertake a study to document and record the site to demonstrate what the avocational archaeologist, historian, or common property owner might consider in contributing to the historical and archaeological record. Recognizing that much of Utah's disappearing heritage lies on private ground, awareness, interest and input from the general public and the everyday homeowner are a must if it is to be preserved. Further, as we move into times of greater need for the conservation of natural resources and materials, reuse will inevitably become more common. This will provide increased opportunity to record and learn from the past as we chart a way forward to the future. For this project, research was carried out to place the author's historic home in the context of Juab Valley, the development of Nephi City, and to discover who the builder may have been and the date of original construction. The details of the home's construction and episodes of renovation are described in architectural drawings, photographs and limited archaeological excavation. As a narrative, this article follows the renovation over the past twenty years to lend context to the study and artifact collection.

An Avocational Investigation

It was during the course of renovating the home that I became seriously interested in archaeology and joined the Utah County Chapter of USAS. I then contemplated the question: Can the avocationist (or the typical homeowner for that matter) make a worthwhile contribution to the historical and archaeological record? In this instance, the home and its materials were still intact and still inhabited. For more than twenty years, my family and I have renovated and refurbished the structure, hopefully preserving it for the future. In doing this we were able to strip away previous remodeling episodes, and thereby follow the story back to the original construction. As work progressed and my knowledge and concern for archaeology developed, time constraints and commitment to family and others placed limits on the endeavor.

Getting the Lay of the Land

Nephi, UT, is situated on an alluvial fan originating from where Salt Creek drains Nephi Canyon and the area south and east of Mt. Nebo, forming a tongue of land extending westward into the Juab Valley (Figure 1). Nephi Canyon marks the boundary between the southernmost extent of the Wasatch Range vertical or "normal fault" zone and the northernmost part of the Gunnison-Sanpete (Sanpitch) Plateau, a "thrust fault" zone. These fault features expose a variety of deep Paleozoic and shallower Mesozoic rock formations (Stokes 1987) that provide both resources, as well as small earthquakes that regularly rumble underfoot. The Juab Valley is the remnant of an ancient lakebed that was once part of the pluvial Lake Bonneville system, and eventually drains through Goshen Canyon, where the stream takes the name of Currant Creek before emptying into Utah Lake in the Utah Valley. It is from the raw materials and resources of this country, ranging from the valley marshlands and pinion-juniper foothills to the ponderosa pine woodlands and alpine reaches of the surrounding mountains, that this home was constructed.

The archaeological and historic records testify to a long occupation and history of exploration in

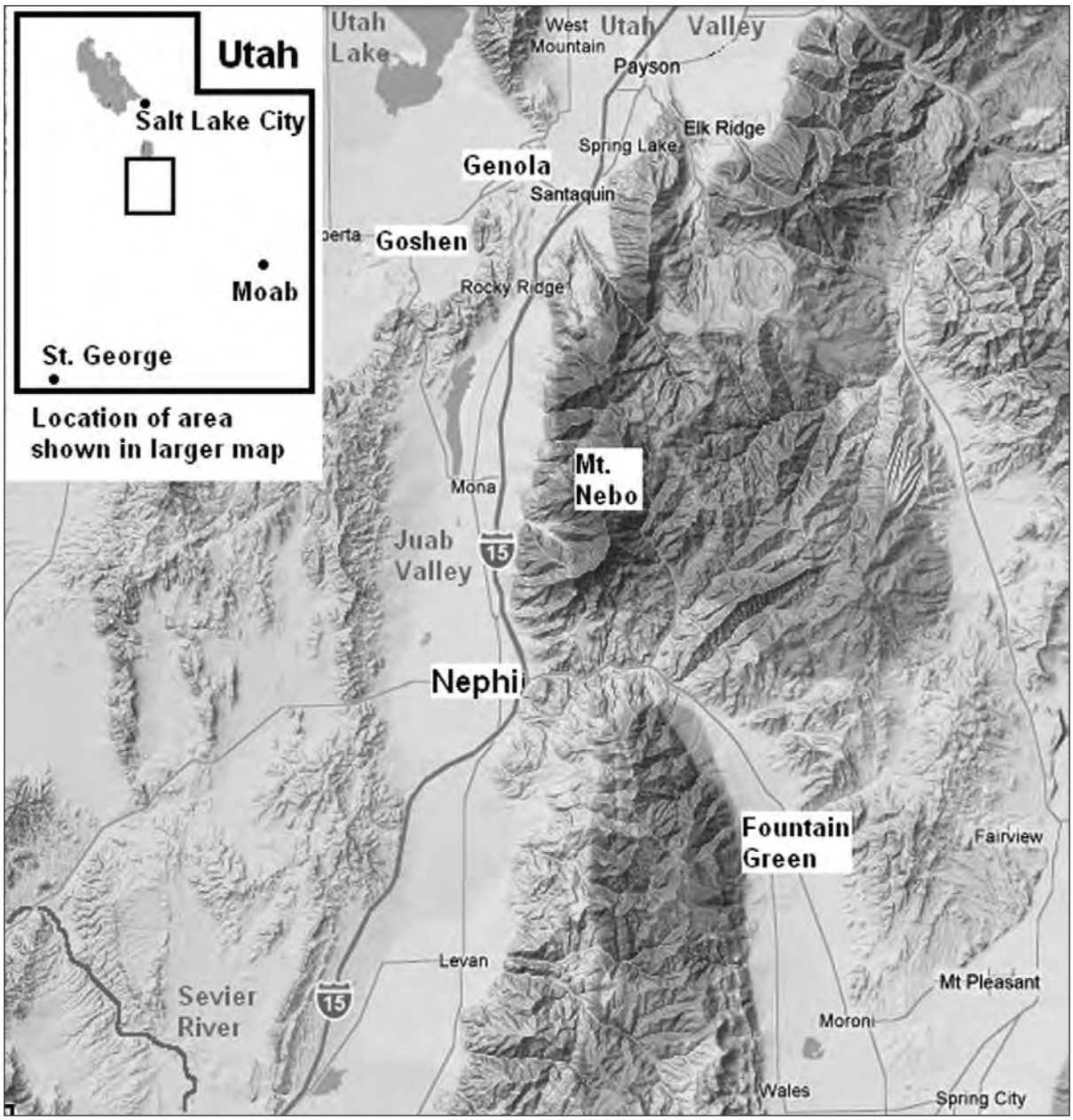


Figure 1. Nephi, Utah, is located near the geographical center of the state, 35 miles South of Provo, and 70 miles south of Salt Lake City.

the area prior to the nineteenth-century colonizing efforts (Copeland and Fike 1988; Sharrock and Marwitt 1967; Steward 1938; McCune 1947; Wilson et al. 1999; Egan 1977). But it was in 1847 that Mormon pioneers, under the leadership of Brigham Young, entered the Salt Lake Valley and moved quickly to occupy the surrounding territories. Howard Stansbury, accompanied by John W. Gunnison, made a survey of the Great Salt Lake and Utah Valleys for the U.S. Government in 1849-1850 (Madsen 1989). The map accompanying the Stansbury report labels a

number of the notable landmarks of Juab Valley with their native Ute names. Burraston Spring is called "*Pungun* Spring" and Salt Creek is labeled the "*Ona-Pah*." Stansbury aptly described the Mormon's settlement practice of sending out groups with diversified skills. The first order of business, after setting up shelter and planning for crops, was to set up grist or flour mills and saw mills.

In September of 1851, seventeen families moved to settle Nephi, and, while it didn't take long for the new settlers to set up mill facilities, the first year or two they depended on products from the established mills of the Sanpete Valley. In the *Deseret News* of December 13, 1851, it was reported that 12 homes had been built, "3 built of adobies, 2 of willows, plastered inside and out, 1 two-story house built of 4 inch plank, and the balance of logs... roofs and flooring are principally of lumber cut at Hamilton A. Potter's mills, San-Pete Valley" (McCune 1947; Worthington et al. 1979).

In 1852, the settlement's inhabitants began to build a defensive wall. The project was modified, enlarged, and finally completed in 1854 (McCune 1947; Worthington et al. 1979). The fort formed by the wall, occupied three square city blocks, and was built primarily on the east of the 'Old California Trail,' today's Main Street and State Highway 41. Hostilities with the native inhabitants limited the colonists' ability to expand and develop their settlement during the 1850s, but by 1860 they were able to leave the confines of the city walls and began to spread out into the surrounding area (McCune 1947; Worthington et al. 1979). This marks the earliest time in which the home in this report, located three blocks outside the fort, to the south, could have been built.

According to the *Abstract of Title* (from the Juab County Recorders Office, acquired in 1988 with the adjoining property) the U.S. Federal Government began conveying ownership of Nephi Township property to private individuals through the new Territorial Government in 1870. This document has been valuable in tracing the division and ownership of the property through time and provided information to produce plot plan drawings of the property then (at the first conveyance) and now (at the present time). The original 1870 conveyance of the property, dated April 26, 1870, names the owner as John Ostler. The Abstract further notes, "(and other property)," which indicates that the original adobe structure was possibly already in place at that time. The property remained in John Ostler's name until February 24, 1912, when a Quit Claim Deed was recorded transferring title from "John Ostler and Mary Ann Ostler, husband and wife."

This documentary evidence, in conjunction with the materials used in construction and the timing of their use in the pioneer period, suggests the most likely construction date to be the ten year period between 1860 when the settlers left the confines of the fort walls, and the government survey of 1870. This is further supported by a brief biography of John Ostler on file with the Juab (Salt Creek) Company of the Daughters of the Utah Pioneers.

John was born June 5, 1839, in Bridport, Dorset, England. He learned the tanning trade in the port city of Southampton where he also served on a merchant ship sailing to Sevastopol, Russia. In April of 1861 he married Mary Ann Prince and the young couple set out for America. In Omaha, Nebraska, John worked on the transcontinental telegraph line to help finance their travels across the country.

John and Mary Ann spent their first winter together living in a dugout shelter in Salt Lake City's Tenth Ward. The couple had two children while living in Salt Lake City, where John worked on building the Salt Lake Theater and the city's first telegraph office. Late in 1864, they moved to Nephi, where John built this small home in the middle of the block between the homes of his brother David to the south, and his father's to the north.

The family saw great success through the years operating a tannery, a bootmaking shop, and later a harness shop which was expanded to a second location in Gunnison, Utah, all while operating

Figure 2. Photo of the pioneer settlement period home in1986, viewed here from the north-west.

freight wagons between Pioche, Nevada and Salt Lake City. As the family grew, John built a large, new home that once stood where the County Fair Grounds are located today.

In 1873 John married Dorothy Howarth, a second wife in the Mormon tradition of plural marriage, and in 1886 bought her a home in Fountain Green, Utah. Both women had large families, Mary Ann having nine children, two daughters and seven sons, and Dorothy having eight children, three daughters and five sons. The biography lists the following dates for their deaths; Mary Ann died February 2, 1913; John on September 7, 1913 and Dorothy, April 7, 1920.

The Newcomers

In May of 1986, my family and I purchased the property and moved in (Figure 2). We had recently moved from New Mexico where we had lived in the last remaining section of the 1833 Gallina Placita (a Spanish jacal pueblo), which acquainted us with the qualities of adobe. Adobe maintains a relatively constant temperature year round, and coupled with the home's small size and low ceilings, we knew this would be a comfortable and economical place for a young family starting out. Another bias that may have led to our acquiring the property is my familiarity with a similar home that was built by my great grandfather, John Thomas, between 1881 and 1883, on Warm Creek (present day Genola) just a stone's throw off Highway 50 and 6 in the Goshen Valley. Four generations of the Thomas family occupied the home before it was demolished, and I can personally attest to a number of similarities in the construction of these two homes.

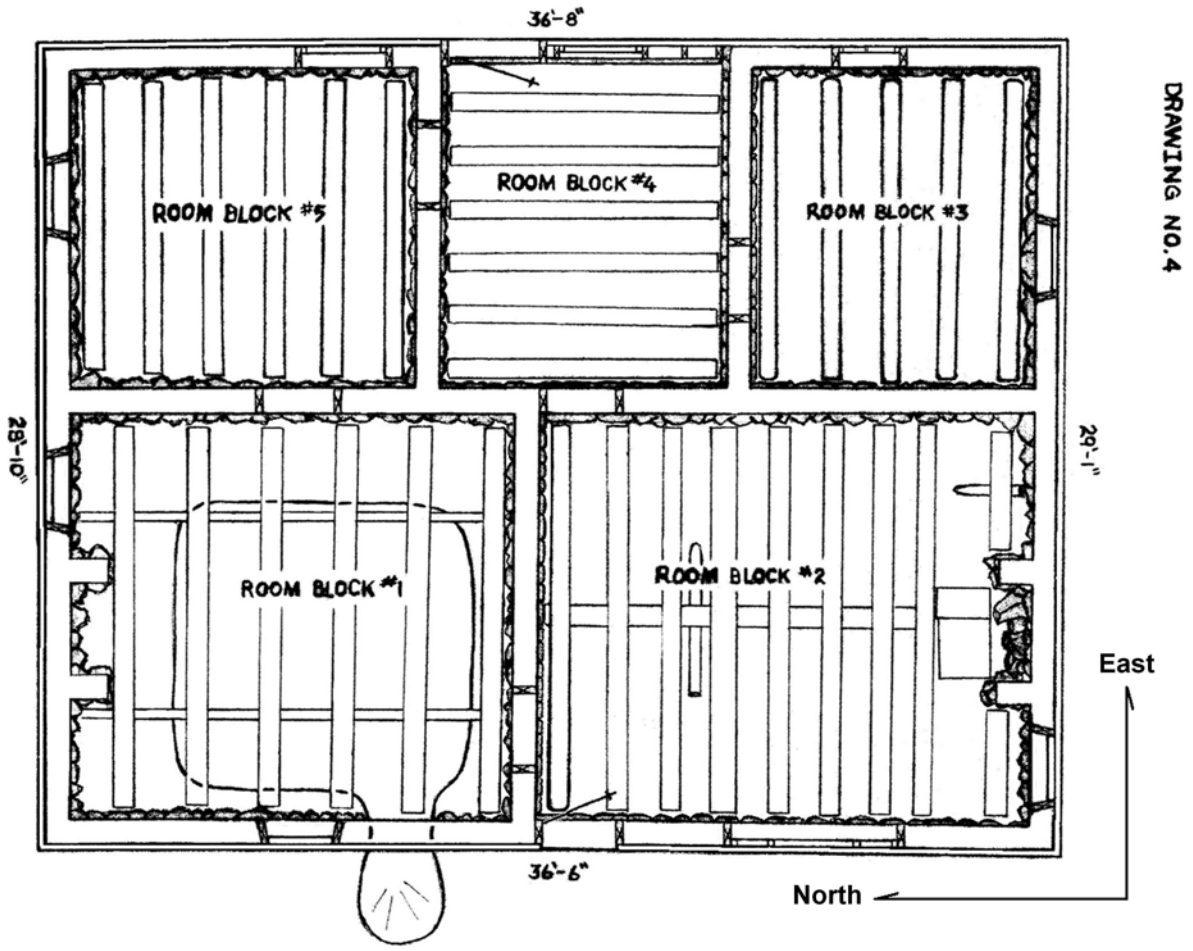


Figure 3. Floor plan showing the stone foundation and log floor superstructure alignment.

De-constructing and Reconstructing

The work of de-constructing and reconstructing this old house has been rewarding, challenging, and full of surprises. The materials used in the original construction limited what could be done in remodeling, and the work of former occupants had hidden what lay beneath. Plans ahead of the work were often modified, as were the preconceived notions of what would be found with each swing of the hammer or scoop of the shovel. As the plan map was developed to show the original layout of the house, the term "room block" was used to describe the areas defined by the original stone foundation.

The main section of the home forms a one-and-a-half story hall-parlor house with internal fireplaces and chimneys at the gable ends (Figures 3 and 4) (Carter and Goss 1988). Its entry is from the west into the larger of the two rooms or the hall (room block #2): to the north is the smaller parlor room (room block #1) To the rear are three room blocks roughly equal in size under a lean-to roof. According to style, the house is classified as a vernacular Classical design, a one-room deep structure with a rear lean-to addition. Details include smooth stucco exterior wall surfaces, symmetrical design elements of a centrally located doorway flanked by window openings on either side, heavy, flat-arched windows, a hip-

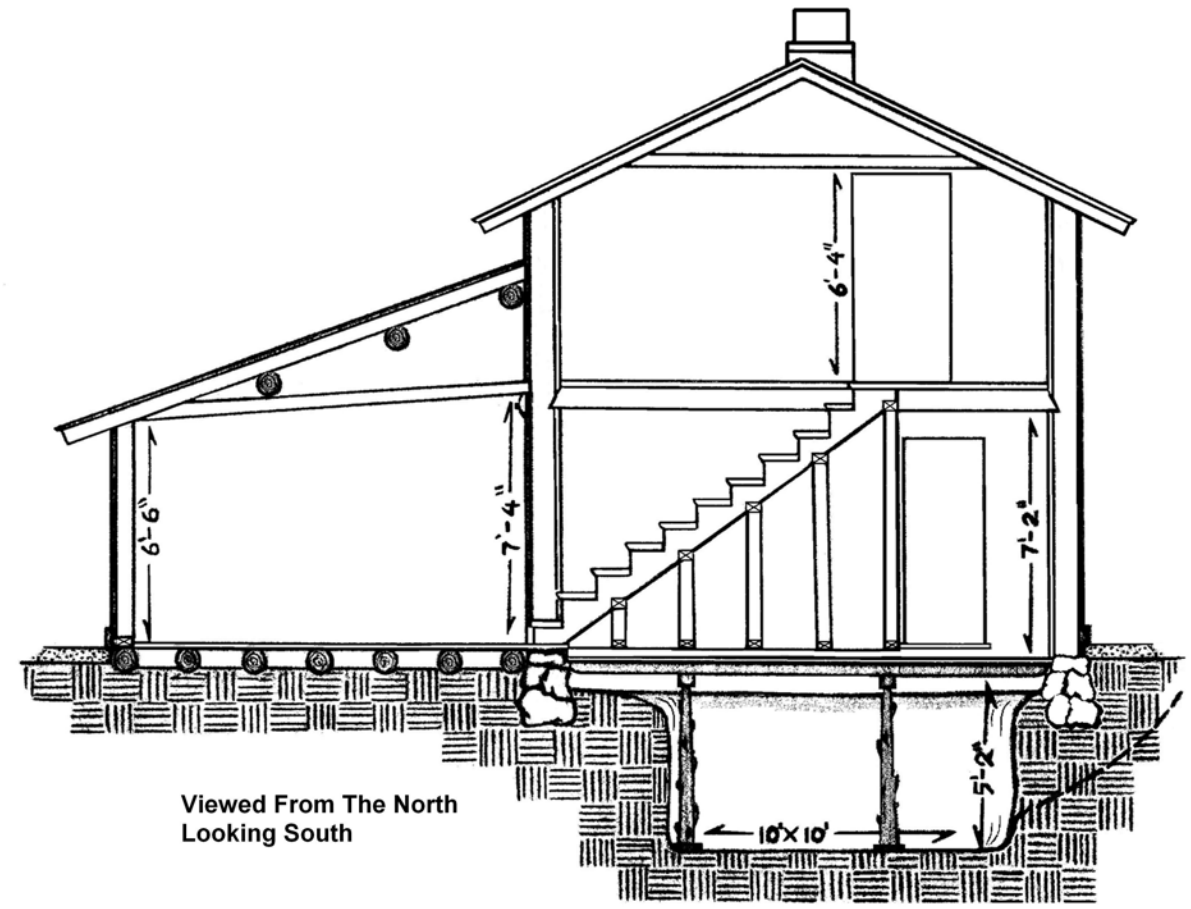


Figure 4. Typical profile perspective of the home, viewed from the north.

roofed porch and a low-pitched gable roof (see Figure 2). The hall-parlor house is considered the "quintessential Utah house" of the second half of the nineteenth century. The classical style reflects the architectural traditions prevalent in the Eastern and Midwestern United States during the 1830s and 1840s and dominant in Utah well into the 1880s (Carter and Goss 1988).

The foundations are constructed of massive irregular rubble stone and generally measures 18" to 24" in height, rising slightly above the surrounding ground level. This type of stone was obtained from Mesozoic rock formations located at the mouth of Nephi Canyon, and used only briefly during the early decades of settlement (Worthington et al. 1979). On the external walls the exposed part of the foundation has been capped with concrete, 2" to 3" thick and 8" to 10" high, which supports the cement, lime and sand stucco of the walls. The exterior portions of the foundation have not been examined. Some interior sections are of a more carefully coursed stone masonry; other sections are more irregular, sometimes with massive stones. Interior dividing wall foundations average about 14" in width and 14" to 18" in height, and are more uniformly coursed (Figure 5). Generally, the east and south faces of the foundation show a uniform, smooth face. This perhaps indicates the use of a form (or at least a uniform line to maintain the overall

Figure 5. View from room block #4, of the log and plank floor being removed from room block #3. In the foreground is the interior dividing wall foundation, to the right is the central wall of the house. Upper left is the gable end wall that has been stabilized with a new concrete foundation.

dimensions and measurements of the house) that vary only 2" in width and 3" in length.

The walls range in thickness from 10" to 14" and are constructed of sun–dried or soft-fired adobe bricks, measuring 4 1/2" wide by 9 1/2" long and 3 1/2" thick (Figure 6), lain in Common (American) bond. The walls were plastered with a scratch coat of adobe mud and a finish coat of lime plaster on the interior surfaces. The modern exterior wall finish is a cement, lime, and sand stucco. The Common (American) bond pattern consists of five courses of stretchers (bricks running parallel to the wall line) with staggered overlapping joints, two wythes (or courses) thick. The first and each sixth course thereafter are of headers, which are bricks set at right angles to the wall surface. These bricks are used to tie the two wythes (courses) together. The walls of room blocks #3 were exposed and the masonry bond could be examined in detail (Figure 7). The outside and center walls demonstrated the regular 1-5-1 bond pattern of headers and stretchers. However, the end wall was irregular, showing a mixed pattern of 1-6-1-5-1-4, with the bond becoming tighter ascending the gable end. Fireplaces and chimneys are integral to the gable end walls and have been left in place and repaired where necessary to maintain the mass and support they provide to the structure. The bricks used in the construction were of two types with no discernable pattern of placement. The least common type is of a chalk-gray colored clay, and the more common has a tan-to-red, gritty temper. Both are well-suited for building, however, friable examples of both types were found. The gray type, referred to as "blue adobe" in the pioneer journals (Worthington et al. 1979), is slightly more brittle, and when broken flakes

Figure 6. Examples of the tan-to-red sun-dried, sometimes referred to as soft-fired adobe bricks. The red, sandstone, grinding wheel and logging chains were found in the cellar. The bricks measure 4 1/2" wide by 9 ½" long and 3 1/2" thick, the wheel is 12" in diameter.

somewhat like shale. The gray clay was reported to have been brought in from the North Meadow, which is located north of town on the valley floor. The tan-to-red type, when broken, crumbles to a gritty, sandy material, resembling the alluvial material of the foothills. Some straw or plant matter was found in the discarded bricks, but it was not abundant.

Windows and doorways were of a flat arch type with rough-cut, lumber lintels topped off with perpendicular header bricks. Splayed side walls were a unique feature of the window openings. The opening, narrowest on the external side of the wall and widening on the inside, allowed a wider angle for sunlight to enter and illuminate the room. The doorways of the hall (room block #2) are flush with the interior walls, with only the wooden frame extending the doorway out from the wall (Figure 8).

The second floor is divided into three roughly equal spaces, with rooms at each end of the house and a hallway with adjoining bath and stairway occupying the central space. The stairway and bath are relatively late additions, and access in the original plan was most likely by ladder or steep stairs from the parlor (room block #1) in the same area that the stairway today ascends over a closet on the ground floor. The end walls (north and south) are formed by the chimneys and gable ends of the house. The chimneys have been blocked off and now serve to vent the attic space. The side walls (east and west) are half-height, at which point the ceiling, being part and parcel of the low-pitch roof, slopes up to a maximum ceiling height of 6' 4". Above this is a small attic

Figure 7. View of the central wall of the house in room block #3 from room block #4. Note the split log ceiling support bolted to the top of the wall, the walls bond pattern and adobe mud scratch coat can also be seen.

space at the roof's peak. The rafters, constructed of rough-sawn lumber, have been reinforced with later kiln-dried, dimensional lumber. The rough-sawn floor joists of the second floor were cut longer than the span of the rooms with the ends cut on a diagonal taper. The ends were then placed in notches in the adobe wall for support and covered with irregular widths of 1" thick planks that serve as the upstairs floor.

The ceiling and roof of room blocks, #3, #4 and #5, are constructed with newer kiln-dried dimensional lumber, which indicates a later remodeling episode. However, the original log supports, which run the entire length of the building, are still in place to support the roof. A unique support was originally used to suspend the ceiling lumber in this area and is still in place in room block #3. A log slab is bolted to the central adobe wall (see Figure 7) with notches cut to hold the lumber pieces that extend down over the outside wall.

The floors of the main level, constructed in the original phase of construction, were of four different types, and their deconstruction and removal has been revealing of the home's history through the years. It is evident from the orientation of the superstructure and our observations during renovations that the log and plank floors in room blocks #1, #2, #3, and #5 were constructed in the original phase and, with the exception of room block # 5, had remained intact and undisturbed to the time of the renovation. The floor of room

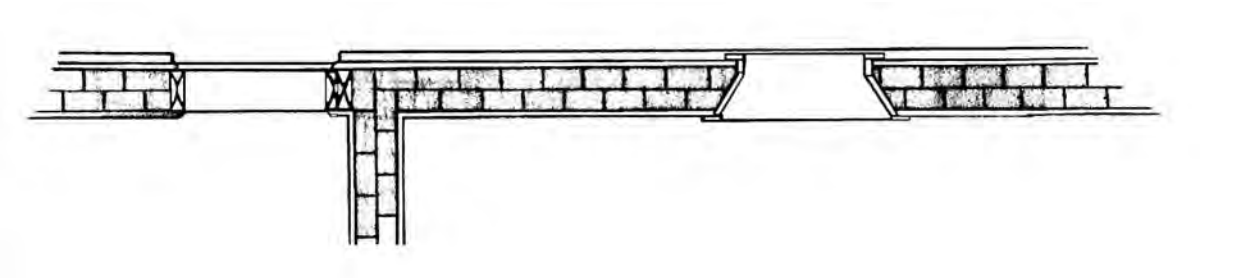


Figure 8. Typical wall section showing door and window openings.

block #5 was significantly altered when water and sewer services were installed, and artifacts recovered there span nearly the entire lifetime of the home. While each floor is unique, the floor of room block # 4 is the most diverse, and gives a revealing and informative portrayal of the home's overall history and development through time. The floor of room block #4 was originally linoleum over a hard packed lime and mud concrete base, with three more successive living floors added through time. A collection of spikes and nails used in the construction has been saved. Nails began to be commercially produced in Nephi in the late 1850s (McCune 1947; Worthington et al. 1979).

Work began in room block #1, as the small shallow cellar there needed to be shored up because of its collapsing entryway, The cellar floor's depth was taken down to a more comfortable height. Cinder block walls were erected and grouted solid, and the doorway casement was set in concrete. Beams were then set in place to support storage shelves around the perimeter and the original split log and plank floor left in place above. The original cellar plan used juniper post supports and the floor and walls were plastered with a thick lime plaster finish (Figure 9). The eastern wall was coursed with a mix of adobe bricks and stones, and it was in this wall that a red grinding wheel made from stone was found. Several logging chains were found hanging from the beams and buried in the loose fill on the floor (see Figure 6).

It was in room block #2 that the layered nature of the living floors was first noticed. The existing carpet was first removed to expose the hardwood flooring, and when that was removed the original split log and plank flooring came into view. In this instance, the split log joists were supported by a central full log that was laid directly on the ground, running north-south down the center of the room (Figures 10 and 11). An axe had been used to fashion simple saddle notch joints where the central log and the floating split log joists intersected. The joists were leveled and supported at the ends by stones in the foundation or rocks lain directly on the ground. This is the only room in which this type of central support beam floor was found.

As the floor was removed and the area was cleaned up and readied for new construction, a number of artifacts were found (Figure 12). First was a tidy collection of corncobs, with long bones and ribs of a young sheep, found in front of and near the side of the fireplace. This later was remembered as the "last supper." There was also a low three-by-four-foot oval mound of lime or gypsum that was probably used in the plaster coat of the interior walls. Also found were a number of scattered fruit pits, a few scraps of leather, a pocket knife and blade, a carved wooden tool and pencil, marbles, and fragments of metal and ceramic. Along the east wall, at the doorway leading to the back rooms of the house, were a number of clothing-related items, including buttons, a thread spool, and a clothespin that had fallen down along the baseboards. Here also was a unique token inscribed with a "Deseret beehive." In front of the fireplace were pieces of red sandstone, likely used as part of a hearth.

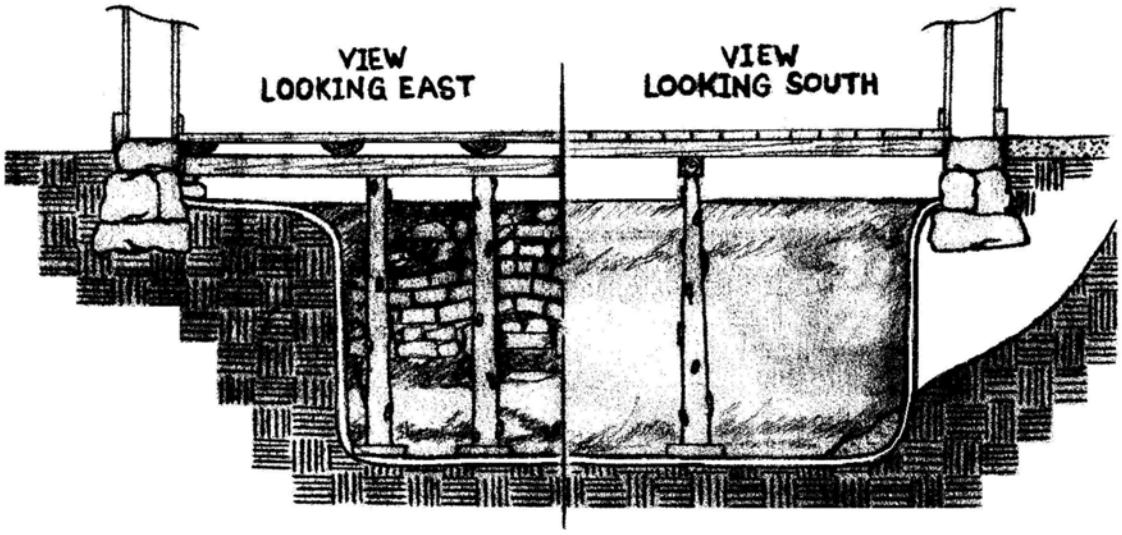


Figure 9. This is a split view of the cellar, looking east on the left and facing south on the right. The stone grinding wheel was found built into in the east adobe and stone coursed wall. Much of the heavy lime plaster that lined the walls and floor was still intact.

As they were removed to make way for the new floor construction, a number of small corncobs under the northwest corner were discovered. Having attended the Goshen Elementary school as a child, where we danced and braided the May Pole each spring, I wanted to believe this might represent another "Old World" tradition of making a dedicatory offering at the hearth. But it is just as likely the work of small rodents.

At the time of renovation, room blocks #3 and #4 formed a single room that served as the kitchen and dining area, respectively. As the modern carpet and linoleum were removed it was revealed that an adobe dividing wall between the room blocks had been in place prior to the construction of this latest floor. The earlier hardwood floor and log and plank floors were present here, as throughout the rest of the house in prior times. However, at the same time that the dividing wall had been removed and covered over, water lines were installed overlaying its stone foundation and the log and plank floor below. A channel had been cut into the hardwood floor to carry these same water pipes across room block #4 to the kitchen area in room block #3. Documentary sources show that the culinary water system in Nephi was began in 1893, most households were served by 1901, and major improvements made to the system in 1947 (Worthington et al. 1979). From the piping materials, and the carpet and linoleum used in the latest floor, it would seem that the water system described here was installed sometime after this latest date. Room block #4 also proved to be unique in that a log served as the exterior wall foundation, not stone, and the orientation of each floor level was perpendicular to those in the rest of the house, possibly indicating a separate phase of construction.

After removing the multiple floors of the kitchen area, we began to clean up the loose fill of dirt that had accumulated over the years. Along the east wall of room block #4 my son, Zachary, found a couple of small blue beads. We fashioned a makeshift screen of 3/8 inch wire mesh, proceeded in a more careful fashion to

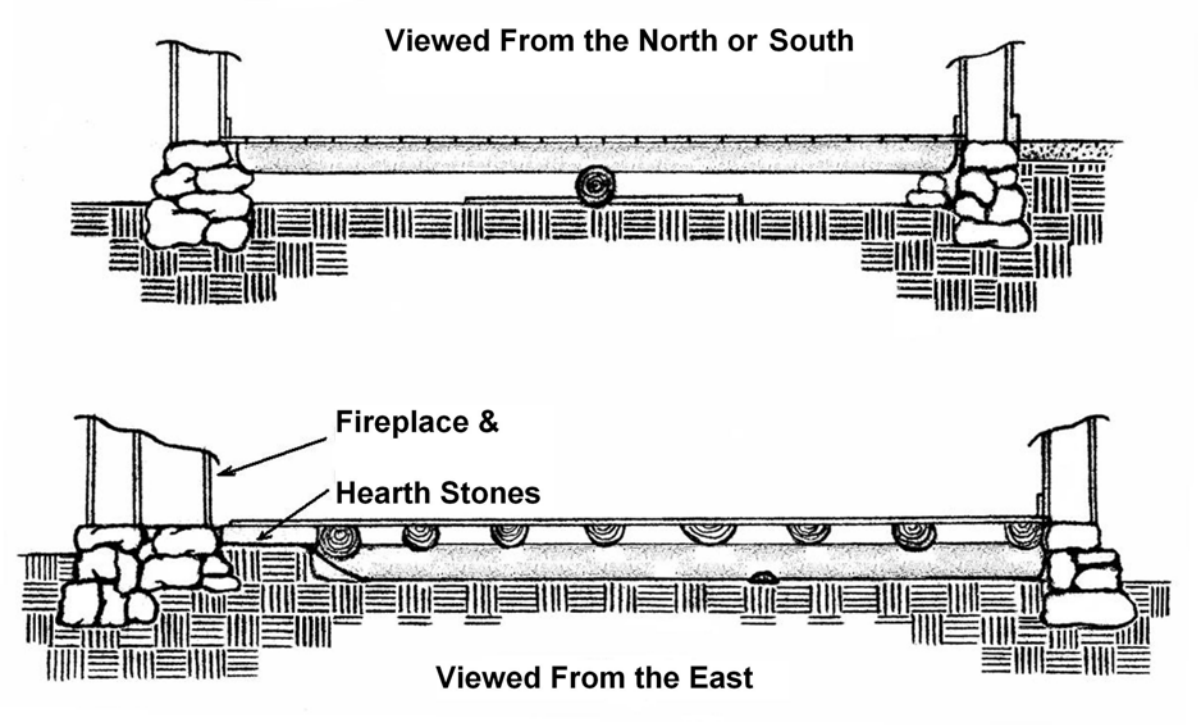


Figure 10. Detail drawings of the central support beam floor construction in room block #2. Viewed from the north or south above, and from the east below.

excavate the fill, and found several more beads of varying sizes. The most abundant artifacts recovered are without question fruit pits; more than one hundred were found, the majority being plum and apricot. It was sometime after we stopped collecting them that we realized they were of two different kinds, but the majority were plum. There were less than twenty peach pits and few cherry pits found. There were a good number of nut shells as well: a half dozen or more walnut and others not yet identified in the collection. Women's items were well represented with hair pins, combs and brooches, and sewing items. Children's toys were also found, including an arm and a leg from porcelain dolls (that became known as "Venus de Milo's limbs") a collection of marbles, and a small handmade wooden animal – a quadruped missing both front legs (Figure 12). There were fragments of metal, knives, leather, and a large quantity of ceramic and glass sherds. Though not as prevalent, some coins were found that date to the mid 1900s. Other unexpected items were discovered, including a large sample of whittled or shaped wedges, picks, and other such implements, as well as a tube or a straw and a bucket handle, all made from wood.

Plant starts were often obtained from the Salt Lake Valley, and transplanted in Nephi (McCune 1947; Worthington et al. 1979). Under the floorboards of room block #3 we found a small ceramic planter that would serve well in transporting such seedlings (also known as "starts"). McCune further notes that John and Jonathon Ostler operated a tannery "which provided leather for the shoes which were made by them and other shoemakers in the towns at that time, as well as supplying harness makers with the necessary leather for their businesses" (McCune 1947:98). A vintage photograph from the Chapman collection shows John Ostler, the

Figure 11. Photo of the central support beam floor in room block #2. The doorway leading to room block #4 is at the upper right.

original owner of this property and first boot maker of record in Nephi, in front of his place of business (Figure 13) (McCune 1947:99; Worthington et al. 1979:33). This brings us to what I consider the "crown jewel" of the artifact collection: a complete, if small sized, woman's shoe (Figure 14) was recovered close to where the ceramic planter was found in room block #3.

As the cleanup across room block #4 continued, a pioneer or lime and mud concrete (in which the floors logs were set and leveled) was identified. According to Carter and Goss (1988), this mixture "refers to an indigenous form of concrete containing specific proportions of lime and mud." The sample collected from this floor also contains a considerable amount

Figure 12. Clockwise from left: The 'last supper,' corn from beneath the hearth stone; brooches and coins; children's toys and the 'Deseret beehive' Mormon token. The scale is of centimeter squares, 15 cm in length.

of charcoal, an indication that the lime, or gypsum, had been either cooked or baked. In this excavation, fragments of fabric-impressed clay were found, and eventually an identifiable piece of linoleum with the tell-tale fabric lining turned up. Although this slowed the excavation, several areas with intact smoothed and compacted clay floor that once underlay the linoleum were identified. This had been the original form of the floor in room block #4, which explains the disconnected alignment of the later log and plank floor superstructure with that of the rest of the house, and brings to four the total number of living floors identified here in room block #4 (Figure 15).

Room block #5 had served as the bath and laundry rooms, as it does today. The floor had been significantly altered at the time that water and sewer services were installed. The original dividing wall between room blocks #4 and #5 was most likely removed at this same time to make room for the new stairway and plumbing to the second floor, and then replaced with a framed lumber wall. Artifacts recovered here span nearly the entire lifetime of the home, from a civil war era U.S. cavalry sharpening stone (Ron Meyers, personal communication 2007), to a screwdriver with synthetic handle that, with the exception of the heavily corroded metal part, would not look out of place in my tool set today.

As this goes to press, the construction of a new garage is turning up new artifacts and details about the property. Found from the area of a backyard flower garden is an 1817 British Silver Halfcrown of George III, a silver coin only minted in the years 1816 and 1817.

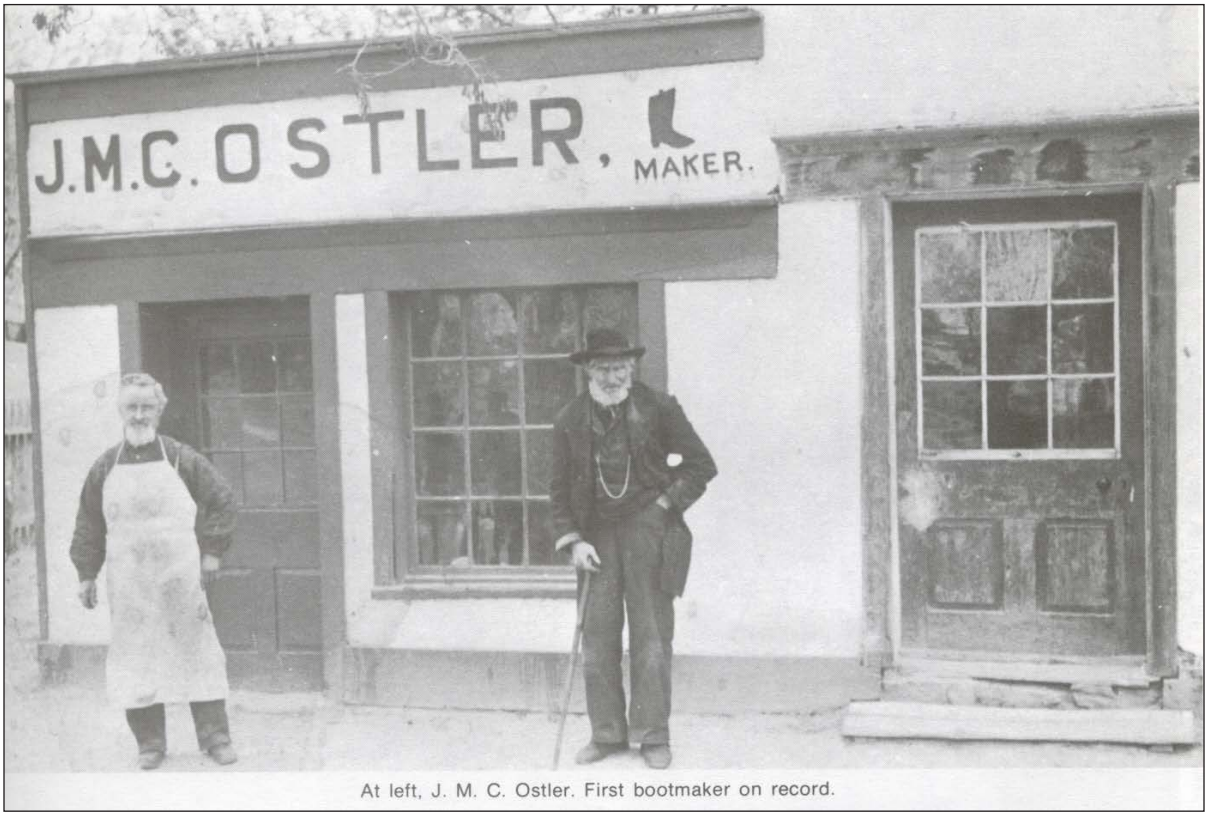


Figure 13. Vintage photograph from the Chapman collection of John Ostler in front of his place of business. McCune 1947; Worthington et al. 1979; Juab (Salt Creek) Company of the Daughters of the Utah Pioneers.

Conclusion

First conceived and initiated for a presentation at the 2007 USAS/UPAC Convention, this article is a summary of the work undertaken to document a settlement period home in Nephi, Utah. Further, the study might be viewed as a complimenting material component to the work of previous workers. Most notably: the Juab (Salt Creek) Company of the Daughters of the Utah Pioneers historian, Alice Paxman McCune, and Keith N. Worthington, Sadie H. Greenalgh and Fred J. Chapman, and of the Utah State Historical Society's Pearl D. Wilson, June McNulty, and David Hampshire. Their work has been indispensable in tying this old house to the times and to the land from which it was raised.

Much has been learned. This is a humble vernacular home, made of local materials at hand to endure along with the land and community. From the documentary record and construction materials we can be sure that it was erected in the early decades of the settlement period, beginning most likely in late 1864, or early 1865. The finding of a large collection of leather fragments and an intact shoe supports the report of the original owner being John Ostler, the first boot maker in Nephi, and that it was here he set out to contribute to the development of a simple agricultural community while making a new life for himself and his family.

The evidence supports the view that they relied on local food supplies of corn, plum, apricot, sheep, cattle and small animals such as chicken and possibly rabbit. The personal and household items represent a family life busy with young children. Tools found here are of a simple

Figure 14. Selected artifacts from room block #3. Clockwise from the upper left: The small hand thrown pot; the small size woman's shoe; leather and metal fragments; and a selection of ceramic pieces. The scale is of centimeter squares, 20 cm in length.

and basic nature used in building and maintaining the home. Often of local manufacture, I was surprised by the several whittled or shaped wooden implements.

In researching the ceramics from this project I was fortunate to visit the excavation of the Thomas Davenport pottery kiln site in Parowan, Utah, and the concurrent exhibition of early Utah pottery at the Iron Mission State Park Museum in Cedar City, Utah, under the direction of Timothy J. Scarlett, Director of the Utah Pottery Project, Michigan Technological University. Dr. Scarlett was kind enough to provide descriptions of a number of the pottery pieces from my collection. The small seedling flower pot is described as a "small earthenware pot, very well fired, hand thrown. Fabric has course sand inclusions, possible temper." The majority of the sherds are simple imported "white improved earthenware (WIE)," with a few that were perhaps ironstone, sometimes improperly referred to as "porcelainous WIE." A small number of sherds are of a WIE type with a blue transfer printed interior. A single fragment, probably of a teacup or small pitcher of European origin is described as "WIE fabric, exterior-black transfer print on blue underglaze, with polychrome overglaze-green and yellow." Other examples include stoneware, possibly Utah made, with an exterior salt glaze and the interior unglazed, and lead glazed earthenware with "paste varying from red to buff or yellow."

Several construction episodes can be discerned and deserve comment. In the original

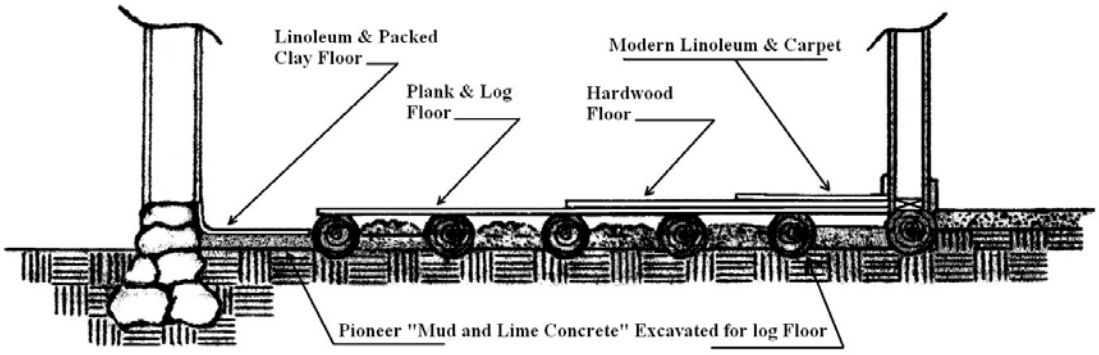


Figure 15. Detail drawing, illustrating through time, the four living floors found in room block #4. From left to right: The mud and lime concrete and linoleum floor; the log and plank floor; the hardwood floor; the modern carpet and linoleum floor.

phase, four of the five room blocks were laid out with similarly oriented log and plank floors, while room block #4 was provided with a floor of hard-packed pioneer or lime and mud concrete overlain with linoleum. Room block #4 seems to have been a central traffic area with entrances from the front "Hall and Parlor" section of the home and from the yard to the rear, and provided access to the living spaces in room blocks # 3 and #5. A small shallow cellar was in place below the parlor or room block #1, and access to the upper floor would have been from room block # 1.The next phase of construction appears to have been the installation of the log and plank floor in room block #4 with an orientation perpendicular to that of the other floors. The activities of the inhabitants had worn the flooring down between the polished knots of the planks, leaving material evidence of a long-lived in living space. In the third phase of construction, a uniform hardwood flooring was placed over the log and plank floors throughout the house, laid out perpendicular to the flooring below.

The most extensive renovations were undertaken in the forth and final episode of construction before the work was done for this project. At that time, most likely after 1947, the adobe walls separating the three room blocks in the rear were removed. This is most likely the same time that the roof and ceiling in the lean-to section of the house was replaced, and the rafters of the upper floor reinforced. Much of the floor in room block #5 was opened up to install the water and sewer services throughout the house. A frame wall was put in place to divide room block # 5 from room block #4, leaving space to open a new stairway to the upper floors. A channel for the water pipes was cut into the hardwood floor of room block #4, and they were laid on top of the planks and stone foundation left in place below. The piping continued on to the kitchen area in room block #3, and the floor there was left intact. A bath and laundry was installed over room block #5, and water services were routed up the stairway to a second floor bath. Then, a final modern floor of carpet and linoleum was installed to cover this work. It is hard to tell when the less intrusive installations of the electrical and telephone systems were put in place, but any needed upgrades were probably done at this time as well.

The work of documenting, cataloging, and analyzing the artifacts and observations goes on and may last a lifetime. In the process of going to press, a project undertaken by Dinah Eastop (Senior Lecturer) at the Textile Conservation Centre, University of Southampton, England, was brought to my attention. The project enlists

anthropologists, archaeologists, curators, historians, and other scientists to documents the folk practice of deliberately concealing objects within the fabric of buildings, a practice prevalent in Britain and Northern Europe for centuries, with some instances known from the United States and Canada. One study from the project shows the practice reached its height from 1800-1899, with few instances prior to 1600 or after 1900, though this may reflect a bias due to the type and ages of buildings available for investigation today. Caches have been found in building foundations, walls, under floorboards, in window frames and in staircases, and often include items of dress, shoes (seldom in pairs), bottles, animal bones, seeds, and nuts. The practice is thought to represent folk magic or superstitious traditions relating to the ritual protection of a household and its inhabitants.

This information may be valuable in understanding the placement and distribution of artifacts in the Nephi home. A misplaced toy, bead, coin, token or clothespin falling behind the baseboard or falling through the cracks is easy to understand. A scrap of leather, a charcoal (graphite) marker, a fragment of metal or a pocket knife being dropped and lost during construction is to be expected, but other instances continue to pose questions and remain perplexing. John Ostler was a recent convert to the new Mormon religion when he left England in 1861 at the age 21. The caches of corn and bones near to and beneath the hearthstones in the hall, or room block #2, as well as the shoe and ceramic planter situated under the floorboards of room block #3, might represent folk traditions learned in his boyhood home, and placed for the protection of his new American home.

A study of this kind is certainly of value to the property, its owners, and hopefully to other investigators at work today, and to the community at large. From this experience I have come to believe this kind of project can be a very rewarding avenue for the avocational archaeologist, historian, and homeowner wishing to make a contribution to the record. The approach can easily be adapted to projects in any community and in collaboration with many of our neighbors as well as organizations, local, regional or statewide. ■

Acknowledgments. This project is dedicated to my wife, Hilda, and my sons, Zachary and Daniel. The work we have accomplished together, turning this old house into a home, has instilled in me a great sense of pride, and I hope this will in some way recompense them for the tolerance and indulgence they have granted me over the years.

The inspiration for this project must be credited to Dr. Joel C. Janetski, Department of Anthropology at Brigham Young University, Provo, Utah, and to Charmaine Thompson, Wasatch and Uinta National Forest Service Archaeologist, Advisors to the Utah County Chapter of USAS. Special thanks to Kevin Jones, Utah State Archaeologist, and Ronald J. Rood, Utah Assistant State Archaeologist for their friendship and good humor in working with USAS. They have all served Utah Archaeology well as stewards, mentors, and instructors to the public.

I would like to express my appreciation to David Yoder and Chris Watkins, Co-Editors of Utah Archaeology, for their encouragement and hard work through this arduous process of publishing, and to Timothy J. Scarlett, Department of Social Sciences at Michigan Technological University, for providing valuable time and ceramics analysis. Thanks to the many members of USAS and the Utah Professional Archaeological Council (UPAC). Special thanks to Jay and Merianne Nelson, Jay Woodard, Ron Meyers, and the late Richard Hansen, whose shared expertise and knowledge with the Utah County chapter of USAS has been invaluable.

Thanks to the staff of the Juab (Salt Creek) Company of the Daughters of the Utah Pioneers, Nephi City Library, and Juab County Recorders office for their assistance in researching the history of the property. Thanks also to the people of Nephi, our many neighbors. In particular, thanks to the late Erwin Jarrett, Sydney H. Bartholomew and Maurice Memmot for sharing their knowledge of this old house's secrets.

Ren R. Thomas
449 South 100 East
Nephi, Utah, 84648
E-mail: thomas2014_1@msn.com

References

Carter, Thomas and Peter Goss
1988 *Utah's Historic Architecture 1847-1940: A Guide*. University of Utah Press: Salt Lake City.

Copeland, James M. and Richard E. Fike
1988 *Fluted Projectile Points in Utah*. Utah Archaeology 1(1):5-28.

Egan, Ferol
1977 *Fremont: Explorer for a Restless Nation.* Doubleday: Garden City, N.Y.

Madsen, Brigham D. (editor)
1989 *Exploring the Great Salt Lake: The Stansbury Expedition of 1849-50*. University of Utah Press: Salt Lake City.

McCune, Alice Paxman
1947 *History of Juab County: A History Prepared for the Centennial of the Coming of the Pioneers to Utah 1847-1947*. Art City Publishing Company: Springville, Utah.

Sharrock, Floyd W. and John P. Marwitt
1967 *Excavations at Nephi, Utah, 1965-1966*. University of Utah Anthropological Papers, No. 88. Salt Lake City.

Steward, Julian H.
1938 *Basin-Plateau Aboriginal Sociopolitical Groups.* University of Utah Press: Salt Lake City, Utah.

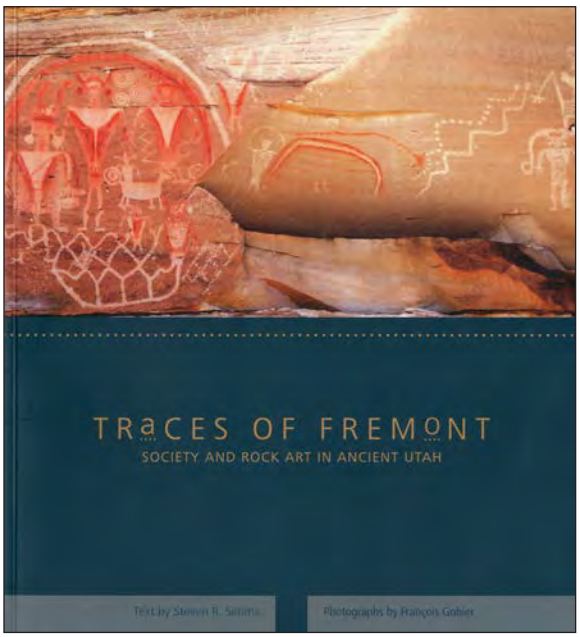
Stokes, William Lee
1987 *Geology of Utah*. Occasional Paper Number 6 of the Utah Museum of Natural History: Salt Lake City.

The Textile Conservation Centre
2009 Deliberately Concealed Garments Project. Electronic document, http://www.concealedgarments.org, accessed Dec 6, 2009.

Wilson, Pearl D., June McNulty and David Hampshire
1999 *A History of Juab County*. Utah State Historical Society, Salt Lake City.

Worthington, Keith N., Sadie H. Greenalgh and Fred J. Chapman
1979 *They Left a Record: A Comprehensive History of Nephi, Utah, 1851*-1978. Community Press: Provo, Utah.

Book Review



Traces of the Fremont: Society and Rock Art in Ancient Utah. **STEVEN R. SIMMS**. 2010. The University of Utah Press, Salt Lake City, UT. 144 pages, 122 illustrations. $24.95 (paper).
ISBN-10: 1607810115
ISBN-13: 978-1607810117

Review by Richard K. Talbot

Office of Public Archaeology, Brigham Young University

Traces of Fremont is exactly that. It is a montage of masterful word working and captivatingly beautiful photographic art of the Fremont landscape, rock art, material culture and architecture. I can think of no other book that captures in such a descriptively pleasing way the fragments of what I perceive Fremont to be. The visually stunning photography brings this text to life. Indeed, if the text and pictures were separated into different volumes, each would easily satisfy the thirst for Fremont imagery. Together they create a new genre of story-telling.

The photography of Francois Gohier is unsurpassed. True to the book subtitle *Society and Rock Art in Ancient Utah*, rock art is the dominant subject of the volume, and the quality of presentation in lighting, angle, and context far outclasses all previous rock art volumes. At the same time, the landscape photos are captivating while artifact photography gives the material record a life of its own. Indeed, each photograph pulls the reader into the frame, and connects eye and mind to the place, time, and feeling of a moment in the past.

Simms' careful word-crafting is no less compelling. The story he tells is more or less a synthesis of what we know or believe about Fremont, but presented in a style that paints a mental image further enhanced by the accompanying photography. Because it is a fragmented story, much is left to the imagination, but the framework Simms builds provides the appropriate context for that mental imagery, with enough leeway for differences of opinion.

A volume such as this is meant to be pondered and enjoyed in moments of relaxation. It is written and presented in snippets, each section short and easy to read with a point to make and a message to share. If there are flaws, they lie in the questions of audience and assumptions. Clearly the book is intended for public ingestion, a tabletop volume that appeals to all, from professional to the lay student and to the generally interested public uninitiated into the language of the profession. And it fulfills

in large measure that goal. But there is an occasional slipping in of verbiage, references to theoretical concepts, and personal conjecture that are likely to be unfamiliar, and so confusing, to the non-professional public. Professionals will understand the often subtle wording and tone as leaning toward a specific paradigm, but the general public will interpret the story as fact and consensus by archaeologists. But to characterize these minor details as a weakness is ungenerous and probably overstated. They are to be expected in a presentation of this kind, and rarely do they ever detract from the spirit of the book.

Overall, this book is a breath of fresh air free from stoic and sterile professional posturing. I perceive it as a final turning of the page that began over a decade ago with a consideration of Fremont as more than just a static material record or an economic strategy. At that point archaeologists finally began to consider Fremont as individuals, families, kinship groups, and communities. We are starting to see Fremont as part of a sociocultural landscape, people with a common heritage and lifeway that gives them a true recognizable identity, one distinct from other contemporaneous farmers in the Southwest, and also from contemporaneous hunter-gatherers to the west, north and east. The words and pictures come the closest that I have ever seen to presenting the story of a people who were, and are, real. They are not the mysterious aberration that has been popularized in frequent news stories, magazine articles, and in public television documentaries. The stories and pictures portray a living, vibrant, and very socially interactive people who farmed the valleys but also knew every inch of the mountains and deserts. *Traces of the Fremont* honors a people with a rich heritage and whose full story remains to be told. ■

Instructions to Authors

Authors submitting manuscripts are requested to follow the Society of American Archaeology (SAA) style. The most recent version of the SAA Style Guide can be found online at www.saa.org. Articles must be factual with some archaeological application. We seek submissions from authors affiliated with government agencies, cultural resource management firms, museums, academic institutions, and avocational archaeologists equally.

Paper categories include:

1. Articles: Synthetic manuscripts, reports of analysis, overviews, and reviews of past research.
2. The Avocationalist's Corner: Topical articles written for the nonspecialist. Articles for this section are encouraged from avocational and professional archaeologists alike.
3. Reports, notes, and comments: Shorter manuscripts including descriptive reports on focused topics; notes or points of interest with a minimum of interpretive discussion; comments on current issues or previously published works. Comments on previously published works will be submitted to the author of that work for review and reply.
4. Photo/illustrative essays: Photo or illustration based articles with descriptive and/or interpretive text to supplement the visual media.
5. Book Reviews: Reviews of current publications that are broadly relevant to archaeology of Utah.

Submission:

Manuscripts should be submitted in an electronic format, as *Utah Archaeology* cannot retype papers. Authors are encouraged to send files as e-mail attachments to the editors, although manuscripts may also be submitted on a CD. Microsoft Word (.DOC or .DOCX) files are strongly encouraged. All manuscripts are submitted for outside review. Authors are sent reviewers' comments and a letter from the editor as to whether the manuscript is acceptable with revision, acceptable in current form, or rejected with a recommendation for substantial revision. The editors reserve the right to evaluate manuscripts for appropriate subject matter, quality, length, and compliance with the style guide, and will likely reject submissions which do not conform to the stipulated requirements.

Formatting:

Manuscripts must be typed on 8.5 by 11 inch paper with 1 inch page margins in 12 point font and double-spaced. Submissions should contain appropriate headings and subheadings and have a brief abstract of 150 words or less. Manuscripts should be paginated consecutively beginning with the title page.

Tables, Figures, and Illustrations:

Authors are responsible for submitting illustrations, photos, and tables of publishable quality, as *Utah Archaeology* will not be responsible for making them presentable and will only make minor adjustments. Figures should be submitted electronically (one figure per file) and authors are responsible for providing a high resolution (minimum 300 dpi at printed size. Maximum size is 6.25 x 8.5 inches or 1825 x 2550 pixels) file in either a .TIFF, .JPG, .PSD, or .PDF file format. Please DO NOT paste figures or tables into word processing document files. Tables should be submitted either as separate files (one per file) or combine into a single workbook or similar format with one table per worksheet. Table formatting should follow the SAA style guide (see above). For all photos, illustrations, and tables please include captions in a separate text file. Please name all figure and table files with their corresponding association in the text (e.g. Figure 1.jpg or Table 1.xls) and use matching names in the caption text file.

UTAH ARCHAEOLOGY **2010 vol. 23(1)**