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UTAH ARCHAEOLOGY

Volume 27, No. 1

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Cover: Plan map of Structure 2 at Wolf Village (42UT273) (see page 38 this volume).

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Message from the Editor

The archaeology of Utah is alive and well. Development has continued to fuel archaeological discovery, and academic institutions within the state carry on the tradition of longitudinal research. Very few archaeological projects may ever measure up to the "mega" status of the Glen Canyon Archaeological Project associated with the creation of Lake Powell, but much dirt has been moved recently to uncover some of Utah's treasured historic and prehistoric resources. This issue contains five invited articles whose main purpose is to provide an overview of several large-scale projects carried out in Utah over the last five to ten years. The research was originally presented at the 2014 Utah Professional Archaeological Council's winter meeting at Weber State University and was expanded for this issue. These contributions, along with the first article in the *Avocationalist Corner* since 2010, provide descriptive insights and represent the diversity of archaeology in our region of the world.

The Editor

Michael T. Searcy

Prehistoric Archaeology in Range Creek Canyon, Utah: A Summary of Activities of the Range Creek Field Station

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Range Creek Canyon is a rugged and remote, mid-elevation canyon in the West Tavaputs Plateau, Utah. The canyon has received much attention because of its remarkably intact record of an intense Fremont occupation from A.D. 900 to 1200. To date, 470 sites have been recorded with only a fraction of the canyon having been surveyed. The University of Utah has held its Archaeological Field School in Range Creek Canyon annually since 2003. This article focuses on the results and direction of research at the University of Utah's Range Creek Field Station, which was established in 2009 for the long-term study, management, and preservation of this rich archaeological resource. Ongoing projects include survey, subsurface testing, experimental farming, wild plant procurement, and paleoenvironmental studies.

Range Creek Canyon is a rugged and remote canyon located in east-central Utah on the West Tavaputs Plateau on the border of Carbon and Emery Counties (Figure 1). Range Creek is a perennial stream draining approximately 145 square miles into the Green River. The elevation ranges from 10,200 ft at Bruin Point to 4,200 ft at the confluence with the Green River. The work of the Range Creek Field Station and the University of Utah's Archaeological Field School has focused primarily on the canyon below the junction with Little Horse Canyon. This is the northern boundary of the field station, and much of the canyon further to the north is privately owned. The archaeological record in the southern part of the canyon is rich, dense, and largely untouched except by time. The lack of disturbance stems from the remote location and strict limits on access enforced by the previous landowners (the Wilcox Family). The vast majority of the sites recorded to date are associated with the Fremont archaeological complex. The majority of radiocarbon dates from these sites fall within the period of A.D. 900–1200.

The Range Creek Field Station includes about 3,000 acres of the canyon bottom in the southern half of the canyon. The field station was established in 2009

> to facilitate the long-term, orderly, scientific investigation, preservation, and protection of cultural resources in the Range Creek drainage and to provide an educational facility to better prepare college students and other qualified parties for professional careers in the field of natural history and other academic disciplines [Comprehensive Management Plan 2012]

About half of the field station was once part of the Wilcox family ranch which is owned by the Utah School and Institutional Trust Lands Administration (SITLA) and managed by the Natural History Museum of Utah at the University of Utah through a Beneficiary Use Agreement. The same arrangement applies to an additional two sections of SITLA land. The remainder of the field station consists of 280 acres recently

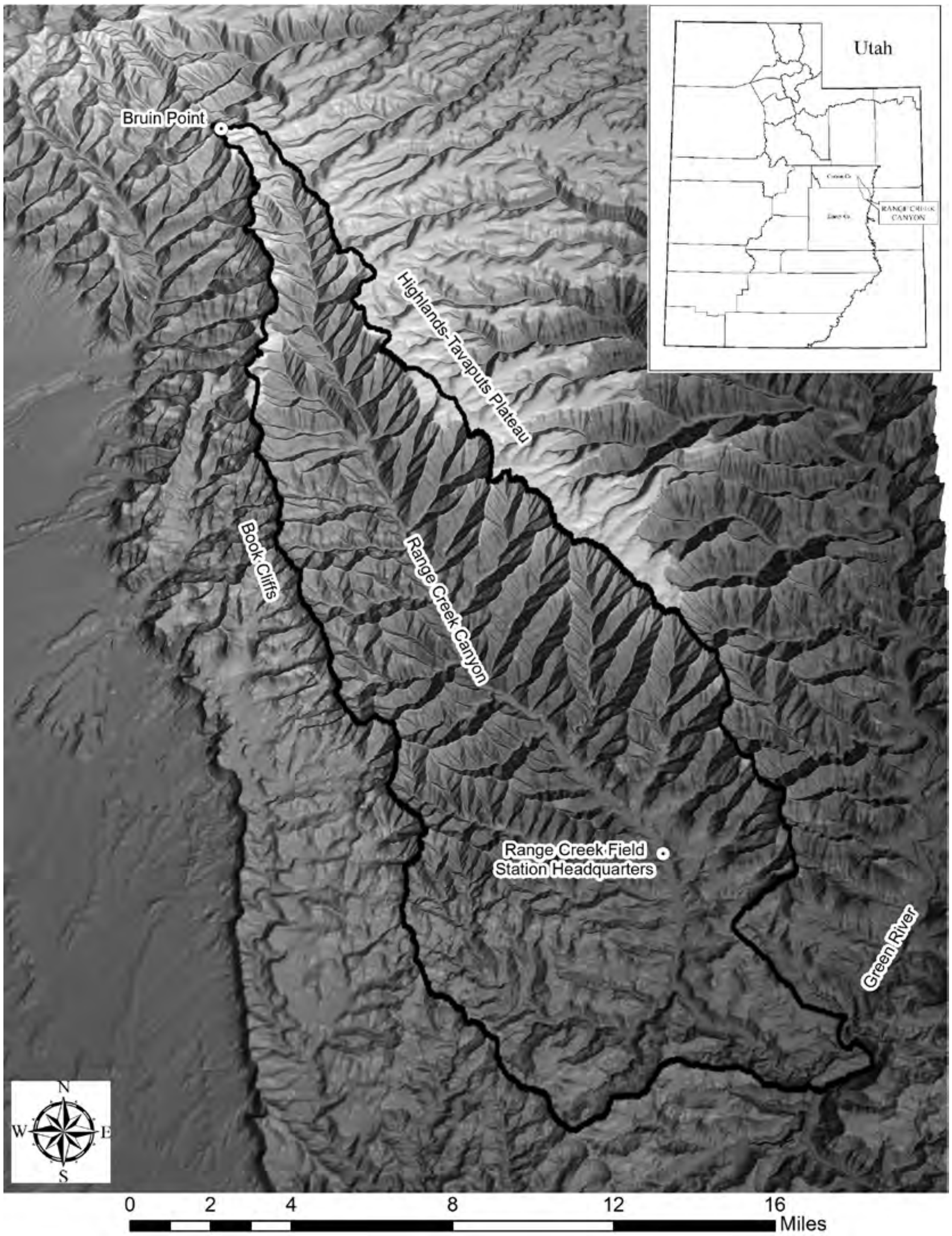

Figure 1. Relief map of Range Creek Canyon showing the hydrologic drainage boundary, major topographic features, and location of the Field Station Headquarters. Inset map of Utah showing location of Range Creek Canyon crossing the border of Carbon and Emery Counties.

gifted to the University of Utah. Management activities on the field station are governed by a conservation easement and a comprehensive management plan. The success of the field station is largely due to the coordinating efforts of SITLA; Utah Division of Forestry, Fire and State Lands; Utah Department of Agriculture and Food; Division of Wildlife Resources; Utah Division of State History and the Bureau of Land Management.

Field stations have a long history in the field of biology—less so in archaeology—but many of the advantages are the same. Field stations provide a spatial focus for diverse but integrated research projects designed to understand a range of ecological questions and phenomena. Field stations provide the time and opportunity to train students in conducting paleoenvironmental and experimental work in the region of archaeological interest. Time is perhaps the greatest benefit of a field station; time to implement elements of research designs that require years to complete, time to discover unique workarounds for the inevitable problems that arise during field operations, and time to employ recent advances in archaeological method and theory.

Project Overview

The University of Utah began work in Range Creek Canyon in 2002 and has conducted an annual Archaeological Field School since 2003 (for summaries, reports, and research designs, see Arnold et al. 2007, 2008; Arnold et al. 2009; Arnold et al. 2010; Arnold et al. 2012; Boomgarden et al. 2014; Metcalfe 2008; Metcalfe et al. 2005; Metcalfe et al. 2012; Spangler et al. 2004; Spangler et al. 2006; Springer and Boomgarden 2012; Yentsch et al. 2010). The Range Creek Field Station's mission is to explore human adaptations of arid-land foragers and farmers within the broader context of Southwestern prehistory. This pursuit requires coordinating paleoenvironmental, experimental, and archaeological investigations. Fortunately, this project does not operate under the time constraints typical of most archaeological investigations conducted in the United States, because the property is protected by a conservation easement which prohibits development projects and the field station provides protection for the archaeological sites and paleoenvironmental proxies by limiting public access.

One of our primary agendas is to teach college-level students the theoretical and methodological aspects of modern archaeological practices. As such, we have geared our research along several critical lines of inquiry to test the validity and/or refine the extant models of what we currently know about Fremont settlement in the canyon. These include chronology, settlement patterns and site structure, and subsistence and storage strategies. Data used to address research questions is gathered primarily by field school students through survey and test excavations.

Until recently, the major emphasis of the field school was to identify and document archaeological sites. This emphasis was largely pragmatic, but also recognized that the Range Creek Field Station was likely to be investigating this canyon for the next 30 or more years. The pragmatic aspect related to the fact that the former Wilcox Ranch, which ultimately became the Range Creek Field Station, was managed by another state agency with little interest in prehistory. Under their management a system for public access, both non-commercial and commercial, was established. While protection for archaeological resources was provided by controlling that access through a permit system and providing daily security patrols, it nevertheless seemed prudent to identify all the archaeological sites that might be visited and potentially impacted.

From a research perspective, identifying the range of sites and their locations is the first step in constructing a statistically justified sampling strategy. We have therefore employed several data collection strategies. These include: 1) intuitive archaeological surveys on the canyon floor as well as higher elevations, 2) systematic survey, and 3) limited test excavations. A summary of the ongoing survey and subsurface testing are presented below.

Survey

During the field school, most of the field time is spent instructing students in systematic and intuitive survey techniques. Each summer we try to conduct systematic surveys of several 1 km^2 quadrats. This survey contributes to obtaining a randomly selected 10% sample of the area drained by Range Creek. A total of 440, 1 km^2 quadrats, aligned to the 1000 m increments of the Universal Transverse Mercator (UTM) coordinate system, are required to cover the entire watershed. Forty-four of these 440 quadrats were randomly chosen for survey beginning in 2003. Thirty-six of the randomly selected blocks are located in the southern half of Range Creek Canyon, adjacent to the Field Station's property. These thirty-six have been the focus over the last twelve years and seventeen have been completed (Figure 2) including substitutions of nearby quads when the terrain has proved too difficult to access or the randomly selected block crosses private property. We intend to survey the remaining nineteen blocks over the next twenty years. The remaining incomplete survey blocks are located on BLM wilderness study area and require crews to stay overnight at remote camps. We completed systematic surveys of the bottoms of most of the side canyons that drain into Range Creek Canyon and a 100 m wide, 15-mile long road survey inside the field station gates. Since 2002, there have been several large fires that have impacted the valley floor. After each fire, we systematically surveyed and recorded sites that were previously hidden by the thick vegetation that covers the valley floor. Fires that caused significant impacts at lower elevations occurred in 2003, 2007, and 2012.

Crews continue to conduct intuitive survey as they are working in the canyon on revisits or other projects. When an area that has not been formally surveyed is visited, staff members often find unrecorded archaeological sites. Intuitive survey includes technical climbs to high elevation ridgelines and pinnacles that while extremely precarious to ascend, nonetheless show evidence of Fremont occupation.

Currently, there are 470 identified sites in the University of Utah's Range Creek database: 446 prehistoric, 21 historic, and 3 multi-component sites (Figure 1). The sites are scattered relatively evenly along the valley, north to south and up onto the ridgelines that lead into the main canyon, with only a few outliers. The sites are classified into the following types: residential, storage, rock art, artifact scatters, and combinations of these. Residential sites are those with surface architecture (rock alignments, stacked walls, etc.) and a diverse artifact assemblage. A particularly interesting subset of these appear to be residential sites located at least 200 ft. above the valley floor on sheer sandstone pinnacles and ridgelines. Storage sites include granaries, cists, and artifact caches of various sizes, shapes, locations, and construction types. Petroglyphs and pictographs of anthropomorphic and zoomorphic figures, shields, and various abstract and curvilinear symbols are found throughout the canyon. While most of these appear to fit firmly into the style attributed to the Fremont, there are some rock art panels that appear to have been executed during the Archaic and Protohistoric Periods. Sites associated with source materials for lithic and ceramic production have been searched for extensively but have not been identified within the canyon.

Revisits

A site revisit/monitoring strategy has been implemented to systematically monitor the condition of archaeological sites through time based on a vandalism study conducted in 2006 (Spangler et al. 2006). Sites within 4 km of the north gate and 200 m of the road (Class I) were categorized as those at the highest risk (Figure 3). Class I sites are monitored on a rotating basis so that each is reassessed every three years. Class II sites are defined as being within 2 km of the south gate and 200 m from

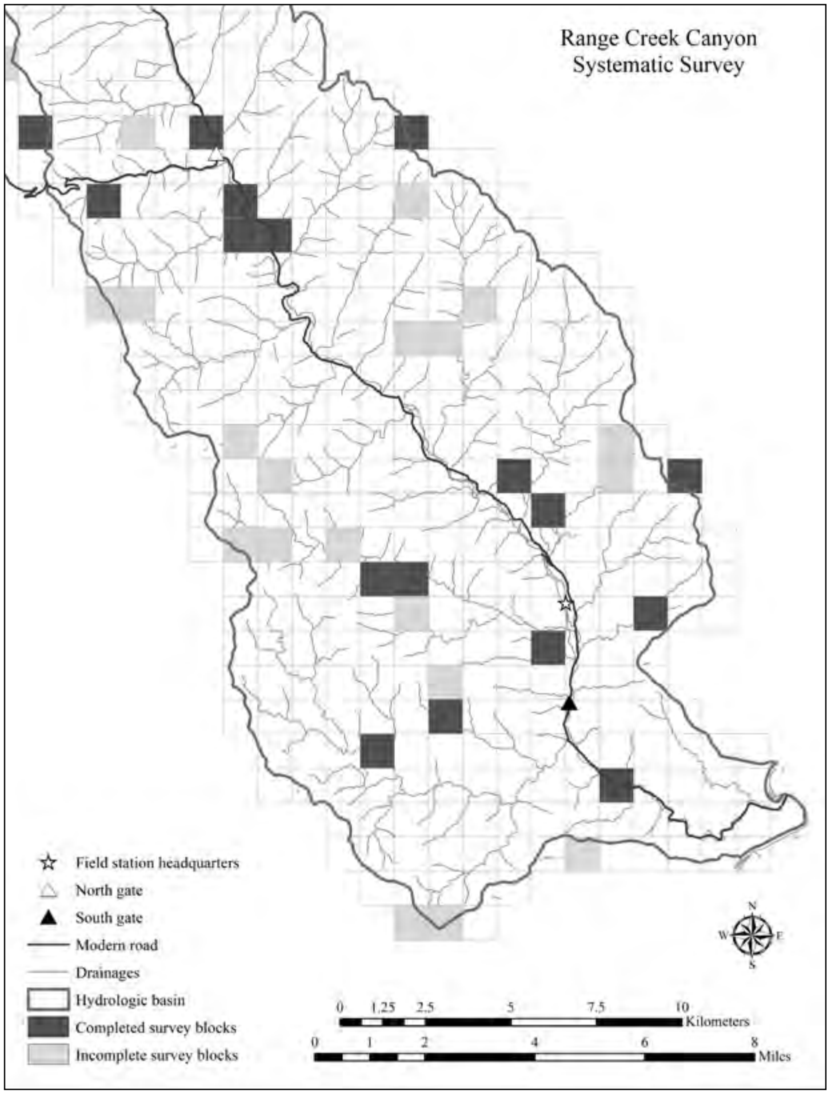

Figure 2. Map of Range Creek Canyon showing the location of randomly selected 1x1 km survey blocks. Seventeen blocks have been systematically surveyed between 2003 and 2013.

the main road. This set of sites is monitored on a five-year rotation and those in Class III (all other sites) on a ten-year rotation (Figure 3). As sites are revisited (and new sites discovered), lengths of rebar are strategically placed as permanent photographic datums in locations to best document the condition of cultural features evident on the surface. Photographs taken from a photo datum can be compared, year-after-year, to visibly document changes to the sites. Crews use the revisits to update the IMACS forms with descriptions of features and artifacts that were not previously recorded or which cannot be relocated since the previous recording. Crews also confirm the location and access information using the most up-to-date technology available.

By the summer of 2013, field school crews had completed all of the Class I and Class II sites and were working on the Class III revisits. Completing a revisit to all 470 sites in

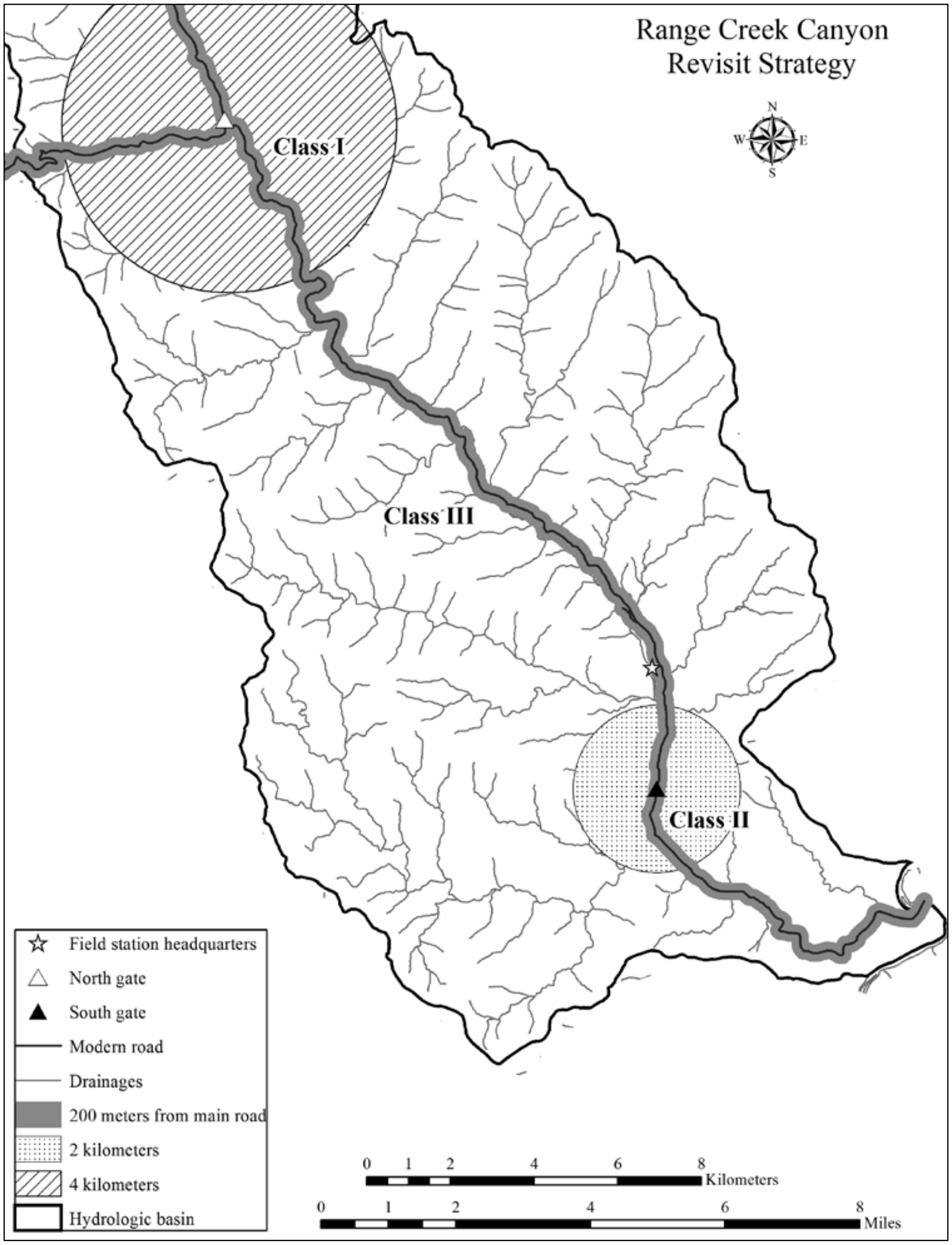

Figure 3. Map of Range Creek Canyon showing the ranking of archaeological sites into three classes based on location and public accessibility. Sites are being revisited on a rotating schedule.

the database is many years off, but the second revisit to the Class I sites is the next step. After a second revisit, we will be better able to assess how well the monitoring strategy is working for site management and protection.

Subsurface Testing

The goal of our limited test excavations (other than training advanced undergraduate and graduate students) is to quantify a set of basic characteristics for archaeological sites in Range Creek Canyon. Specifically we hope to characterize the range of variability in site structure, assemblage variability, feature composition, stratigraphic integrity, preservation, and chronology. We have tested three village sites, but over the last 5 years we have focused on 42EM2861 (Big Village). Big Village is a large (50 m x 115 m) residential site centrally located in Lower Range Creek Canyon, at an elevation of 1,706.6 m (5,600 ft.), on the toe of a west-sloping ridge. The site is located on lands administered by the SITLA and leased by the University. It was recorded on IMACS in 2003 by the Price Chapter of the Utah Statewide Archaeological Society (USAS) under the supervision of Pam and Blaine Miller. Six surface features were described as relatively large and roughly circular alignments of large sandstone boulders and slabs, some set on end. Also noted were three concentrations of charcoal-stained sediment thought to be evidence of middens and a concentration of artifacts in the flat open area near the center of the site. The artifact assemblage consisted of beads, projectile points and other flaked stone tools, debitage, ground stone, and Fremont grayware.

Six test trenches have been excavated at Big Village to explore four of the surface rock alignments and the large open area at the center of the site (Figure 4). These locations were chosen to investigate the variability in surface evidence present, each offering the opportunity to expose structures of varying form and function. In 2008, Time Team America filmed a documentary-style reality show in Range Creek Canyon. Their crews assisted in our excavations and conducted geophysical scans of Big Village under the direction of Dr. Meg Watters. The scans exposed several areas beneath the ground surface that appeared to have burned, both interior and exterior of visible rock alignments. These scans factored into the positioning of our test trenches relative to the surface alignments.

Over several field seasons, Dr. Richard Terry (Brigham Young University), sampled surface soils systematically across village sites and from several of our excavations, to look for geochemical elements associated with prehistoric human activities (Burnet et al. 2011; Eberl et al. 2012; Terry et al. 2012). At Big Village, Terry was looking specifically for evidence of high levels of phosphorus inside *vs*. outside structures that would indicate food related activities. Dr. Terry collected surface samples from an area approximately 25 x 25 m that included two surface features. He did not find significantly higher levels of phosphorus levels within the surface rock alignment features. Two locations show the highest levels of phosphorous (180–210 mg/kg) and both were found outside of the two surface features in the sample area (Terry 2008).

Shallow Burned Pithouse

Trench 1 exposed a large burned pit structure (Figure 4). This shallow pithouse was filled with the collapsed remains of a wood superstructure. The outer layers of a burned beam lying on the bedrock floor of the structure dated to 960 B.P. ± 15 (PRI-08-102-1; wood charcoal; δ^{13} C = -22.4 ‰) with a 2σ calibrated date range of cal A.D. 1020–1160 (calibrated at 2σ with the program IntCal 13, OxCal 4.2 [Bronk Ramsey 2009], see Table 1). A burned upright post in the floor of the pithouse dated to B.P. 1153 ± 24 (UGAMS-3947; wood charcoal; δ^{13} C = -20.43 o/oo). with a 2σ calibrated date range of cal A.D. 770–970 (calibrated at 2σ with the program IntCal 13, OxCal 4.2 [Bronk Ramsey 2009], see Table 1). A clay rimmed hearth was exposed at the center of the structure and the edge of the feature was exposed on the west side. Assuming that the hearth was centrally located, the pit structure was approximately 8 m in diameter. A total of 759 artifacts including 50 bone fragments, 399 ceramic sherds, 294 lithic flakes, 4 projectile points, 3 bifaces, 3 groundstone fragments, and 1 bead were collected from the multi-year

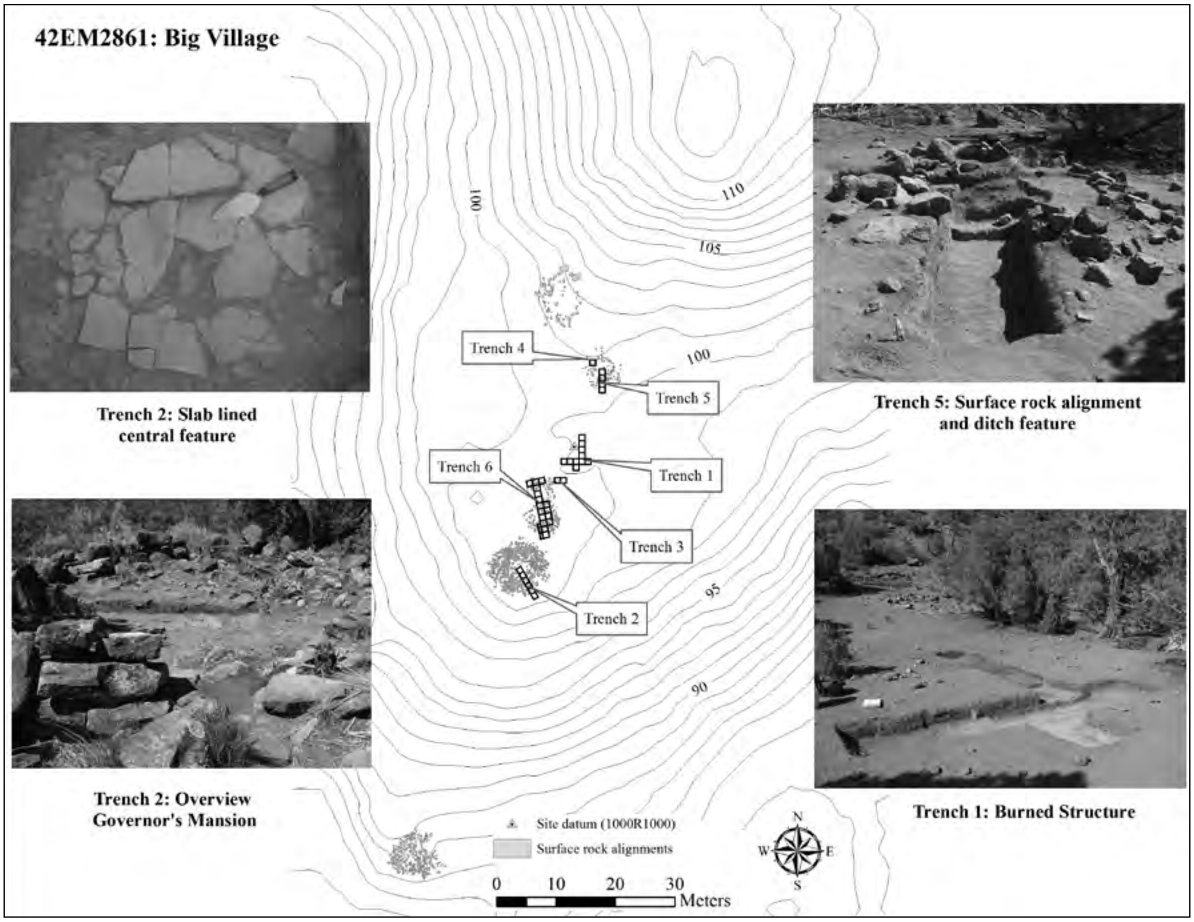

Figure 4. Contour map of Big Village showing the location of surface rock alignments, test excavations conducted over the last seven years, and photographs of the excavations.

excavation of this feature. The majority of the artifacts came from the burned stratum (3–7 cm in thickness) at the interface with the bedrock floor (n = 202) and the overlying loose surface sediment 3–5 cm in thickness (n = 427).

Governor's Mansion

The large surface rock alignment/rubble mound, nicknamed the Governor's Mansion, is located on the southeast side of the site (Trench 2, Figure 4). It is one of the most substantial surface rock alignments identified in Range Creek Canyon. It is composed of locally available tabular rocks placed in a roughly circular alignment. Some of these rocks weigh well over 100 kilograms including some that are set with their long axes vertical. The interior diameter of the feature is approximately 3.5–4 m and the outside diameter, including all the fallen debris, measures 8 m. A few sections of the alignment still show some horizontal coursing. Given that sediment accumulation at this edge of the ridge appears to be very thin, a pithouse in this location would be very shallow.

Accounts from the previous landowner and surface evidence indicated that this structure had been damaged prior to excavation. It was therefore not surprising that the excavation resulted in more questions than answers. No clear residential features were identified, e.g. hearth, roof material, posts. Geophysical scans showed

Table 1. Radiocarbon dates from Range Creek Canyon.

Site Number	Sample No.	Material Type	Isotopic Value	Radiocarbon Age (BP)		Calibrated Age (AD)*			Provenience
				Mean BP	SE	Low	High	Median	
42Em3315	Beta-235068	unburned plant	-22.6	110	60	1670	1950	1830	Wild tobacco bundle
LC-13-06	UGAMS-16506	unburned plant	-24.9	880	25	1040	1220	1170	Wood from granary
42Em2861	UGAMS-12221	charcoal	-22.50	900	20	1040	1210	1110	Beam from pithouse
42Em3213	Beta-202190	wood	-22.9	930	40	1020	1190	1100	Beam from pithouse
42Em3048	UGAMS-3951	unburned plant	-11.42	932	24	1030	1160	1100	Corn cob
42Em3585	Beta-214831	unburned plant	-23	940	40	1010	1190	1100	Snares
42Em3217	UGAMS-12220	unburned plant	-23.2	940	20	1030	1160	1100	Binding from granary
42Em2885	Beta-175755	unburned plant	-9.1	940	50	1000	1220	1100	Corn cob
42Em2886	UGAMS-3950	unburned plant	-23.74	948	23	1020	1160	1100	Basket
42Em0019	Beta-235067	charcoal	-21.1	950	40	1010	1190	1100	Beam from pithouse
42Em0761	Beta-202189	unburned plant	-21.1	950	40	1010	1190	1100	Grass
42Em2837	Beta-175753	unburned plant	-8.7	950	40	1010	1190	1100	Corn cob
42Em0019	UGAMS-3944	charcoal	-20.36	951	24	1020	1160	1100	Hearth
42Em3424	UGAMS-3952	unburned plant	-10.63	958	23	1020	1160	1100	Corn cob
42Em2861	PRI-08-102-1	charcoal	-22.4	960	15	1020	1160	1100	Beam from pithouse
42Em3998	UGAMS-3953	unburned plant	-20.78	963	24	1050	1160	1100	Snares
42Em2885	UGAMS-3949	unburned plant	-10.65	965	23	1010	1160	1090	Corn cob
42Em4318	UGAMS-12223	unburned plant	-10.30	980	20	1010	1160	1040	Corn cob
42Em0741	Beta-202191	wood	-21.7	980	40	990	1160	1080	Beam from granary
42Em3117	Beta-202188	unburned plant	-9.5	980	40	990	1160	1080	Corn cob
42Em3294	Beta-214832	unburned plant	-22.8	990	40	980	1160	1050	Arrow
42Em2849	Beta-203630	unburned plant	-8.9	1000	40	970	1160	1030	Corn cob
42Em3359	UGAMS-12222	wood	-25.2	1010	20	980	1040	1020	Binding from granary
42Em4261	UGAMS-12219	unburned plant	-9.50	1050	20	960	1030	1000	Corn cob
42Em0019	UGAMS-3945	charcoal	-20.35	1053	24	900	1030	1000	Beam from pithouse
42Em2843	UGAMS-3946	unburned plant	-27.97	1077	24	890	1020	970	Arrow

*Calibrated using IntCal 13, OxCal 4.2 (Bronk Ramsey 2009)

Table 1. continued

Site Number	Sample No.	Material Type	Isotopic Value	Radiocarbon Age (BP)		Calibrated Age (AD)*			Provenience
				Mean BP	SE	Low	High	Median	
42Em2861	UGAMS-16504	charcoal	-25.2	1115	24	880	990	940	Hearth
42Em2881	Beta-175754	unburned plant	-10.9	1130	40	770	990	920	Corn cob
42Em2865	UGAMS-3948	unburned plant	-11.43	1133	23	770	990	930	Corn cob
42Em2861	UGAMS-3947	charcoal	-20.43	1153	24	770	970	890	Beam from pithouse
42Em2861	UGAMS-16505	charcoal	-21.50	1185	24	770	940	830	Hearth
42Em2861	UGAMS-16503	charcoal	-22.30	1540	24	420	580	490	Hearth
32Em3170	Beta-202187	unburned plant	-26	1660	40	250	540	390	Basket

*Calibrated using IntCal 13, OxCal 4.2 (Bronk Ramsey 2009)

only faint evidence of an interior anomaly but upon excavation the center did not have a typical hearth, but rather a collection of tabular rocks arranged in an oval shape (Figure 4). Charcoal stained soil lenses and flecks of charcoal were found throughout the trench but there was no burned material associated with the interior slab feature. At present the function of this tabular feature is unclear but a sample was taken for pollen and starch analysis.

One hypothesis is that the structure was a large surface storage feature. Samples were collected under the direction of Dr. Richard Terry to compare the interior phosphorous levels with those outside the feature and with other features on the site. The reasoning was that high phosphorous levels inside the feature might indicate the decomposition of a significant amount of organic remains compared to outside the feature (Burnet et al. 2011; Eberl et al. 2012; Terry et al. 2012). Terry's analysis did not find a significant difference in phosphorus levels within structures *vs*. outside at Big Village. Governor's Mansion did not have the elevated levels of phosphorus that would indicate use of the feature to store organic material.

A total of 551 artifacts were collected from the multi-year excavation of Trench 2 (94 from exterior deposits and 457 from interior deposits). Artifacts from the fill of the structure include 42 bone fragments, 80 ceramic sherds, 311 lithic flakes, six bifaces, and five beads. A single burned corn cob fragment was found in the screens. The majority of the artifacts came from the stratum deposited above and at the interface with the slab lined feature (n = 270).

Burned Anomalies

Trenches 3 and 4 were excavated in 2008 to investigate anomalies recorded by the Time Team America geophysical analysis (for full descriptions of the Time Team America findings, see Arnold et al. 2008). The magnetometer scans showed areas of intense burning below the surface sediments. A 2 x 1 m test trench (Trench 3) was excavated southwest of the large pit structure excavation of Trench 2 (Figure 4). It was thought that the isolated, heavily burned spot might be an outdoor hearth associated with the pit structure. It was determined to be a natural burn, and not a cultural feature. The excavation of Trench 3 yielded 151 artifacts.

The second anomaly was located on the northwest edge of a circular rock alignment on the north end of the site (Trench 4, Figure 4). This feature showed three small heavily burned anomalies along the edges of the rock ring and a lightly burned central anomaly. We thought that these features might represent burned posts and a central hearth associated with a residential structure. Because of time constraints, only part of a 1 m² test unit was excavated and the anomaly was not discovered. Further excavation was necessary to understand the subsurface character of this feature, but in 2009 it was decided that Trench 4 would not be reopened. Twenty-four artifacts were collected.

Circular Rock Alignment

Trench 5 was established to investigate three small heavily burned anomalies along the edges of the circular surface rock alignment and a lightly burned central anomaly. The circular rock alignment is roughly 4 m in diameter and is composed of medium-sized unmodified sandstone boulders. Although none of these rocks exhibit signs of stacking, several along the northern edge of the alignment have been oriented on their long axis, suggesting intentional placement.

Trench 5, a 1 x 4 m test trench, was excavated in the southwest portion of the feature (Figure 4). This test provided no evidence that the circular alignment was a residential structure and failed to locate the burned anomalies identified on the magnetometer scans. However, a subsurface, u-shaped, linear feature was exposed running north-south beneath the rock alignment. This ditch-like feature is wider and deeper on one end, measuring 165 x 47 cm, and narrower and shallower on the other end, measuring 120 cm wide and 31 cm deep. Because of the limited nature of this excavation, we were unable to identify a relationship between the subsurface linear feature and the surface rock alignment. The excavation yielded 196 artifacts including two bone fragments, 125 lithic flakes, 54 ceramic sherds, four bifaces, and two beads.

Superimposed Structures

Excavation of Trench 6 revealed the first example of feature superposition in Range Creek Canyon with at least three superimposed features exposed in the trench (Figures 5 and 6). A larger scale excavation is needed to fully understand the sequence of occupation and the relationship of the features. Thus far, it is clear that there are two residential structures. The older structure, Structure 1, measures 8.8 m long in profile (Figure 5). It was defined by the presence of a collapsed burned roof layer consisting of patchy hardened clay and intact carbonized beams lying on an unprepared floor; the floor has a clay-rimmed, slab-lined, central hearth (Figure 6). A sample from the outer layers of a roof beam dated to 900 B.P. ± 20 (UGAMS-12221 δ^{13} C = - 22.50 o/oo) with a 2σ calibrated date range of cal A.D. 1040–1210 (calibrated at 2σ with the program IntCal 13, OxCal 4.2 [Bronk Ramsey 2009], see Table 1). The hearth located at the center of Structure 1 was dated to 1540 B.P. ± 24 (UGAMS-16503; wood charcoal; δ^{13} C = -22.30 o/oo) with a 2σ calibrated date range of cal A.D. 420–580 (calibrated at 2σ with the program IntCal 13, OxCal 4.2 [Bronk Ramsey 2009], see Table 1). Given the stratigraphic location of this feature and those dated beneath it, this would result in an age reversal. We suspect that this date is from old wood. Unfortunately, only a single piece of charcoal was recovered from this excavation and the rest of the fill was ash. Bulk sediment was collected from this feature but has not been analyzed. Perhaps floatation of this material will provide a higher quality datable material.

Structure 2 is located directly above Structure 1 in the southern half of Trench 6 (Figures 5 and 6) and measures nearly half the diameter of the underlying structure. This structure consists of a flat unprepared floor, a slab-lined central hearth, and a circular rock slab wall stacked two courses

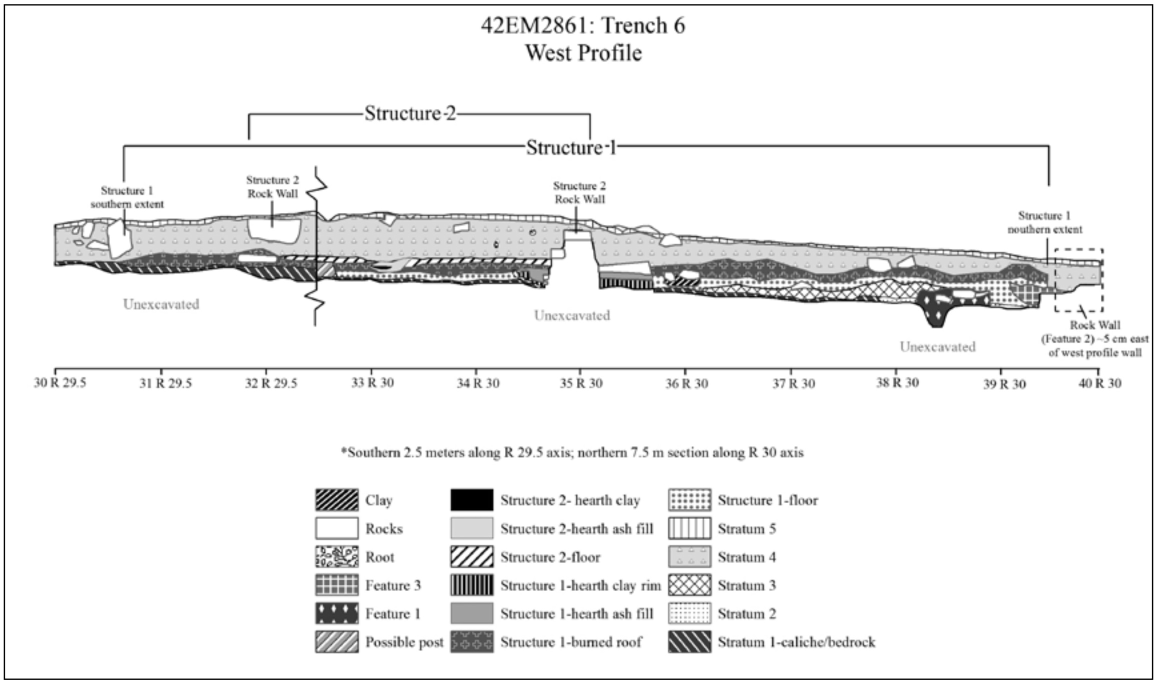

Figure 5. West profile of Trench 6 showing the stratigraphy associated with two superimposed residential structures and associated interior features.

high (Figure 6). The associated surface rubble suggests the walls were stacked several courses higher, but have eroded and fallen in a circular pattern around the perimeter. The wall of Structure 2 bisects the central hearth of Structure 1 (Figure 6).

In addition to the two structures, Trench 6 partially exposed several other features. These include a possible post, a bedrock feature tentatively designated as a roasting pit (Feature 1), another rock wall (Feature 2) bisecting the northern end of the trench, and a hearth (Feature 3) on the north end beneath the rock wall that appears to 'float' in the depositional layers unrelated to surrounding features (Figures 5 and 6).

Feature 1 (Figure 5, 38R30, and Figure 6) is a charcoal filled pit capped with two layers of stone slabs. The shape and extent of this feature is unknown as only a small portion was exposed in Trench 6, and an even smaller portion has been excavated. Several of the stacked stone slabs were removed on the southern edge of the feature and the charcoal fill beneath these was removed and collected down to bedrock. The maximum depth of the excavated pit is 35 cm. Charcoal was also collected from between the stone slabs. A sample taken from the bottom of this feature dated to 1115 B.P. ± 24 (UGAMS-16504; wood charcoal; δ^{13} C = - 25.2 o/oo) with a 2σ calibrated date range of cal A.D. 880–990 (calibrated at 2σ with the program IntCal 13, OxCal 4.2 [Bronk Ramsey 2009], see Table 1). Further excavation is needed to understand the form and function of this feature and its relationship with the surrounding structures.

The rock alignment (Feature 2) was discovered in the northernmost unit (Figures 5 and 6). The alignment consists of five boulders (possibly more unexcavated) with at least one placed up-right with a pointed end placed into a hole. Three of the boulders were exposed in profile bisected at an angle by Trench 6 with the other two boulders visible in alignment on either side of the trench and assumed to be part of the same wall. One of the rocks was excavated and

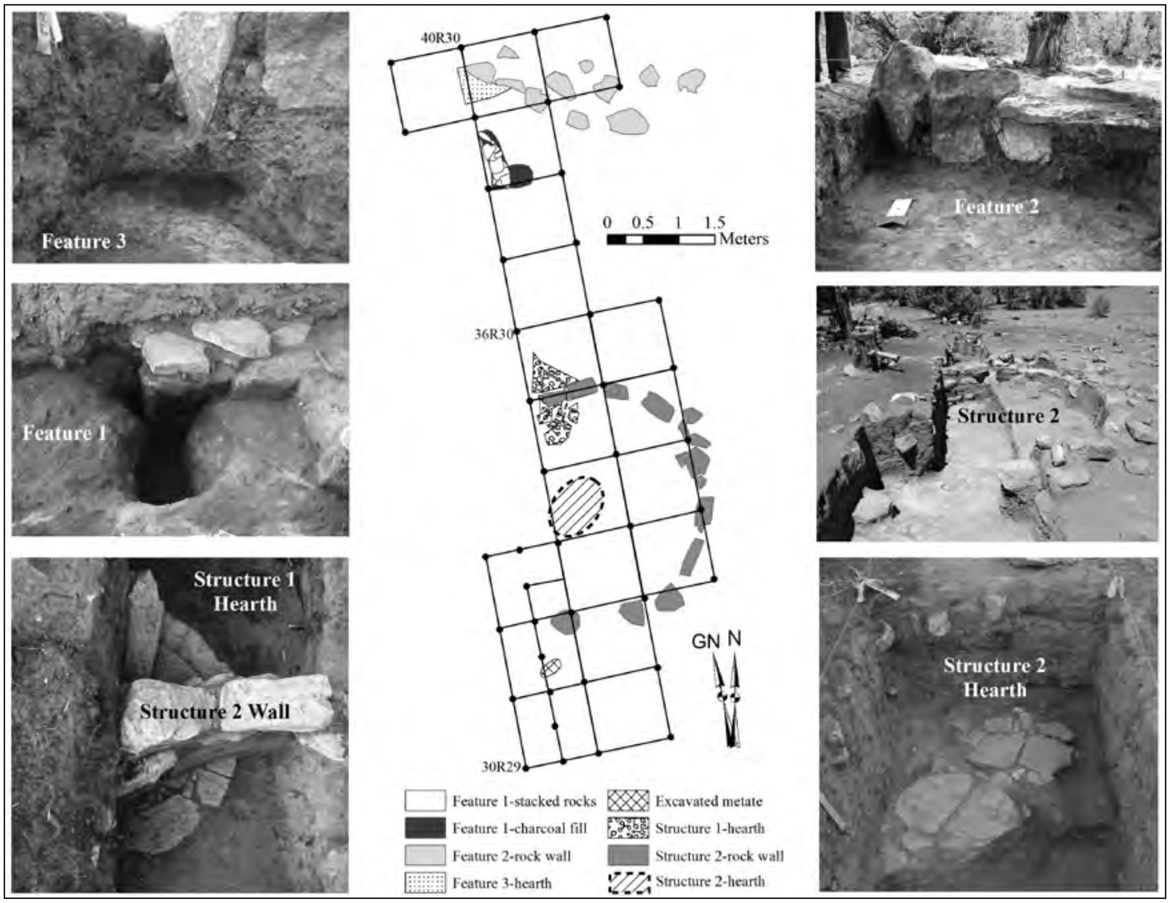

Figure 6. Plan view map of Trench 6 showing the location of features associated with two superimposed residential structures and photographs of the interior features.

found to be positioned directly on the collapsed burned roof of Structure 1 while the unexcavated boulders exposed in profile appear to be set-in, cutting through the strata of Structure 1 and into a lower hearth (Feature 3). The level of origin for this alignment is above Structure 1 but the form, function, and relationship to other features in the area is unclear.

Feature 3 is a hearth found within a stratum below the floor of Structure 1 on the north end of Trench 6 (Figures 5 and 6). Only a small portion of this hearth was exposed in the trench and the rock wall above cuts into and disturbs the visibility of this feature in plan view. The hearth appears to extend into the north and west profiles. A sample dated to 1185 B.P. ± 24 (UGAMS-16505; wood charcoal; δ^{13} C = -21.50 o/oo) with a 2σ calibrated date range of cal A.D. 770–940 (calibrated at 2σ with the program IntCal 13, OxCal 4.2 [Bronk Ramsey 2009], see Table 1). Further excavation is needed to understand the size of this feature and its relationship with the surrounding features. Bulk soil was collected from this feature, but floatation of a portion did not yield higher-quality, datable material.

A total of 2,588 artifacts were collected from the excavation of Trench 6 including bone fragments, beads, shale bead fragments, bifaces, ceramic sherds, lithic debitage, projectile points, flaked stone tools, ground stone, and maize (see Table 2 for additional items and numbers). A strikingly large number of artifacts (n = 909)

Table 2. Artifacts collected from Trench 6, Big Village (42EM2861)

Provenience	Bone	Bead	Shale/ bead material	Biface	Ceramic	Debitage	Projectile point	Other flaked stone tool	Teeth	Maize	Seeds	Turquoise	Ochre/ pigment	Mano	Metate	Manuport	Wood	Groundstone other	Shell fragment	Total
Surface (Stratum 5)	10	1	92	2	13	108	0	0	5	0	0	0	0	0	0	0	0	0	0	231
Stratum 4-Structure 2 exterior	136	6	39	5	63	276	0	2	11	1	0	0	12	0	0	1	0	3	1	556
Stratum 4-Structure 2 interior	88	1	6	2	53	171	2	2	9	0	0	1	2	1	0	6	0	0	0	344
Stratum 3 and Stratum 2	50	1	0	0	15	27	0	0	0	0	0	0	0	0	0	0	1	0	0	94
Stratum 1	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Structure 2 hearth	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	6
Structure 2 floor	16	0	6	2	11	12	2	1	0	0	1	0	0	1	0	0	2	0	0	54
Structure 1 roof	247	12	86	2	171	342	3	1	13	0	0	1	16	0	3	0	9	3	0	909
Structure 1 floor	69	7	6	2	78	94	1	1	1	0	0	0	3	0	0	0	0	0	0	262
Structure 1 hearth	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	5
Feature 1	1	0	0	0	7	11	0	0	0	0	0	0	0	0	0	0	2	0	0	21
Feature 3	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	4
Unprovenienced	16	3	4	0	12	55	0	1	0	0	7	0	0	0	0	0	0	0	0	98
Total	636	31	240	15	427	1104	8	8	39	1	8	2	33	2	3	7	17	6	1	2588

came from the stratum that we initially interpreted as a burned roof associated with Structure 1. These artifacts tend to be small broken items, not typical of items that might be stored on or under a roof (primary refuse). Since a roof would not typically exhibit such a high density of secondary refuse, this phenomenon requires further investigation. Perhaps after Structure 1 was abandoned and the roof burned, the shallow pithouse depression was used as a trash pit prior to the building of Structure 2.

The next phase in the investigation of Big Village is full scale excavation. Rather than answering questions about the subsurface features of this site, testing is adding more questions by exposing such a limited area. Little progress can be made in interpretation with such small exposures. We propose excavating the western half of the two structures and exposing the full extent of the underlying features to more clearly define their nature and improve our understanding of the sequence of occupation at this site.

Chronology

Developing chronologies has proven to be a surprisingly vexing problem in Range Creek Canyon. Radiocarbon dates from cultural contexts have offered little in terms of variation to help explain the sequence of occupation of the canyon and the 470 sites recorded thus far. While the lack of variation likely indicates a rapid influx of many people, it is difficult to imagine all the sites being occupied all at once. There appears to be several strategies for residential occupation (high elevation *vs*. low elevation) as well as several storage strategies (small hidden caches *vs*. large highly visible structures; Boomgarden 2009). Were all of these strategies being implemented simultaneously and throughout the entire occupation? Radiocarbon dating alone is not going to give us the detailed chronology that would aid in determining the settlement patterns and land use strategies that occurred over a seemingly very short interval of time.

We have instead looked at other indicators of variation through time in the use of the landscape as well as other dating techniques to try and understand the sequence of occupation. One strategy has been to reconstruct the past environment and the geomorphology of the area to see how prehistoric subsistence strategies might have been impacted. We have cored sediments in several locations in the canyon likely to have been profitable areas for farming in the past and we have profiled and sampled large exposures of the cut creek bed. We have used these sediments to identify dateable material, count the amount of charcoal accumulating through time, identify pollen (especially associated with maize), and collect isotopic data. All of these pieces of the puzzle can inform on the sequence and intensity of human activities in the canyon. The dates on charcoal and pollen from these natural stratigraphic profiles and soil cores are producing age reversals that cannot yet be explained through years of repeated stratigraphic investigation and dating has not resolved. Unfortunately the explanatory power of all the data collected from these cores and profiles hinges on the ability to reliably date the material. As a consequence, we have embarked on several new avenues of research to overcome, or at least understand, these problems.

Radiocarbon Dating

A total of 33 radiocarbon samples from secure archaeological contexts have been dated (Table 1). These samples come from the length of the canyon and include a broad range of organic remains including structural elements, tools, and corn cobs. Over half the radiocarbon dates (n = 17) have median dates that fall between A.D. 1080 and 1120, and the 95 percent confidence intervals are captured in the span of A.D. 990–1210. The 95 percent confidence intervals of 27 of the dates are contained within the span A.D. 780–1210 (Figure 7). One item, a basket fragment, dates significantly older at A.D. 400; a prepared bundle of wild tobacco dates to around A.D. 1800.

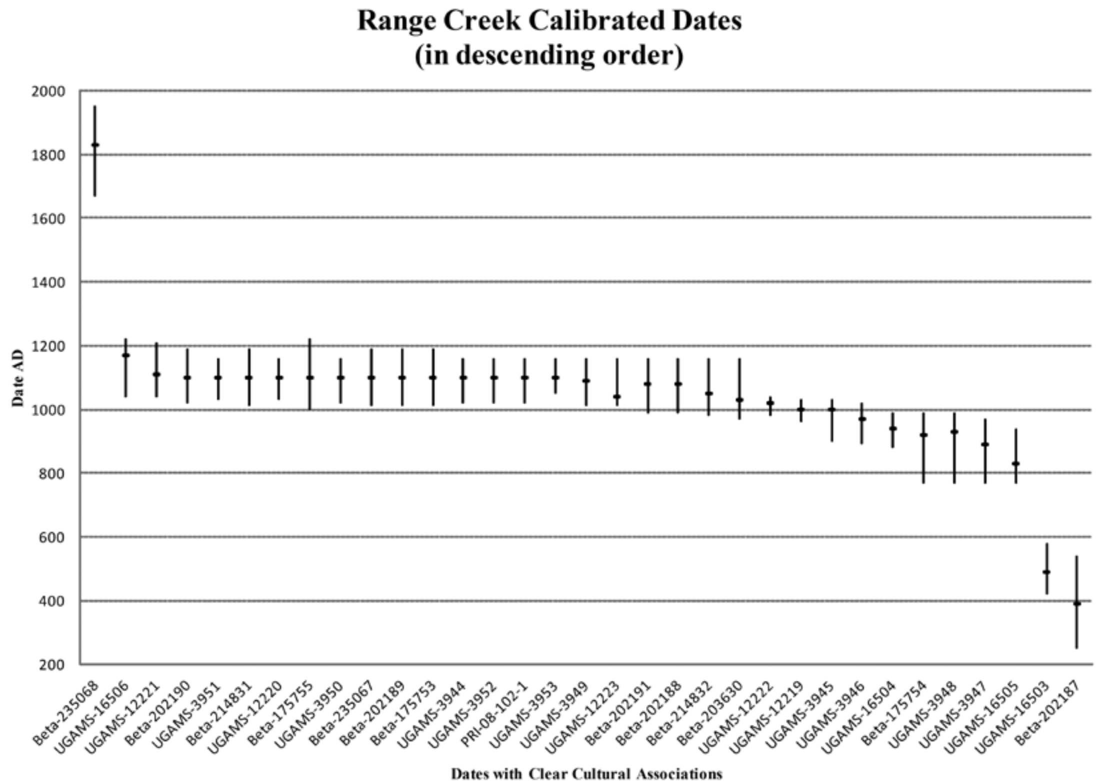

Figure 7. Calibrated radiocarbon dates from Range Creek Canyon sorted in descending order.

Improving the precision of the radiocarbon dates will only marginally improve the resolution of the calibrated dates (Metcalfe 2011). This section of the radiocarbon calibration curve (IntCal09, Reimer et al. 2009) is ill-behaved because it is characterized by multiple intercepts. The effect of multiple intercepts is to expand the calendar age range relative to the radiocarbon age range. Because of this, if the radiocarbon samples dated so far are representative of the universe of cultural dates in Range Creek, then radiocarbon dating will not have sufficient resolution to temporally subdivide the Fremont occupation of this canyon.

About two dozen additional radiocarbon dates have been analyzed from sediments exposed in the banks of the creek and from a series of sediment cores obtained for paleoenvironmental analyses (isotope, pollen, magnetic susceptibility, and charcoal abundance analysis). In all cases where three or more dates have been analyzed from a single column, at least one is out of position; that is, it is out of sequence with respect to the other dates. This was true for sediment columns recovered from more than one location in the canyon. We originally concluded that the sediments must have been disturbed by bioturbation or some other post-depositional agent because our earliest work focused on sediment cores where such disturbance might well escape identification. The result is that we refocused our attention to broad exposures of sediments in the banks of Range Creek. The same mishmash of dates was obtained from these contexts.

We finally concluded that the anomalous dates were the result of contamination from very old carbon originating in the Eocene and

Paleocene deposits exposed in the canyon walls. Some of these deposits are rich in carbon, albeit not the radioactive isotope of carbon. Geologically, these deposits are quite young and have not been subjected to the heat and pressure required to convert the original organic material to coal. We therefore suspected that bitumen or kerogen, antecedents to coal, might be the source of contamination. We sent three sediment samples recovered from the bank of Range Creek in the vicinity of Billy Slope Bog to the Organic Geochemistry Laboratory, Energy & Geochemistry Institute at the University of Utah for analysis of bitumen. Soluble bitumen was isolated using soxhlet extraction and dichloromethane, and analyzed using gas chromatography-flame ionization detector. Bitumen was identified in each sample, but the amounts were too small to account for the anomalous dates (0.01 to 0.02 percent weights). While it is also possible that solid bitumen or kerogen, both of which are insoluble and consequently much more difficult to isolate and quantify, were contaminating the ^{14}C samples, we decided instead to try dating these sediments using optically stimulated luminescence.

Dendrochronology

In 2005, the Range Creek Tree-Ring Project began as a National Science Foundation (NSF) collaborative effort by researchers from the Laboratory of Tree-Ring Research (LTRR) at the University of Arizona, Tucson, Salt Lake Community College (SLCC), the Natural History Museum of Utah (NHMU) at the University of Utah, and the Department of Anthropology at the University of Utah (Towner et al. 2009). The goals of the project were to employ dendrochronological methods to build master chronologies for Range Creek Canyon and those canyons that drain into Range Creek based on five different tree species within the canyon: pinyon pine (*Pinus edulis)*, juniper (*Juniperus spp*), Gambel oak (*Quercus gambelii*), ponderosa pine (*Pinus ponderosa*), and Douglas fir (*Pseudotsuga menziesii*). Goals also include teaching students basic theoretical and methodological aspects of dendrochronology and to date prehistoric and historic sites within Range Creek.

Researchers involved in this project collected live-tree samples, archaeological samples, and remnant wood (logs) for purposes of chronology building. A total of 197 samples were collected from prehistoric granaries, of which 19 yielded dates, only four of which were cutting or near-cutting dates. Although the specific dates were not published, the researchers state that the prehistoric date range is A.D. 609–1126 (Towner 2009:120). The low rate of success was attributed to the wide range of tree species comprising the Fremont samples, small diameter of the sampled timbers, and the lack of species-specific master sequences for the area.

In 2013, a graduate student (Ryan Bares) initiated a study focused on assessing whether using variation in the stable isotopic variation in tree rings, in addition to variation in the thickness of tree rings, might produce a higher dating success rate. Oxygen isotopes should assist in identifying false rings, which are an important impediment to tree ring dating of juniper; to the degree that isotopes and tree ring thickness vary independently through time, this multi-dimensional approach should allow the dating of shorter tree ring sequences. Bares has sampled six juniper trees from different areas of the canyon, measured their tree ring thicknesses, and then sampled each of the newest 30 tree rings using a high-precision, computer-controlled micromill in the Cerling Laboratory at the University of Utah. Cellulose was isolated from each of the subsamples and then analyzed for stable carbon ratios on the mass spectrometer at the Stable Isotope Ratio Facility for Environmental Research (SIRFER) at the University of Utah. The analysis explores using stable carbon isotopes to unambiguously identify false rings, examine the amplitude of the variation in stable isotopes, and the coherence of patterning in that variation among the sampled trees. If the results prove productive, then the samples will be analyzed for the stable isotopes of oxygen, hydrogen, and possibly nitrogen. The results will be available through the Department of Geography in 2014.

Optically Stimulated Luminescence

Optically Stimulated Luminescence (OSL) is a technique for measuring the time that has elapsed since a sample of material with a crystalline structure was last exposed to light or heat (Aiken 1998). We are especially fortunate that Dr. Rittenour joined the faculty at Utah State University and established the Luminescence Laboratory in 2007. Rittenour specializes in the geomorphology of fluvial systems and has sampled the same column of sediments near Billy Slope Bog that produced many of the troublesome ^{14}C dates that were analyzed for contaminating "old carbon."

The precision of OSL dating was improved dramatically with the development of the single aliquot regenerative dose protocol which allows researchers to calculate dose equivalents (Murray and Wintle 2000). In addition, with increasingly precise instruments to measure the luminescence signal, single grains of quartz can now be analyzed. This is important for dating fluvial sediments because fluvial transport can often result in the incomplete bleaching of the quartz grains at the time of deposition, the event we are trying to date. By analyzing hundreds of individual grains from a single sample, a frequency distribution of ages is produced that is then interpreted based on the fluvial geomorphology of the deposits from which the sample was taken.

Rittenour recovered five samples for OSL dating from the stratigraphic profiles previously radiocarbon dated and analyzed and several dozen additional sediment samples for grain-size analysis to assist with the interpretation of the OSL results. We anticipate receiving the OSL dates prior to beginning the 2014 field season. While this technique is unlikely to allow fine parsing of Fremont age sites, it will aid in understanding the age of our problematic profiles and sediment cores.

Experimental

The archaeological field school at Range Creek is explicitly embarking on new directions of research. While most of our time is devoted to teaching students methods and techniques for survey and excavation, students are also involved in experiments designed to calculate the costs and benefits associated with exploiting various wild resources. Students learn and employ techniques for quantifying various aspects of the environment, such as the distribution and seasonality of plant resources that were likely economically important to the prehistoric residents of the canyon.

Students in the field school harvest and process a number of wild plant resources, recording the time spent in the activity and the amount collected. The first year the focus was on four resources: pinyon pine (*Pinus edulis*), three-leaf sumac (*Rhus trilobata*), sego lily (*Calachortus nuttallii*), and Indian ricegrass (*Achnatherum hymenoides*). Students were involved in the collection of particular resources, and each wild resource was procured from various locations in the canyon. Collecting times were recorded as well as the amount collected. The collected resources were processed using historically recorded techniques. These data will allow us to estimate individual learning curves, as well as how specific features of the exploited patches influence return rates. The harvested resources may be analyzed to determine the energy they produce (caloric values are available for a number of wild resources) and for their stable isotope ratios, which are recorded in the tissues of individuals consuming these foods.

In 2013, we initiated a series of small farm plots, focusing on the costs and benefits of irrigation. We dug an irrigation ditch and built diversion dams, measuring the time that goes into their construction. Four small corn plots were planted and irrigated at different schedules to begin to identify the costs and benefits of this important arid land farming activity. Samples of the soils in the field and water samples from the creek and growing season precipitation were recovered for baseline data for stable isotope analysis. Finally, the kernels and cobs were analyzed to determine how these different sources of water influence the stable isotope composition of the harvest. All experimental field times were measured, as were the yields of the resulting harvests. The pilot study showed that irrigation water was necessary for any maize to grow. We also learned about the length of the growing season, the influence of flooding and monsoon rains, and the pest problem. This study will continue for several years before the results are compiled and reported.

The field station currently has a single weather station located a couple of miles north of the field station headquarters. Initial analysis of precipitation events recorded by the weather station and fluctuations of the stable isotope composition of the creek water failed to demonstrate any correlation, likely the consequence of the patchy nature of summer precipitation in Range Creek. Another weather station was established at the north end of the field station in 2013, and we are investigating the possibilities of adding a flow meter to monitor flow variation in the creek near the original weather station. The weather stations use standalone instrumentation that only requires downloading data a couple of times each year, but to fully understand the precipitation dynamics of the canyon, we have placed twenty or so manual precipitation gauges along the length of the field station. When checked after each precipitation event, the manual gauges not only record precipitation amounts, but also provide water samples for isotope analysis.

Taken together, these studies will be the first steps in developing a comprehensive database addressing the cost/benefits of conducting activities with simple technologies for living in Range Creek. The results from this first year will inform the character of experiments in each successive year. We believe that this approach to building an interpretive framework for exploring the archaeology in Range Creek will be productive and rewarding.

Conclusion

There was an intense Fremont occupation of Range Creek Canyon from A.D. 900–1200. There was a heavy reliance on maize agriculture and a high level of internal strife, likely stimulated by competition over limited resources including water and arable land. Evidence supporting these hypotheses includes defensive structures and defensive food storage strategies. To understand the difficulties faced by Fremont farmers in this relatively small area, we must reconstruct the paleoenvironmental conditions that drove the adaptation and behavioral responses of the inhabitants. There is a considerable amount of work that needs to be done in Range Creek Canyon. Our future work will emphasize building the modern and paleoenvironmental context for rigorously exploring the archaeological record of the Fremont who occupied this canyon 900 years ago. The advantage of conducting research from a field station is that it allows the study of variability in the modern environment and the paleoenvironment of the same geographic location as the archaeological research.

This aspect of working at a field station is especially advantageous for researchers using models from behavioral ecology to test propositions about human behavior in the past (Metcalfe et al. 2012). These models require that various environmental and social parameters be accurately estimated, and this task is difficult in a region that is as biologically, topographically, meteorologically, and geologically diverse as the state of Utah. There is always some uncertainty about how data on the spatial and seasonal distribution of rainfall from one valley, for instance, inform those same patterns in a neighboring valley or adjoining mountains. Similarly, it is informed speculation (which is much better than uninformed speculation) as to how well historically recorded rates of return for corn grown in Mexico bracket the same return rates in a very specific part of Utah. While we may believe that we have fairly good data about the return rates for pinion pine nut collecting, those rates can only be conditionally applied to any particular place other than where they were obtained.

Reconstructing the paleoclimate for Range Creek is only a means to an end: reconstructing the physical environment during the 400 year period when the Fremont occupied this remote canyon. Fortunately, not all aspects of the past environment need to be reconstructed, just those parts likely to have been important to the people living there. Clearly knowing how changes in climate affected the degree of down cutting of Range Creek into its channel has important implications for the costs and benefits of farmers trying to use its waters to irrigate their fields. Understanding the affect of long-term droughts on the distribution and abundance of wild foods that were likely important (high ranked in terms of their impact upon encounter benefit/cost ratio) is important for understanding the options available to the Fremont when farming either began to be less profitable or the hunting and gathering of wild resources became more profitable (Barlow 2002). Reconstructing the spatial distribution of the suite of important resources (water, arable land, wild food resources, lithic raw material, wood for fuel and construction, etc.) is required to predict how the Fremont would have negotiated the tradeoff of living in a patchy environment and how that tradeoff should be reflected in assemblage composition (Barlow and Metcalfe 1996; Beck 2008; Metcalfe and Barlow 1992). Without reasonably precise reconstructions of the spatial distribution of selected resources, all explanations of settlement pattern are essentially *ad hoc* storytelling.

Fortunately, some of the shorter-term consequences of variation in weather can be monitored in Range Creek Canyon today. Systematically measuring the flow of water in the creek, monitoring and mapping the distribution of wild resources, planting experimental corn fields, as well as carefully measuring changes in weather can show how one influences the others. The two Range Creek weather stations will provide baseline weather data against which variations in the success of corn farming, and the costs and benefits of hunting and gathering wild foods can be explored.

In addition to climatic reconstruction, we will continue to survey, excavate, experiment, and instruct students in archaeological method and theory. Clearly there is much more work to be done. ■

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Wolf Village (42UT273): A Case Study in Fremont Architectural Variability

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The Brigham Young University archaeological field school has spent five field seasons excavating at Wolf Village (42UT273), a large Fremont site in Utah Valley. Wolf Village is a blend of typical Fremont architectural traits and unique or rare characteristics. This blending is exemplified in the two adobe surface structures, which are the only well-documented adobe structures in Utah Valley; the residential pit structures, which include features such as multiple ventilation entrances and are abnormally large; and the 80.5 m² pit structure, which is the largest Fremont structure found to date and was likely used for communal activities. Despite the differences in construction, radiocarbon dating suggests that all these structures date to a relatively short time period in the A.D. 1000s. Exploring architectural traits and variation at Wolf Village and other Fremont sites gives new insights into community and interaction within the Fremont world.

Between about A.D. 500 and 1300, the Fremont lived in much of modern Utah and parts of Colorado, Nevada, and Idaho (Talbot 2000a:278). Fremont people used ceramics which are different than those used by other Southwestern groups (Watkins 2009), cultivated and consumed maize while still relying on some wild resources (Simms 1986), and, by at least A.D. 1050, sometimes lived in aggregated villages (Talbot et al. 2000; Johansson et al. 2012; Wilde and Soper 1999). While the term Fremont is currently used to encompass both farmers and foragers who used a distinctive style of artifacts, we focus here on Fremont farmers, specifically those who congregated in distinct village communities. Within these communities, the Fremont built structures in a variety of shapes and sizes, using several different construction methods. Regional and temporal variability can account for some of these differences, but architecture is also highly variable among contemporaneous structures within many Fremont villages.

Wolf Village (42UT273) is a Fremont site located south of Utah Lake on a series of ridges and adjacent south-facing slopes just north of the mouth of Goshen Canyon on the west side of Currant Creek (Figure 1). From 2009 to 2013, Brigham Young University's Archaeological Field School excavated nine structures at Wolf Village (Allison and Janetski 2012). Radiocarbon dates suggest that all of the excavated structures were occupied within a few decades in the 11th or early 12th centuries A.D., yet house forms include both pit and surface structures, and structure size ranges from less than 20 to over 70 m^2 (Table 1; Figure 2). This article describes the architecture of the excavated structures at Wolf Village as an example of the high degree of architectural variability present at Fremont sites. Our goals are largely descriptive and our analyses preliminary, but we also discuss how intrasite variation at Wolf Village and at other Fremont

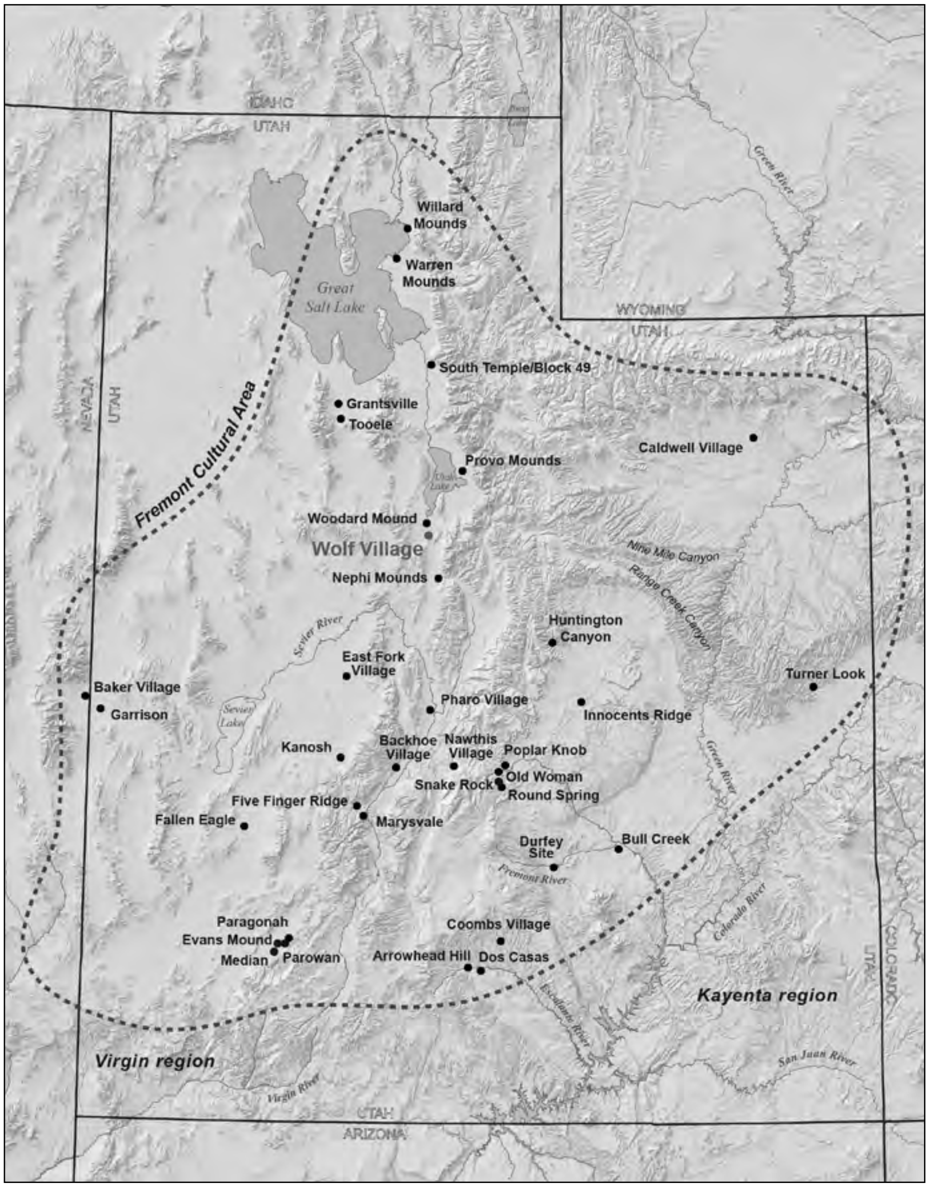

Figure 1. Map of the area occupied by Fremont farmers, showing the locations of Wolf Village and selected other Fremont sites.

sites gives insight into community organization and interaction within Fremont communities.

Wolf Village Architecture

During a reconnaissance survey of Goshen Valley, Leland Gilsen (1968:27) documented 13 structures at Wolf Village based on concentrations of artifacts and "decaying clay walls." Joel C. Janetski returned to the site in 2009 to begin excavations[1], and during the past five field seasons, nine structures have been excavated. This includes seven pit structures and two surface structures. Among the pit structures are five pithouses (Structures 3, 4, 5, 8, and 9), one pitstructure possibly used for

Table 1. AMS Radiocarbon Dates on Maize from Wolf Village Structures.

Beta Number	Structure	Measured Radiocarbon Age BP	13C/12C	Conventional Radiocarbon Age BP	Calibrated 95 % Interval
287720	1	740+/-40	-11.2	970+/-40	998-1157 A.D.
287726	1	730+/-40	-10.3	970+/-40	998-1157 A.D.
261679	1	720+/-40	-10.2	960+/-40	1007-1164 A.D.
287727	2	780+/-40	-11.0	1010+/-40	965-1154 A.D.
287723	2	750+/-40	-10.7	980+/-40	992-1154 A.D.
287725	2	740+/-40	-10.5	980+/-40	992-1154 A.D.
287724	2	730+/-40	-10.9	960+/-40	1007-1164 A.D.
287722	2	720+/-40	-10.8	950+/-40	1015-1172 A.D.
338654	2	640+/-30	-8.7	910+/-30	1032-1194 A.D.
338655	2	660+/-30	-10.2	900+/-30	1040-1207 A.D.
261680	3	780+/-40	-10.3	1020+/-40	900-1128 A.D.
287721	3	750+/-40	-10.1	990+/-40	987-1153 A.D.
312654	4	730+/-30	-10.9	960+/-30	1021-1152 A.D.
312653	5	680+/-30	-11.8	900+/-30	1040-1207 A.D.
287728	6	690+/-40	-10.5	930+/-40	1022-1189 A.D.
287730	6	690+/-40	-10.9	920+/-40	1026-1200 A.D.
287729	6	670+/-40	-10.2	910+/-40	1031-1208 A.D.
312655	7	750+/-30	-9.8	1000+/-30	989-1145 A.D.

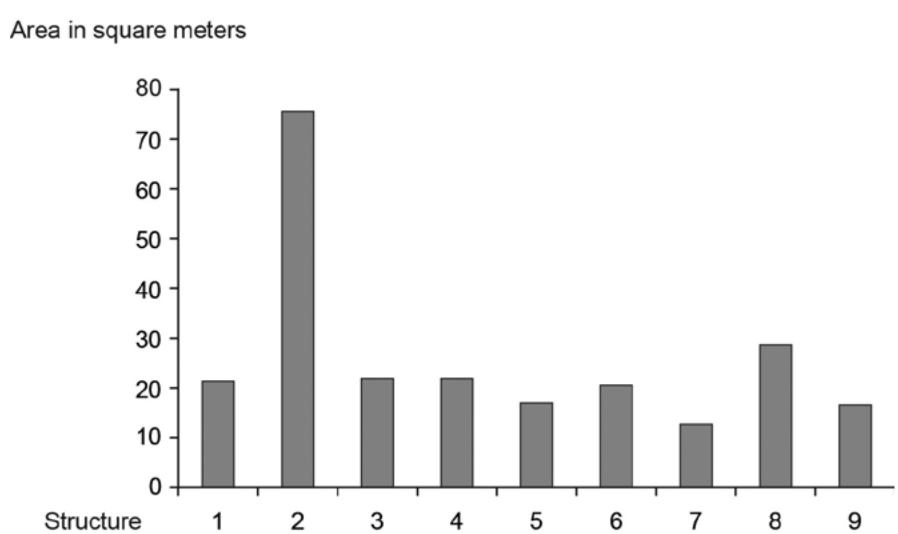

Figure 2. Bar Chart showing area (m^2) of the Wolf Village structures.

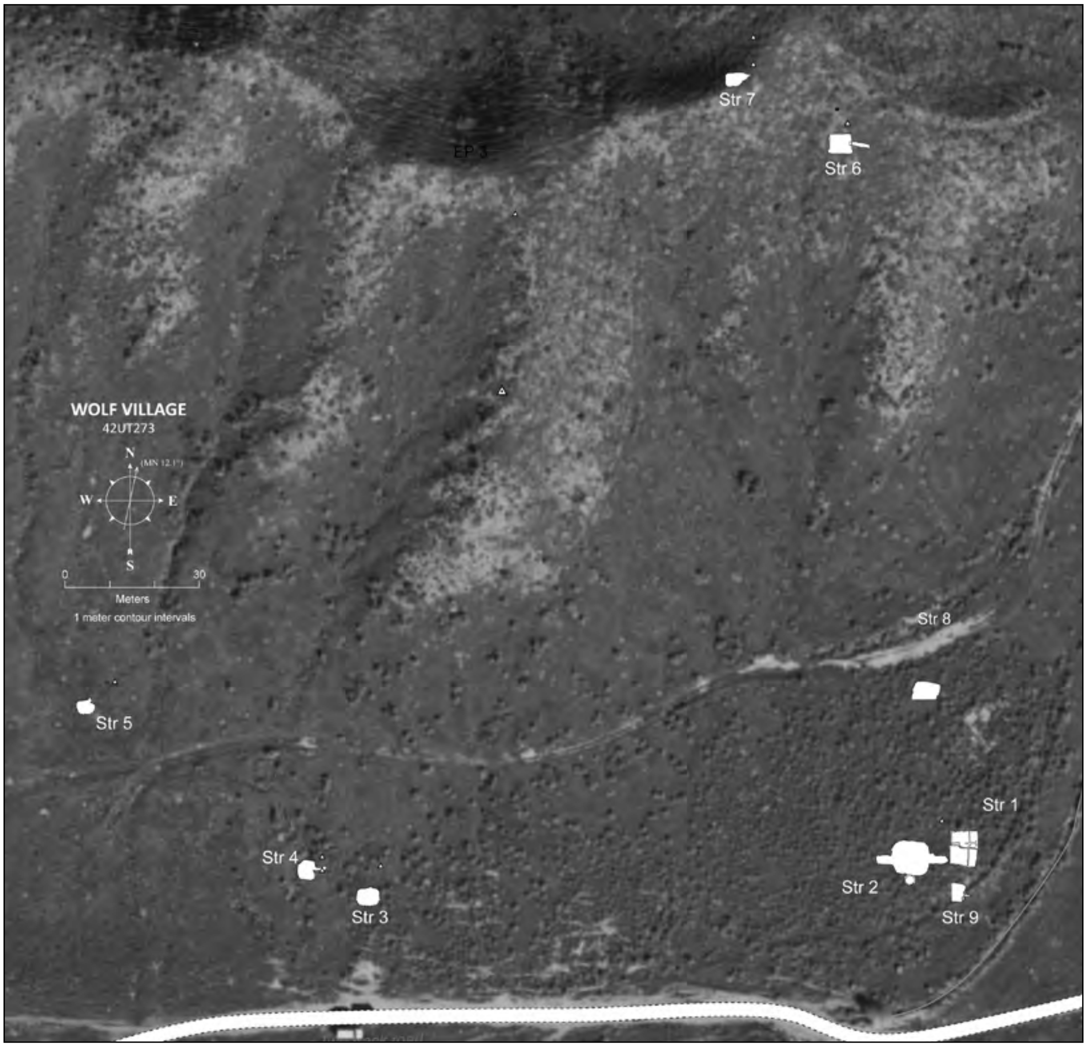

Figure 3. Aerial photo of Wolf Village, with structure outlines shown as white silhouettes.

storage (Structure 7), and at least one oversized pit structure (Structure 2). In addition to the oversized pit structure, the two adobe surface structures (Structures 1 and 6) are both unusual. Some of the more unusual structures on the site probably had both communal and residential functions (Figure 3).

Pit Structures

Fremont pit structures vary in size but typically contain central hearths, small storage pits, and internal structural supports. In addition, ventilation tunnels are usually, but not always present. Shape among Fremont pit structures varies greatly. On the Colorado Plateau, pit structures are primarily circular while in the Basin and the Basin-Plateau transition zone there is a greater mix of circular and sub-rectangular shapes. Temporally, pit structure shape is variable as well, at least within the eastern Great Basin, and circular pit structures there are, in general, older than sub-rectangular pithouses (Talbot 2000b:166). Beginning in the A.D. 900s, quadrilateral pit structures are linked to increased sedentism and population growth,

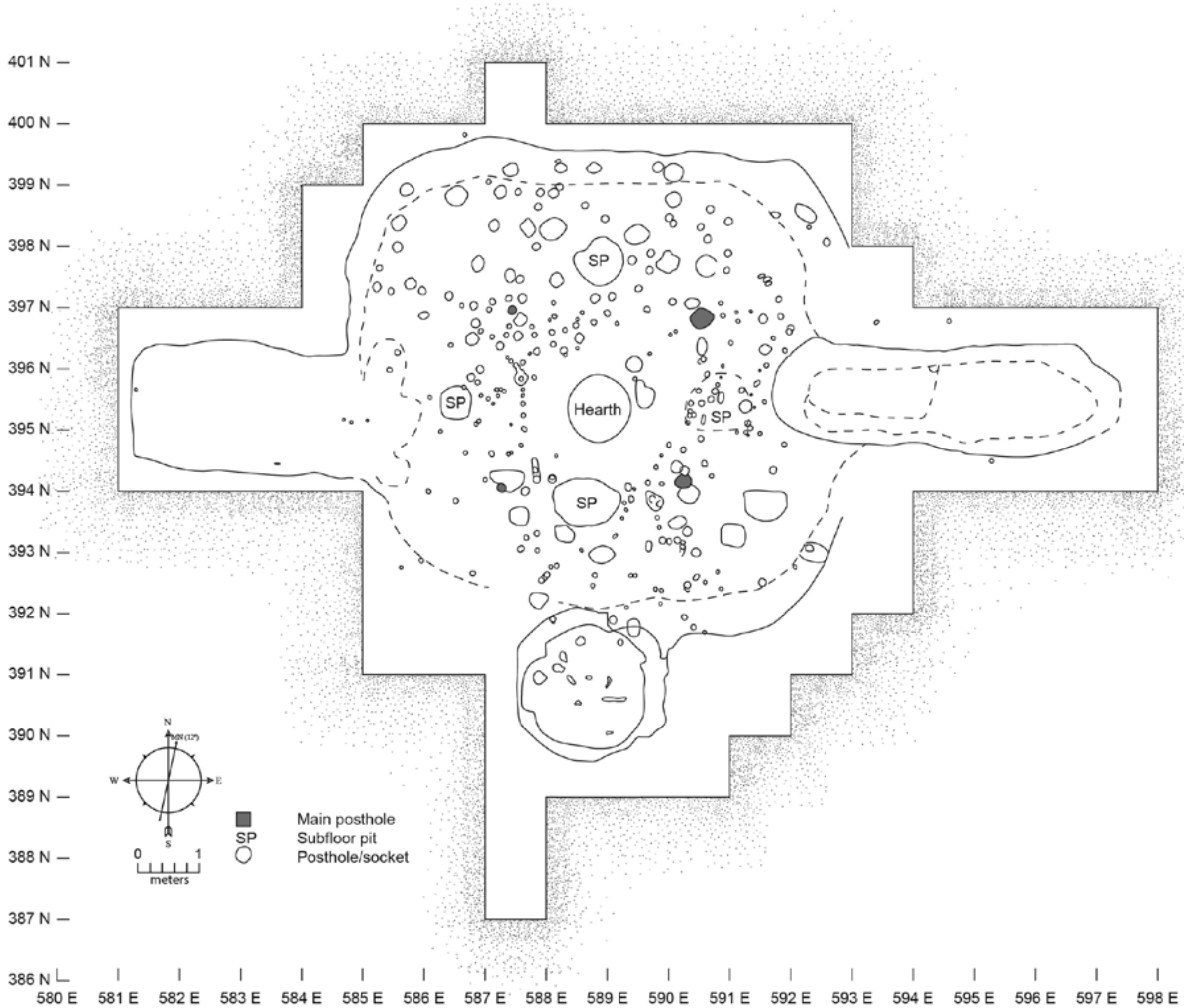

Figure 4. Plan map of Structure 2.

and replace circular pit structures completely in larger sites. Pit structure size varies both spatially and temporally as well, with structures in the northern Fremont area "on average larger than those to the south" (Talbot 2000b:169).

At Wolf Village, seven pit structures have been identified. At least six are sub-rectangular and the seventh is either sub-rectangular or D-shaped. The shape coincides with Richard K. Talbot's (2000b:166, 168) argument that quadrilateral pithouses were built later than circular pithouses and were occupied after the A.D. 900s. Radiocarbon dates on maize place occupation of the Wolf Village pit structures in the A.D. 1000s or early A.D. 1100s.

Structure 2

Structure 2 is an unusually large sub-rectangular pit structure with roofed tunnels attached to the east and west sides and a small antechamber on the south side (Figure 4). It was excavated during the 2010-2013 field seasons and the total area is 80.5 m^2, making Structure 2 the largest known Fremont pit structure and over four times larger than the average pit structure at

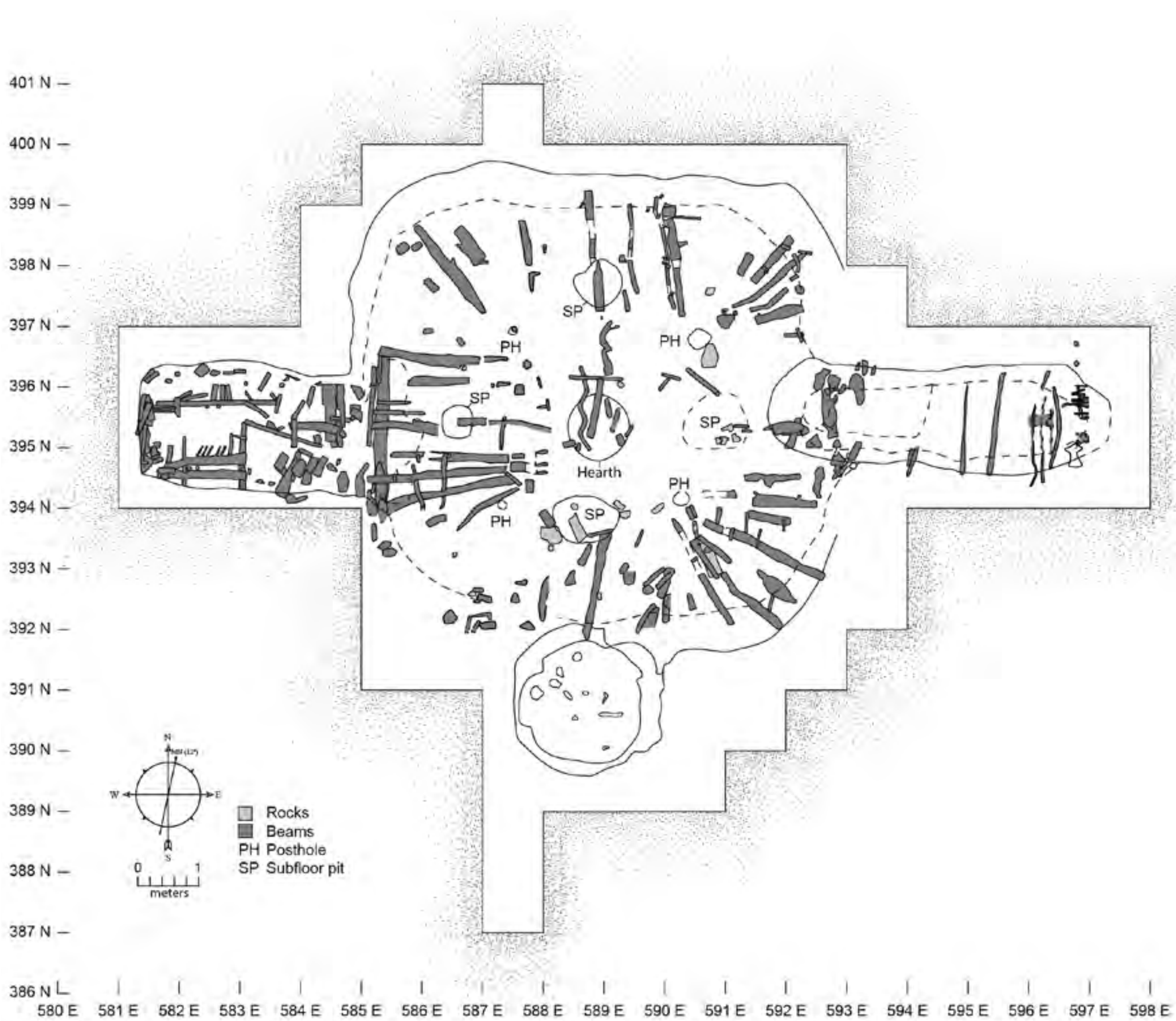

Figure 5. Plan map of Structure 2, showing the locations of major subfloor features and well-preserved burned roof beams.

Wolf Village. It contained a large central hearth measuring 1.10 m in diameter and over 200 postholes and post sockets were documented. The roof appears to have been supported by four main posts like a typical pithouse, but there are numerous secondary support posts that are evidence of remodeling and repair of the roof. Additional post holes are related to interior walls which also appear to have been remodeled on multiple occasions. Other beams were placed into post holes around the edges of the structure and apparently sloped inwards to be supported on horizontal beams resting on the four main posts. When the structure burned and collapsed, this arrangement created a wagon wheel pattern in the burned beams (Figure 5). Four subfloor pits measuring over 1 m in diameter were excavated—one in each of cardinal directions from the hearth—and three of these pits were filled while the structure was still in use, with small postholes dug into the fill of the decommissioned pits. The extensive remodeling likely indicates that the structure had a long use-life and that the roof of the structure needed reinforcement and repair to keep the structure usable.

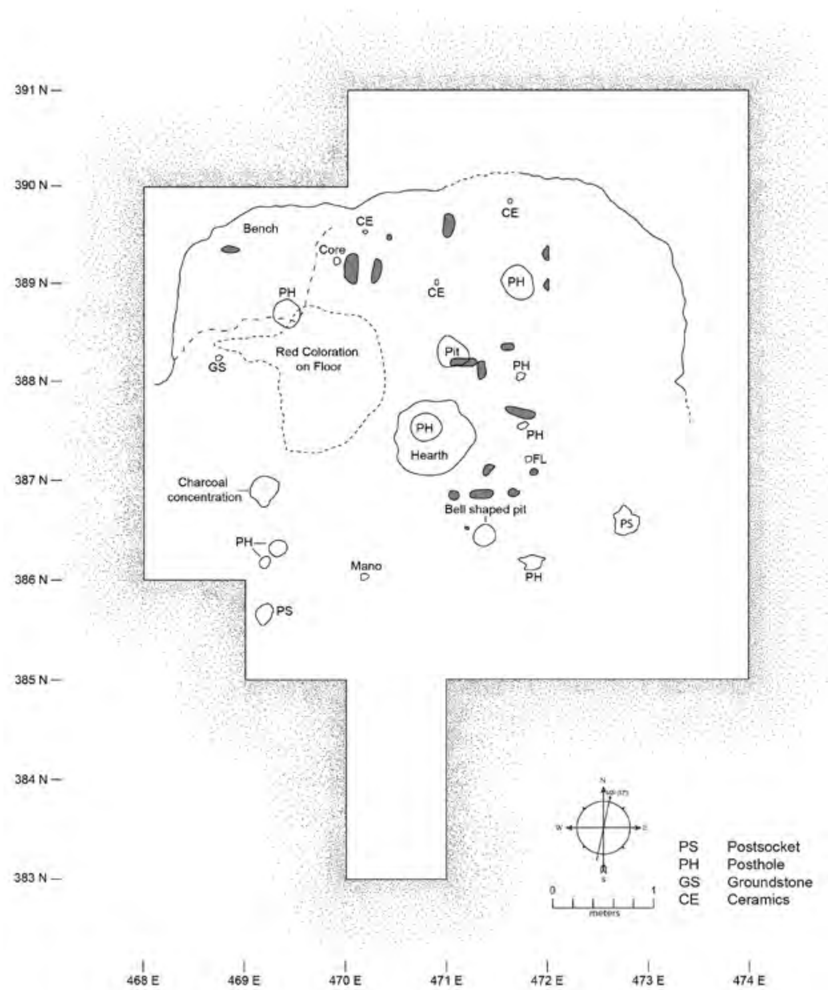

Figure 6. Plan map of Structure 3.

In addition to the unusual architecture, the artifacts both above and below the collapsed roof of Structure 2 are unusual. After Structure 2 was burned, a rich midden layer was rapidly deposited directly above the collapsed roof. This layer includes artifacts such as figurine fragments, pipes, gaming pieces, and shell and lignite beads. These artifacts are concentrated in the midden layer, which has yielded approximately 40 percent of all artifacts recovered from Wolf Village to date. The lack of laminated sediments washed in during rain or snow storms indicates that this 65 cm thick layer was deposited during a short period of time, and perhaps indicates the deliberate filling of the structure using midden deposits associated with its use. Below the collapsed roof, similar unusual artifacts were also recovered, including beads and gaming pieces, some of which may have been ritual and/or termination objects.

Structure 3

Structure 3 is a pithouse with a well-preserved floor, side benches, and post holes that were excavated during the 2009 and 2010 field seasons (Figure 6). A hearth is located in the approximate center and definable walls are present on three sides. The floor of this structure is only a few

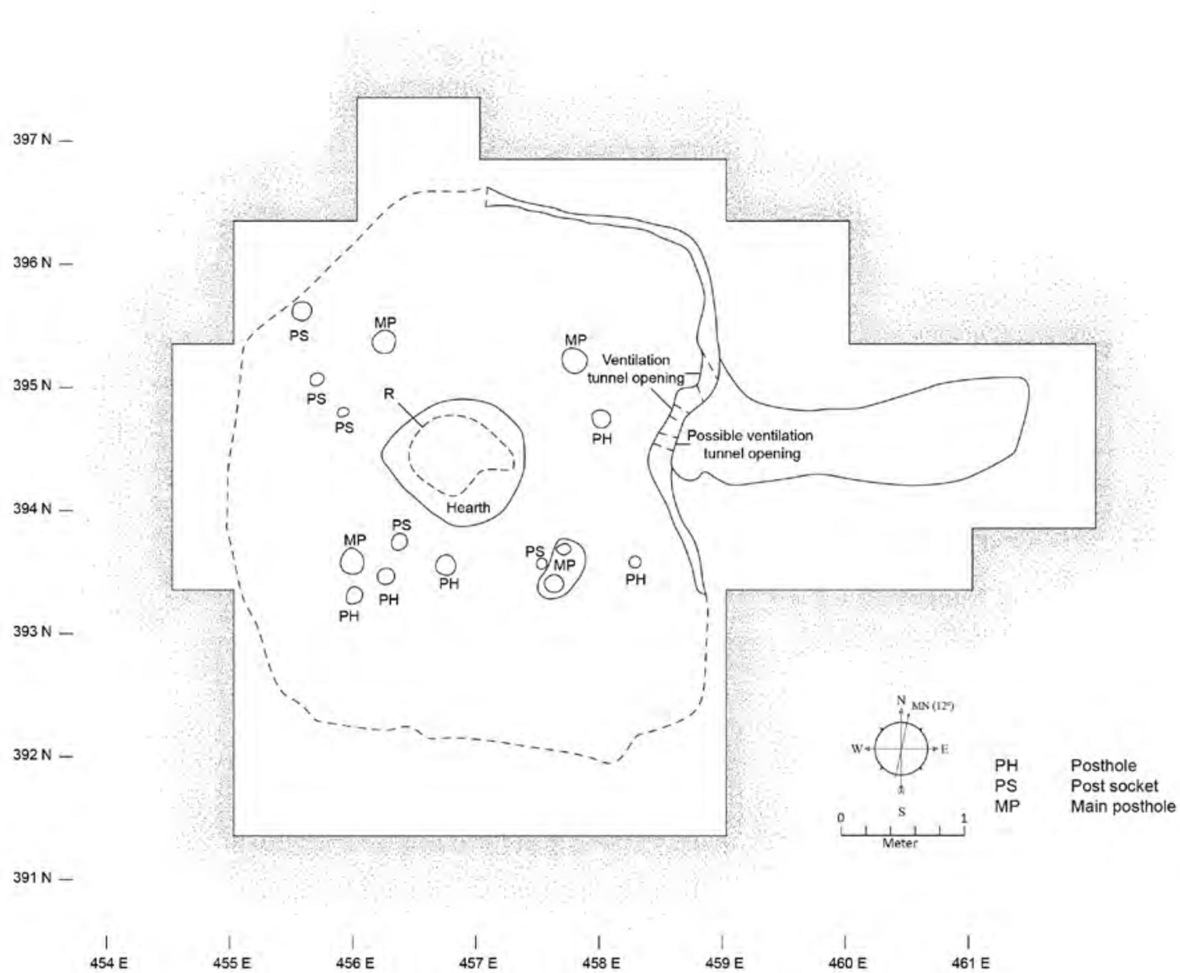

Figure 7. Plan map of Structure 4.

centimeters below modern ground surface, and, as a result, much of the walls and the southern edge of the structure have eroded away. It is estimated that Structure 3 was originally 5.3 x 4.4 m in diameter and 21.8 m^2. The floor is distinctly higher (by a few centimeters) in the northwest portion of the structure than in other areas. Combined with what may be traces of a second hearth, the higher floor suggests that Structure 3 may include floors from two superimposed structures.

Structure 4

Structure 4 is a sub-rectangular or D-shaped pithouse with a ventilation tunnel located about 9 m west and 1 m north of Structure 3 (Figure 7). Structure 4 was excavated during the 2010 and 2011 field seasons, and measures 3.8x3.5 m, with a floor area of approximately 13.3 m^2. The most unusual feature of this structure is the ventilation tunnel, which has three small openings into the structure, at least one of which was created during a remodeling episode. The presence of remodeling on the ventilation tunnel and the high

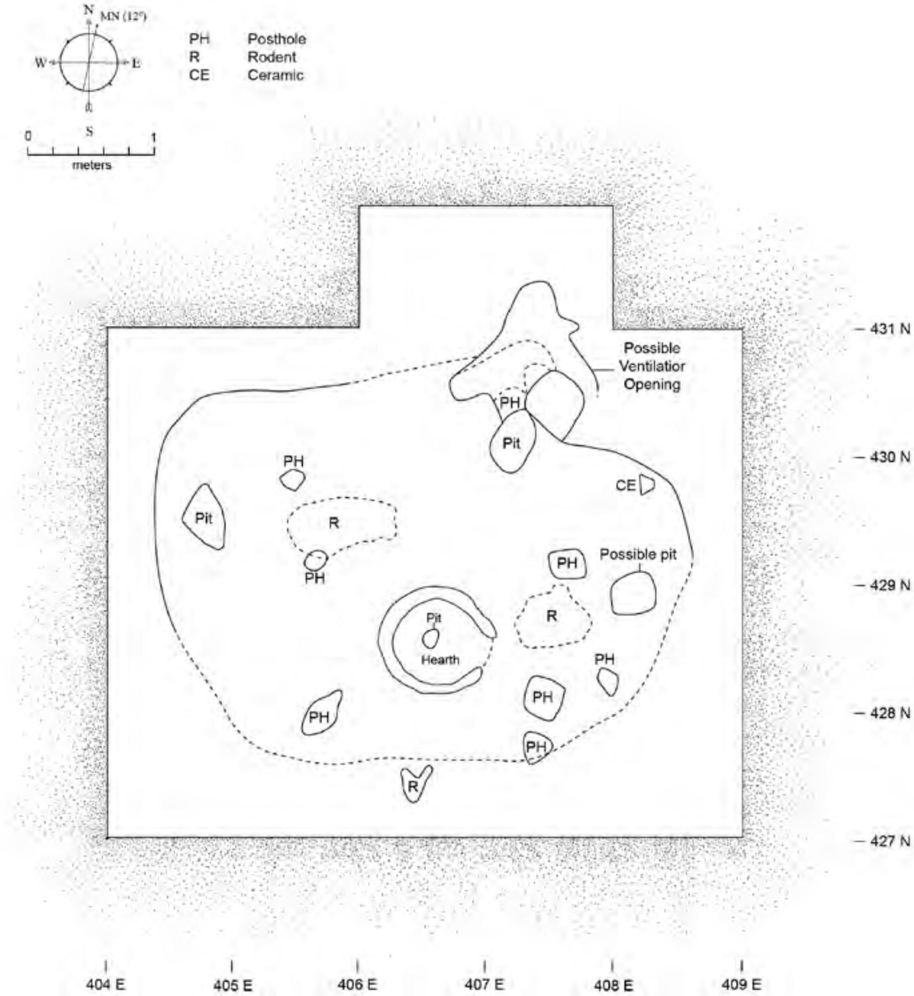

Figure 8. Plan map of Structure 5.

number of postholes and post sockets in the floor suggests that Structure 4 was used for a relatively long period of time.

Structure 5

Structure 5 is a sub-rectangular pithouse measuring 3.08 x 4.14 m with a floor area of 12.1 m^2 at the time of excavation (Figure 8). The structure was excavated during the 2010 field season and contains a hearth with a well-preserved clay rim. The floor is only a few centimeters below the modern ground surface, and as a result much of the walls and the southern edge of the structure have eroded away. If the hearth was centrally located, Structure 5 may originally have been as large as 17 m^2. The features and artifacts on the floor of Structure 5 indicate a range of domestic activities, including food preparation, cooking, and storage of items.

Structure 7

Structure 7 is semi-subterranean, sub-rectangular in shape, and located on the south facing slope of the ridge (Figure 9). As a result, much of the walls, the eastern, and the southern edge of the structure have eroded away, and we are unable to

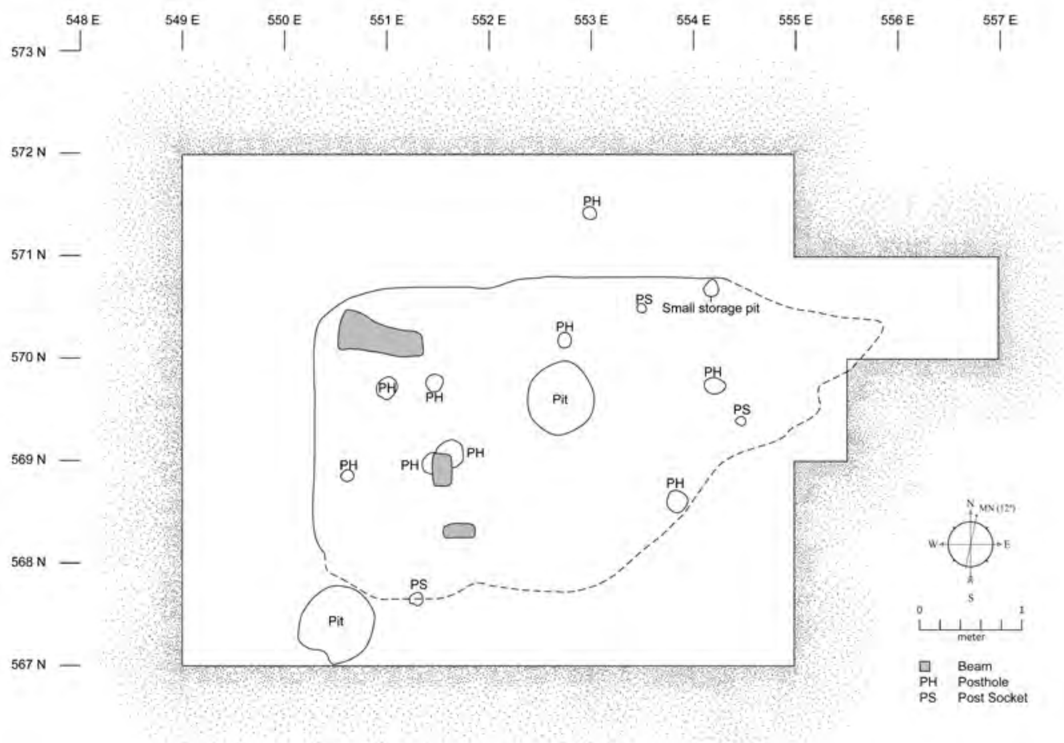

Figure 9. Plan map of Structure 7.

determine the exact dimensions of the structure or how far Structure 7 was excavated below prehistoric ground surface. Based on placement of postholes, Structure 7 may have originally been as large as 5 x 3 m and 15 m^2. The high number of postholes and uneven nature of the floor suggest that the roof was reconstructed several times, but the floor of the structure was either open to the elements or never formally prepared. The pattern of burned beams on the floor, in a lattice-work pattern as opposed to wheel spoke, indicates that construction of Structure 7 was different from the other pithouses on the site. In addition, the structure lacked a formal hearth. A large storage pit in the center of the structure was filled and used as a hearth immediately prior to abandonment of the structure, but this was neither the original nor the typical function of Structure 7's central feature. The absence of a formal hearth supports the conclusion that Structure 7 was not built as a residential structure, but possibly a semi-subterranean storage room, although it may have been used as a residence late in its use-life. In addition, while no artifacts were found on the floor of Structure 7, pits indicate storage or disposal of items—specifically food items including fish and deer. The reddened floor and burned beams indicate that the structure was purposefully burned when it was abandoned.

Structure 8

Structure 8 is a sub-rectangular pithouse located north of Structure 2 (Figure 10). It was tested in 2012 and approximately half of the structure was excavated during the 2013 field season. It measures 5.8 m east-to-west and contains a hearth approximately 1 m in diameter. Floor area of the structure was estimated based on the assumption that the hearth is centrally

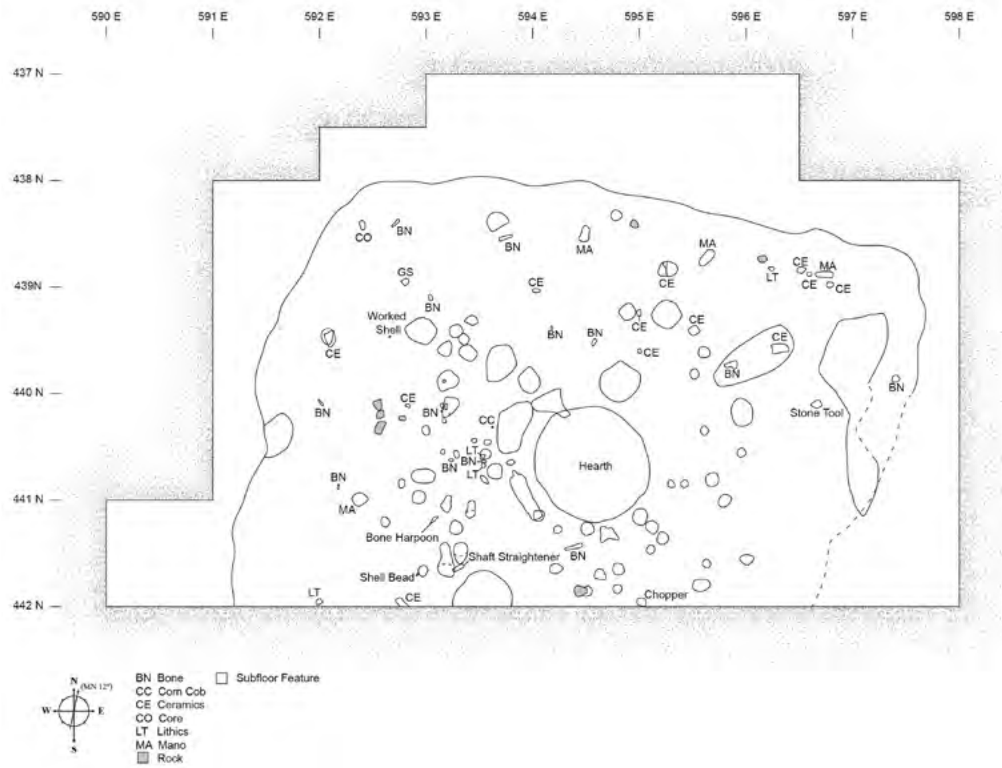

Figure 10. Plan map of Structure 8.

located; if that is true then Structure 8 may originally have been as large as 30 m^2. About 50 artifacts were left on the floor of the excavated portion of the structure including, ceramics, faunal bone, lithics, manos, a bead, a worked-bone harpoon, and a shaft straightener. There is no indication that the structure was burned. A compact use surface and hearth were found in the fill of Structure 8, indicating that after it was abandoned the depression made by the collapsed pithouse was occupied for a short period of time. It is unclear if this use surface represents the floor of a superimposed structure, an activity area, or a short term campsite, although there was no evidence of walls associated with the use surface.

Structure 9

Structure 9 is a pithouse that was partially excavated during the 2013 field season (Figure 11). It appears to be sub-rectangular, measures 4 m north-to-south, and contains a deep ventilation tunnel. The floor area is estimated to be around 15 m^2. Structure 9 was deeply buried, and the prehistoric ground surface on the northern side was still intact, indicating that it was excavated approximately 1 m into prehistoric ground surface at the time of construction. The structure had burned, and remnants of the burned roof and two support posts were found in the excavated area; the placement of the posts indicates the structure had four main support posts. The edge of a hearth protruded slightly into the excavated area; the hearth as well as the few floor artifacts suggest that domestic activities took place here.

Surface Structures

Fremont surface structures are constructed of "freestanding walls of coursed adobe, jacal, or masonry" (Talbot 2000b:138). These can be divided into two types, those used for storage,

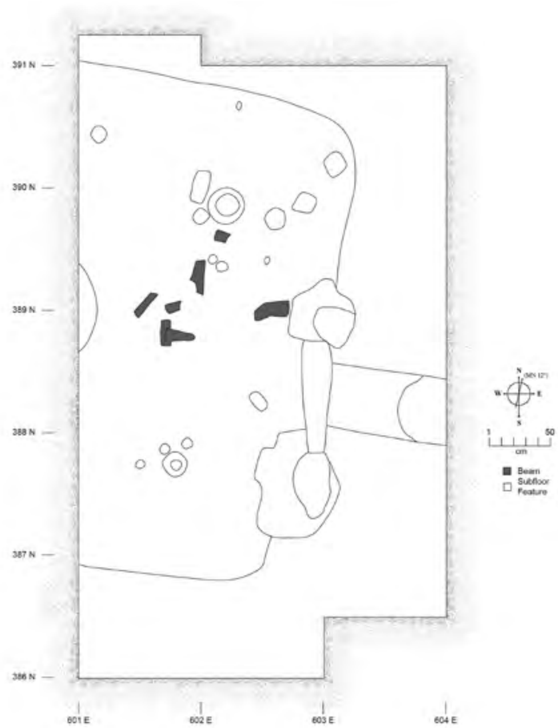

Figure 11. Plan map of Structure 9.

which are small and lack many internal floor features, and those that may have been used for habitation, which typically display all of the functional characteristics of a pit structure including a central hearth and subfloor features such as pits and postholes (Talbot 2000b:139). Fremont surface structures typically lack ventilator tunnels, as ventilation was likely achieved through doorways (Talbot 2000b:138-139). In terms of size, surface structures are usually comparable to pit structures and "at many sites storage rooms are attached to the habitation room" (Talbot 2000b:139). These attached storage rooms are typically only accessible from the habitation room of the surface house. Typically, Fremont surface structures are almost square or rectangular in shape, sometimes with slightly rounded corners (Talbot 2000b:147).

As mentioned above, some Fremont surface structures are interpreted as surface houses when data indicates that they were used primarily for residential purposes. However, Talbot (2000b:139) also documented the presence of large surface structures with unusual architectural characteristics and large hearths. He termed these central structures and identified the presence of at least nine at Fremont sites dating to after A.D. 1100–1150 (Talbot 2000b:139). Among other attributes, their large size and architectural traits suggest these central structures were communal buildings.

At Wolf Village, two surface structures have been identified. They are both constructed of adobe, and both have unusual architectural features, which will be discussed below.

Structure 1

Structure 1 is a multi-room surface structure (Figure 12). Currently, six rooms have been excavated: a habitation room measuring 14.61 m^2, four smaller rooms, probably used for storage, ranging in size from less than 1 to about 5 m^2, and at least one other room which was not completely excavated and for which the dimensions are currently unclear. Based on the tops of walls exposed during excavation, other rooms appear to be present, but have not been fully defined. The walls of the structure were made of coursed adobe, and although the coursing was only visible in a few of the walls, it likely continued throughout the entire structure. There is no evidence that the structure was burned when it was abandoned.

Structure 6

Structure 6 is a surface structure with a ventilation tunnel (Figure 13). It is rectangular in shape measuring 22 m^2, with walls constructed out of adobe. The walls were covered with a layer of plaster, at least on the interior where remnants of plaster were fired hard and preserved by heat from the fire that apparently coincided with abandonment of the structure. Around the exterior of the walls, a number of posts were placed at an approximately 45 degree angle towards or into the wall, presumably to add support. The ventilation tunnel, the only such

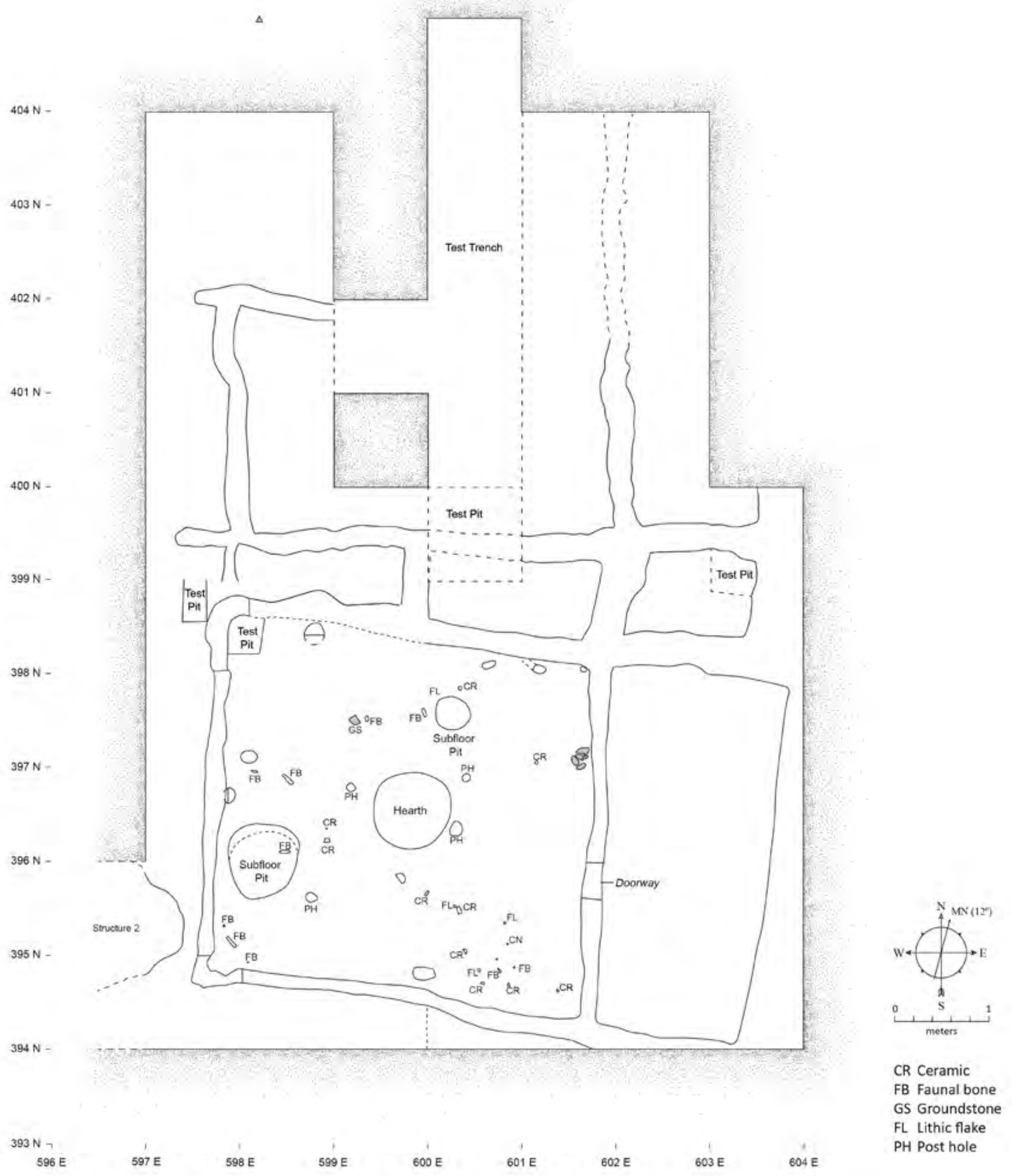

Figure 12. Plan map of Structure 1.

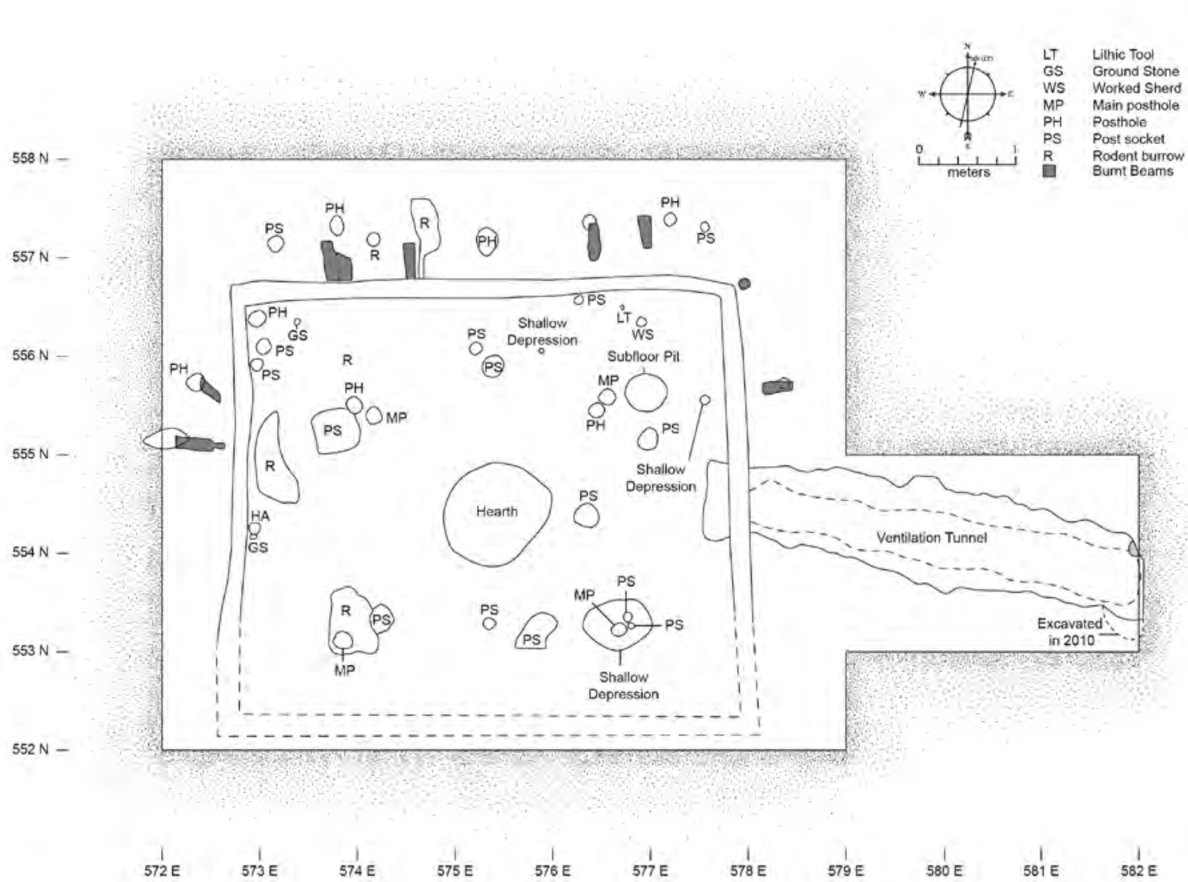

Figure 13. Plan map of Structure 6.

feature ever found in a Fremont surface structure, is located on the eastern side of Structure 6 and extends approximately 4 m east-southeast from the structure. It was remodeled and maintained, as evidenced by the numerous post sockets and the accumulation of sterile windblown sediments in the eastern end of the ventilation tunnel. The structure was likely intentionally burned when abandoned. Two figurines were found along the outside of the northern wall, probably as part of the abandonment of the structure. Other figurines, articulated mule deer mandibles, and groundstone artifacts were also found in the ventilation tunnel and are likely associated with the structure's abandonment.

The Function of Fremont Architectural Forms

As described above, the Fremont people constructed buildings using stone, jacal, and adobe for building materials (Talbot 2000b:182). While structures are built from a variety of materials, architecture in the Fremont world falls into the two general forms outlined above, pit structures and surface structures. Our description of the structures at Wolf Village has been organized along these formal categories to this point; however, these two forms are cross-cut by at least four functional categories: relatively permanent residential structures, less-permanent "secondary" structures used as short-term residences, storage structures, and communal structures. Here, we discuss the variability which exists within Fremont functional categories. We focus in particular on those functional architectural categories found at Wolf Village, namely residential structures and communal structures.

Residential Structures

Fremont residential structures are one of the functional categories which include both architectural forms: pit structures and surface structures. Fremont people used both pit structures and surface structures for residential purposes, and, because they functioned primarily as residences, these structures are often termed pithouses and surface houses. At least four of the pit structures at Wolf Village were likely pithouses (Structures 3, 4, 5, and 9). Talbot (2000b:139) observed that while occupation of surface houses is concurrent with pithouse occupation at many large sites, it is rare to have more than one surface house on a site occupied at the same time. Because of the unusual construction of surface houses, the closely guarded storerooms that are often attached, and their relative scarcity, Talbot (2000b:139) believed that the inhabitants of surface houses may have been differentiated "from pithouse residents, suggesting these structures may have housed village leaders, or at least individuals with some degree of prestige." Based on the presence of multiple storerooms, Structure 1 appears to fall into this category as the home of someone of elevated status—possibly a civil or religious leader of some kind. By having storerooms attached to their home, the individual(s) living in Structure 1 would have had more access and control over food items, and therefore more power and control within the community (Figures 14 and 15).

Communal Structures

As with residential structures, Fremont communal structures include both pit and surface structures. Many small-scale horticulturalists construct communal architecture, but the forms of the structures vary widely, as do the activities carried out in the structures. Adler and Wilshusen (1990) reviewed world-wide ethnographic literature and noted a basic distinction between "facilities meant to be used by entire communities," which they called "high-level integrative facilities" and other structures that "serve smaller portions of a community," which they called "low-level facilities." This distinction is important because low-level facilities, which are usually between about 25–80 m^2, "are used as often for day-to-day, domestic activities as they are for ritual activities" (Adler and Wilshusen 1990:136). All of the Fremont communal structures we discuss are 80 m^2 or smaller and almost certainly are "low-level integrative facilities" under Adler and Wilshusen's terminology. This means that, in addition to community functions, these Fremont communal structures likely also served residential functions.

In Talbot's (2000b:183) categorization of Fremont architecture, communal structures are those that are "much larger than the average sized pit house" or surface house and occur in low numbers at sites dating to after approximately A.D. 1100. While Adler and Wilshusen (1990) use the term "integrative facilities" to describe these structures, we prefer "communal architecture." Our use of the term "communal" implies that the structures we discuss were built and used by groups larger than family units; these communal structures were created on such a large scale that it would have required the cooperation of large portions of the community to build and maintain them. Because of the high amount of effort involved in their construction, it is unlikely that they were used exclusively by one family or even one kin group (Talbot 2000b:139). Access to these spaces may not have been available to all members of the community at all times, but despite

Figure 14. Photo of Structure 1 at the end of the 2010 field season, facing west and showing Rooms 1 and 2. Note the doorway connecting the two rooms. Additional rooms located in the unexcavated area to the north (right in the photo) were excavated in 2013.

Figure 15. Photo of Structure 1 at the end of the 2013 field season, facing southeast. The rooms excavated in 2010 are backfilled in this photo, but Room 1 is visible in the upper right quadrant of the photo, outlined in part by the plastic that lined the walls when the room was backfilled. In the open excavation, three small rooms are visible adjacent to the north wall of the backfilled rooms, with a short segment of adobe wall extending west of any defined rooms in the corner of the excavated area. Additional walls extend north (toward the lower left corner of the photo) from the defined rooms.

restricted access, these buildings were "socially acknowledged as a context for integration of individuals above the household level" and were likely used to help bind the community together and to provide mechanisms to alleviate tensions that arise as people aggregate (Adler and Wilshusen 1990:133). At the same time, the events hosted in communal structures likely provided opportunities for some individuals to distinguish themselves, and this, combined with the exclusion of some community members from certain events, probably meant that the building and use of "integrative" structures also contributed to differentiation and factionalism within the community.

In the broadest sense, we define communal structures similarly to Talbot (2000b:183) as unusually large structures. Large size is determined in comparison to other structures at the site; Fremont communal structures are around twice the size or more of residential structures, typically between 25 and 30 m^2 (Allison et al. 2012). Although several studies have attempted to determine the function of communal structures at specific sites (among others, see Allison et al. 2012; Hockett 1998; and Ure and Stauffer 2010), widespread analyses associating specific activities with communal structures is lacking. However, the evidence available suggests that community activities such as feasting, dancing, or other ritual behavior were associated with these structures. In the near future, detailed analysis of the many floor features and large artifact assemblage associated with Structure 2 at Wolf Village promises to provide new insights into the activities that occurred in at least one Fremont communal structure, but most of this analysis remains to be completed.

Because of both their large size and often singular occurrence at sites, communal structures "represent the most compelling examples of Fremont integrative architecture" (Talbot 2000b:139). Talbot (2000b) identified only one type of structure that was used communally, the central structure. We agree that central structures are examples of architecture that were likely built and used communally, but instead of representing the full spectrum of Fremont integrative architecture, central structures are a specific type of communal structure. Here, we include oversized pit structures as an additional type.

Central Structures

Talbot (2000b:139) defined central structures as "built on the surface, with freestanding adobe, jacal, and/or masonry walls." In addition, these structures are large, have many unusual architectural characteristics, and "appear to have a primary integrative function" (Talbot 2000b:183). Using Pima ethnographic studies, Ure and Stauffer (2010:12) argued that central structures may have been a gathering place for community meetings, religious ceremonies, and celebratory events. They noted that in many sites, Fremont central structures are "associated with a complex of structures including oversized pithouses, one or two other surface structures and a plaza area" (Ure and Stauffer 2010:13). Although not always the geographic center of the community, this complex of structures "may represent a center of power within the Fremont village; a place where community leaders, religious persons (shamans?), and other influential individuals organized and directed community life" (Ure and Stauffer 2010:13).

In his study, Talbot (2000b:139) identified structures from nine different sites as possible central structures: Baker Village, the Garrison Site, Beaver Mounds, Paragonah Mounds, Evans Mound, Five Finger Ridge, Poplar Knob, Huntington Canyon, and Turner-Look. In their analysis of possible central structure function, Ure and Stauffer (2010:3) also included the Blue Trail House and Wolf Village Structure 6 as central structures. Two other large structures in the Uinta Basin are also probable central structures: the "Rock Wall House" at Julian Steward's Uintah Basin Mounds (Steward 1936:32-34), and Structure 1 at Whiterocks Village (Shields 1967:17-18).

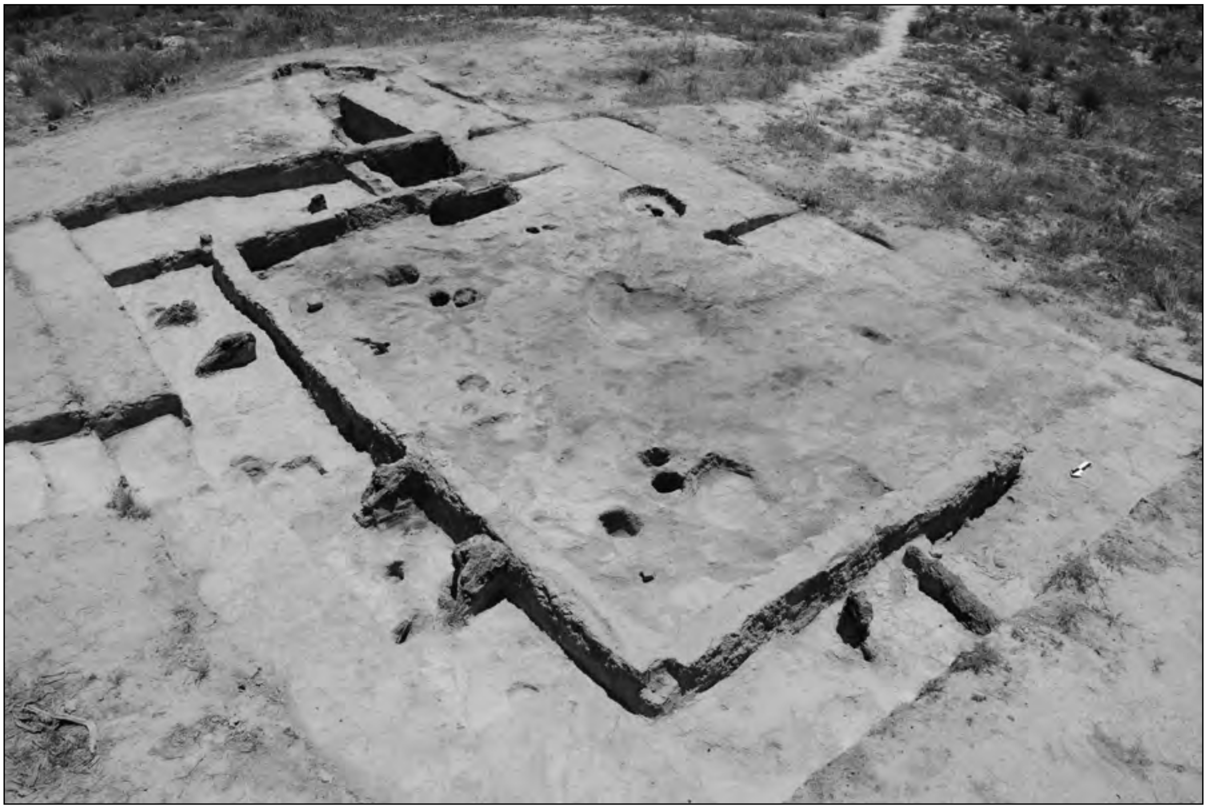

Figure 16. Photo of Structure 6 facing southeast at the end of the 2010 field season. Note the partially excavated ventilation tunnel extending east (toward the top of the photo; the rest of the ventilation tunnel was excavated in 2011). Also note the burned wood along the outside of the north and west walls; these logs were set in low-angled postholes and appear to have intersected the lower portions of the walls, probably serving to buttress the walls.

Unlike Ure and Stauffer (2010), we are not convinced that Structure 6 at Wolf Village should be considered a central structure (Figure 16). Several lines of evidence suggest ritual abandonment of the structure, including the presence of two figurines along the outside of the northern wall and the presence of numerous artifacts, including figurines and articulated mule deer mandibles, placed in the ventilation tunnel just prior to the structure burning (Wilson 2013). But, while the unusual architectural features of Structure 6 and the evidence for ritual abandonment indicate that it may have been a special building, at only 22 m^2 Structure 6 is not large enough to be certain that it was built or used communally.

Oversized Pit Structures

Central structures are not the only type of Fremont communal structure; the Fremont also built oversized pit structures with probable communal purposes. We define oversized pit structures similarly to central structures as large structures which generally contain exotic artifacts and abnormally large hearths. Oversized pit structures have been excavated at several Fremont sites, including Five Finger Ridge, Nephi Mounds, the Old Woman site, Pharo Village, the Barnson site, and Wolf Village. Like central structures, the effort needed to build and maintain oversized pit structures "would have been much greater than that for most

Figure 17. Photo of Structure 2 at the end of the 2012 field season, facing southwest. The hearth is difficult to see, but is a low shallow depression in the center of the structure. The four largest subfloor pits are located in the cardinal directions from the hearth, although only three of them are excavated in this photo. The large pit to the east of the hearth is unexcavated, but can be seen as a faint outline between the end of the east-side tunnel and the hearth; postholes intrude the fill of that pit, apparently remnants of a short wall between the tunnel and the hearth. On the west side a semi-circular alignment of small postholes (just above and to the right of the meter stick) indicates a similar wall was built between the western tunnel and the hearth.

other architectural forms, which further implies communal use" (Talbot 2000b:139).

As evidenced by its large size and multiple remodeling episodes, Structure 2 was an oversized pit structure and an important building for the community (Figure 17). The architecture is unusual, and the artifacts found within Structure 2 indicate that a variety of non-domestic activities took place here. High quantities of gaming pieces, olivella shell, and pipes were recovered both from the structure fill and from the overlying midden, indicating that this building was special during its use life and continued being important to the individuals living at Wolf Village after its burning and abandonment.

In addition to Structure 2, Structure 8 is a pit structure which may have also functioned communally based on its large floor area and hearth (Figure 18). Unusual artifacts found on the floor, including a bone harpoon, further reinforce that Structure 8, while appearing similar to, although slightly larger than, other pithouses, may have been used in different ways and for different purposes than a typical pithouse. We believe this structure is similar to Structure 57 at Five Finger Ridge, which Talbot et al. (2000:121-122) argue may have been occupied by individuals of higher than average status. Similar to Structure 57 at Five Finger Ridge, Wolf Village Structure 8 is more similar in construction to residential pithouses than to other oversized pit structures (such as Structure 2), or to central structures.

Figure 18. Photo of Structure 8, partially excavated, at the end of the 2013 field season, facing north-northeast.

Discussion and Conclusion

Architectural variability at Fremont villages such as Wolf Village cannot be attributed simply to temporal variation. At Wolf Village, radiocarbon dates on maize range from 900 to 1020 BP, suggesting that use of structures was spread over a time period of at least a few decades; calibration of the dates suggests that all the structures were used in the eleventh or early twelfth centuries A.D. The dates of functionally and formally distinct structures overlap, and it is clear that in the mid to late eleventh century A.D. some Wolf Village residents were living in pithouses while others were living in coursed adobe surface houses, and some, or all, of the residents of the village were using Structure 2.

The simultaneous use of different architectural types and the presence of communal structures raise a number of interesting questions. The variation in house forms could indicate that Fremont villages housed people with different ideas about how houses should be built, or, more likely, that social differentiation and possibly even hierarchy existed within Fremont communities. Distinguishing between these and other possibilities will require thorough studies of the artifacts and activities associated with the different structure types, and will be explored in future publications.

In conclusion, we stress that architecture is an important medium through which community integration and social organization can be studied. Michelle Hegmon (1989:7) stated that everyday architecture can help to define groups of individuals. Architecture, along with other material culture such as ceramics and projectile points, can define group boundaries and show distinctions between those within the group and those without (see Cameron 1998; Lipe 2006). The organization of communities such as Wolf Village around communal structures, such as the central structures and oversized pitstructures discussed here as well as plazas and communal storage structures, may also be important. Because the formation of villages represents "a time of tremendous social change," once the Fremont begin congregating and building communities, issues of integration and social organization beyond the household level are necessary to consider and architecture is a useful mechanism through which it can be studied (Adler and Wilshusen 1990:143).

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Endnotes

1. Janetski directed the field school in 2009. From 2010 through 2011, and again in 2013, the field school was directed by James Allison. In 2012, Allison and Michael Searcy codirected the field school.

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Fremont Use of Dune Environments in Western Utah

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A number of sites found in the dunes and around the playas of western Utah are characterized by surface scatters of lithics, ceramics, ground stone, fire-cracked rock, and occasional soil staining. Seven such sites with ephemeral structures were excavated and reported between 1980 and 2010. While five of the seven were multicomponent, they were most intensively utilized during the Formative Period. Comparison of site location, artifacts, and features indicate each was used for short-term occupations primarily focused on foraging small seeds and animals, and that sites in dune environments played an important role in the subsistence and land use practices of prehistoric groups.

At first glance, the deserts of western Utah appear to be a desolate place; a region of aridity with limited resources. However at times in the past many of these areas existed in a more water-rich environment, and even today may contain plants, animals, and other resources that were important to prehistoric peoples. It is not surprising then that a number of Formative-period occupations with ephemeral structures have been found in dune locations near playas and intermittent water sources throughout Utah's western deserts (Figure 1).

One of the first well-documented excavations of such a site was by Steven Simms in 1986 (Simms 1986; Simms and Isgreen 1984). Topaz Slough was situated in sand dunes on the western edge of the Old River Bed in west-central Utah. At the time of use the area was home to a "brackish slough containing various types of wetland floristic associations" (Simms 1986:208). The excavation of two brush wickiup-type structures helped to broaden our understanding of Fremont architectural and settlement diversity. Based in part on these excavations, Simms proposed several subsistence and settlement adaptations for the Fremont, beginning his focus on Fremont adaptive diversity (developed more fully in Madsen and Simms 1998).

Eight years later Shelley Smith (1994) reported the excavation of a similar site in Skull Valley, Utah. 42TO504 was located on a long dune adjacent to a hardpan playa and contained a small artifact assemblage, a few pits, and the remains of a light brush structure. The location, botanical remains, artifact assemblage, associated features, and radiocarbon dates all suggested to Smith that the site was once on the edge of a localized perennial water source used by Fremont peoples as a short-term habitation from which individuals dispersed to gather and process small seeds. Due to the presence of similar sites in the area, Smith postulated that 42TO504 was representative of a pattern whereby Fremont groups repeatedly occupied sand dunes adjacent to wetland areas over short periods of time to exploit small seeds. She further noted that aside from Topaz Slough, such a pattern had not been widely documented elsewhere, but felt that future investigation of similar desert locales would, "further explicate this pattern and its variations" (Smith 1994:65).

In the last two decades additional sites have been discovered in western Utah that fit the basic

Figure 1. Excavation of Gunnison Bend (42MD3014); a dune site in the western desert of Utah.

pattern described by Simms (1986) and Smith (1994). In this article I review these excavated sites and suggest that there are now sufficient data to confirm the pattern hypothesized by earlier researchers. Multiple lines of evidence, including site location and environment, types of structures and features present, artifact assemblages, faunal and botanical remains, and chronometric dating all support a subsistence and settlement pattern associated with short occupations of dune environments for the collecting and processing of small seeds and animals. Seven such sites are discussed below, their similarities and differences are outlined, and the data from each is used to explore an important aspect of Fremont subsistence and settlement in the region.

Excavated Formative Period Dune Sites with Ephemeral Structures in Western Utah

42TO504

42TO504 is located near the center of Skull Valley where two major dunes extend in a north/south direction for roughly two miles (Figure 2) (Smith 1994). A diffuse surface scatter of roughly 100 flakes, four gray ware sherds, and two fire-cracked rock (FCR) concentrations alerted researchers to the potential for subsurface deposits, and test excavations at five other sites on the westernmost bar suggested only 42TO504 retained any significant subsurface materials (Table 1).

Four backhoe trenches and 10 to 12 m^2 of hand excavations were carried out. In one of the FCR concentrations a dark, charcoal-stained lens measuring approximately 2 m in diameter was interpreted by the excavators as a light brush structure constructed of *Phragmites* (common reed) and daub. The recovery of *Phragmites* revealed that prehistorically the area was much wetter, however, the excavators cautioned that this might have been a localized occurrence of perennial water only as other marsh resources (e.g. cattail or bulrush) were not recovered.

Four small- to moderate-sized pits were found around the structure, three of which may have

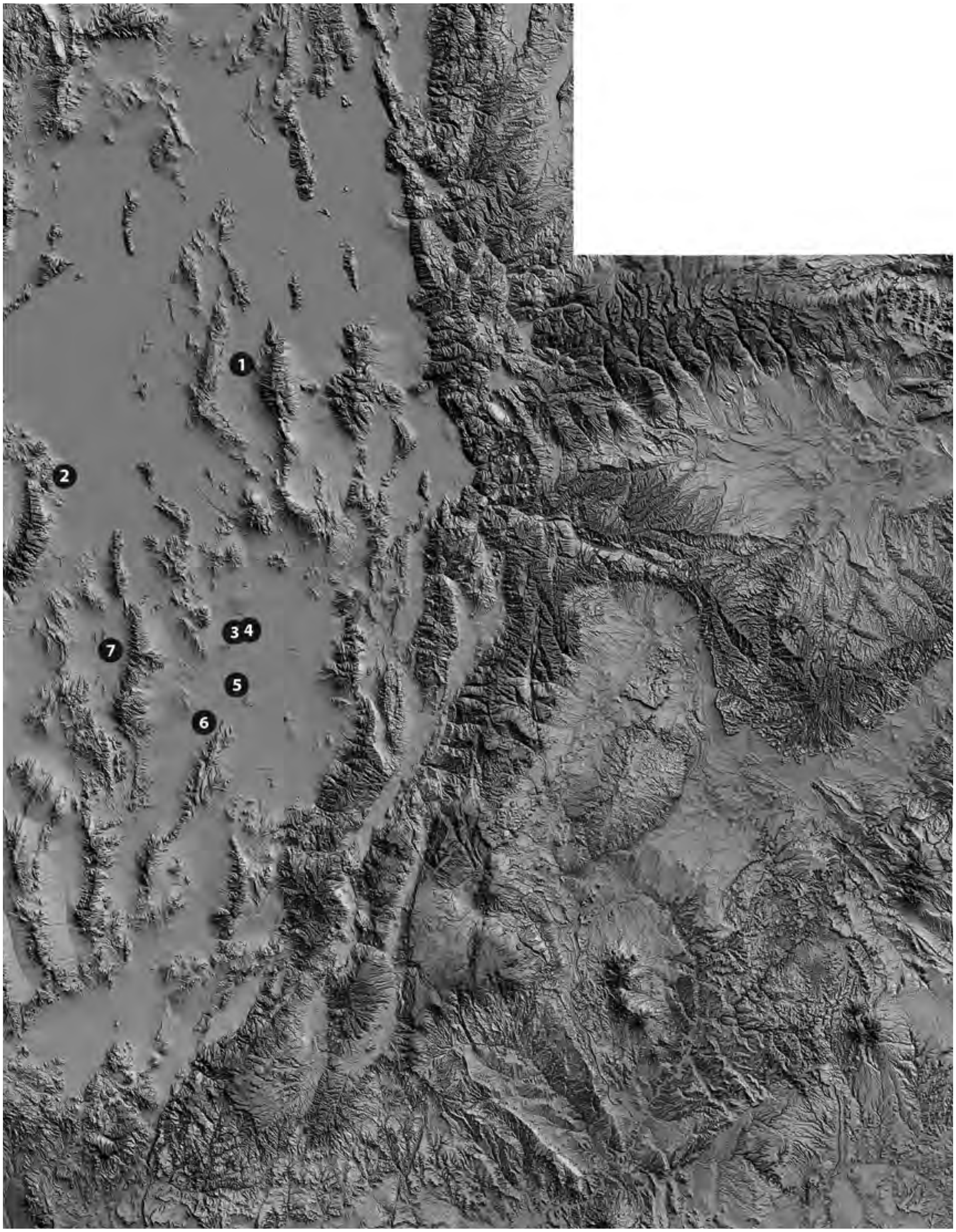

Figure 2. Location of sites discussed in text: (1) 42TO504, (2) Buzz-Cut Dune, (3) Topaz Slough, (4) Crater Bench Dune, (5) Gunnison Bend, (6) The Thursday Site, (7) The Bennett Site.

Table 1. Radiocarbon Dates of Formative Period Components from Sites Discussed in Text.

Site	Formative Occupation	Other Occupation*	Habitation Structure(s)	FCR**	Fremont Ceramics (n)	Projectile points	Ground Stone	Faunal Remains (NISP)	Maize	Botanicals†
42TO504	~A.D. 650-850	None	X	X	7	–	X	–	X	Cheno-ams, Saltbush, seepweed, peppergrass
42TO1459 (Buzz-Cut Dune)	~A.D. 900-1150	Archaic, Late Prehistoric	X	X	422	X	X	774	–	Pickleweed
42MD742 (Topaz Slough)	~A.D. 900-1300	Late Prehistoric?	X	X	403	X	X	123	X	Cheno-ams
42MD3285 (Crater Bench Dune)	~A.D. 540-620	Archaic, Late Prehistoric	X	X	46	X	X	–	–	Cheno-ams, bulrush, saltbush
42MD3014 (Gunnison Bend)	~A.D. 725-1150	Archaic	X	–	113	X	X	53	X	Cheno-ams, Saltbush, ricegrass, dropseed grass, little barley grass, bulrush, and sunflower
42MD1053 (Thursday Site)	~A.D. 400-1000	Archaic	X	–	<10	X	X	1781	–	Cheno-ams, cattail, bulrush
42MD1052 (Bennett Site)	~A.D. 650-1300	Archaic?	X	X	125	X	X	‡	X	Cheno-ams

(X) Presence, (-) Absence

* Features and artifacts represented in table are associated with Formative occupations only

**FCR was not considered present if there were only a few pieces on site.

† Botanical remains recovered and likely used for subsistence (as reported by orginal researcher).

‡ Report mentions faunal bone on site surface but gives no additional information.

been work areas or features associated with plant processing. The fourth was a storage pit that represented six distinct episodes of use, each marked by a silty-clay lining. The artifact assemblage included a small amount of lithics, ground stone, and Fremont gray ware sherds. Aside from a few naturally occurring rodent bones, no faunal remains were recovered. Macrobotanical and pollen samples indicated that cheno-ams (including saltbush [*Atriplex*] and seepweed [*Suaeda*]) and peppergrass (*Lepidium* sp.) were utilized by the inhabitants, and two radiocarbon dates indicated the site was occupied sometime between A.D. 650–850 (Table 2). Based on the available evidence, Smith (1994:64) stated that the site was probably occupied repeatedly for short durations as a "station from which to gather storable seeds in the late summer and/or early fall."

Buzz-Cut Dune (42TO1459)

42TO1495 is spread across the top of a large dune located on the western edge of the Great Salt Lake Desert (Figure 2). Discovered during construction activities on the Dugway Proving Ground, the site was subsequently excavated between the fall of 2000 and spring of 2001 (Madsen and Schmitt 2005). Although multiple components were present, work focused on the disturbed dune top area characterized by Fremont materials, FCR concentrations, and the remains of four light, temporary structures (called houses by the excavators) (Table 1).

House 3 measured approximately 3.5 m in diameter, had two shallow hearths near its center, and was likely associated with two nearby exterior hearths. House 4 measured 4.2 m by 2.5 m in diameter, was approximately 1 to 2 cm thick, and also had a hearth near its center. Madsen and Schmitt (2005:71) interpreted both features as temporary, possibly brush-enclosed structures due to the presence of internal hearths and their heavily stained, compacted, and sharply bounded floors. The interpretation of Houses 2 and 5 was more problematic because of extensive disturbance by construction activities and erosion. Both were roughly circular areas of charcoal-stained, midden-like deposits, one of which had a hearth near its center. Ceramic and projectile point types in and around both features suggested a Fremont occupation.

The artifact assemblage from Buzz-Cut Dune included specimens from a number of different components, but most came from the disturbed dune top where the Fremont occupation was focused. The chipped stone debitage and tools (n = 2136) were primarily made of obsidian, with 25 projectile points recovered from the dune top as well as 422 Fremont gray ware sherds and 18 metate and mano fragments. The faunal remains represented both natural and cultural accumulation, but the portion of the assemblage that was clearly cultural was dominated by jackrabbit (*Lepus* cf. *californicus*) sized bone. Charred pickleweed (*Allenrolfea* sp.) seeds were recovered from 27 of the 29 floatation samples and indicated the importance of this resource to the prehistoric occupants. Finally, thousands of individual pieces of FCR as well as a number of concentrations were scattered across all portions of the site.

Madsen and Schmitt stated that prehistoric groups had been using the area around Buzz-Cut Dune for thousands of years and that use may have intensified during the Formative Period. They further postulated that the Fremont had probably used the site as a special purpose camp in the fall from which they gathered pickleweed seeds and hunted small game (Madsen and Schmitt 2005:129–136).

Topaz Slough (42MD742)

Located in the Sevier Desert, 42MD742 was excavated in the early 1980s during mitigation for the Intermountain Power Project (IPP) (Simms and Isgreen 1984) (Figure 2). The site is in dunes bordering the west edge of the Old River Bed, a formerly north-flowing perennial outlet of Pleistocene Lake Gunnison. While this extinct waterway is currently occupied by an ephemeral stream only flowing in times of high surface runoff, Simms (1986:208) notes that

Table 2. Data Comparison of Selected Sites in Dune Environments.

Site	Sample Number	Material	Provenience	14C ± yrs B.P.	Calibrated Date* (1σ)	Reference
42TO504	–	Charcoal	Locus 2 structure	1320±70	A.D. 649-769	Smith 1994:58-59
42TO504	Beta-33794	Maize	Locus 2 structure	1290±70	A.D. 654-851	Smith 1994:58-59
42TO1459	Beta-158257	Charcoal	House 4 hearth (F49)	1050±40	A.D. 907-1023	Madsen and Schmitt 2005:Table 3.1
42TO1459	Beta-165272	Charcoal	House 3 hearth (F46)	980±40	A.D. 1016-1150	Madsen and Schmitt 2005:Table 3.1
42TO1459	Beta-158257	Charcoal	House 3 hearth (F47)	980±40	A.D. 1016-1150	Madsen and Schmitt 2005:Table 3.1
42MD742	Beta-8014	Charcoal	Refuse area	1090±70	A.D. 881-1022	Simms and Isgreen 1984:140
42MD742	Beta-8015	Charcoal	Structure 1	870±80	A.D. 1046-1245	Simms and Isgreen 1984:139
42MD3285	Beta-266337	Charcoal	Structure (F5)	1490±40	A.D. 541-619	Yoder et al. 2012:Table 89
42MD3285	Beta-266338	Charcoal	Structure (F5)	1490±40	A.D. 541-619	Yoder et al. 2012:Table 89
42MD3014	Beta-276995	Maize	Pit (F5)	1220±40	A.D. 723-876	Yoder et al. 2012:Table 72
42MD3014	Beta-266332	Charcoal	TU 29 (related to F3)	1150±40	A.D. 778-968	Yoder et al. 2012:Table 72
42MD3014	Beta-266334	Charcoal	Pit (F4)	1150±40	A.D. 778-968	Yoder et al. 2012:Table 72
42MD3014	Beta-266331	Charcoal	Depression (F1)	1110±40	A.D. 893-981	Yoder et al. 2012:Table 72
42MD3014	Beta-276996	Sunflower	Pit (F5)	1110±40	A.D. 893-981	Yoder et al. 2012:Table 72
42MD3014	Beta-266333	Charcoal	Structure (F30	1000±40	A.D. 989-1146	Yoder et al. 2012:Table 72
42MD1053	Beta-97026	Charcoal	F77	1520±80	A.D. 429-607	Shearin 2001:Appendix
42MD1053	Beta-75979	Charcoal	F22 or 23	1490±60	A.D. 439-643	Shearin 1995b:Appendix
42MD1053	Beta-77129	Charcoal	F22 or 23	1460±100	A.D. 433-662	Shearin 1995b:Appendix
42MD1053	Beta-97027	Soil sample	F84	1140±70	A.D. 778-979	Shearin 2001:Appendix
42MD1052	Beta-68930	Charcoal	Hearth (F49)	1250±120	A.D. 662-890	Shearin 1995a:Table 2; Appendix
42MD1052	Beta-94606	Soil sample	West structure (F41)	1220±50	A.D. 719-880	Shearin 1995a:Table 2; Appendix
42MD1052	Beta-68927	Charcoal	Hearth (F27)	790±80	A.D. 1162-1284	Shearin 1995a:Table 2; Appendix

*Calibrated using Calib Radiocrabon Calibration Program, Rev 7.0.2

during periods of increased effective moisture it was prehistorically home to a, "brackish slough containing various types of wetland floristic associations."

Hand excavations and three backhoe trenches revealed the remains of two wickiup-type structures and a refuse area (Table 1). Structure 1 was described as, "wickiup-like with a light super-structure of willow or cottonwood covered by brush from xeric shrubs" measuring approximately 2 to 3 m in diameter with a small hearth slightly off center (Simms 1986:208). The structure was slightly truncated on the east by a refuse area, which, despite a conflicting radiocarbon date (Table 2), was probably created shortly after the abandonment of the structure as evidenced by stratigraphic association.

A second wickiup was discovered late in the project but was seen only in the profile of a backhoe trench. Stratigraphic evidence and the nearby artifact assemblage suggested that Structure 2 was also used by Fremont groups, causing Simms to disregard a late radiocarbon date from the hearth (290±50 B.P.; A.D. 1515–1658, 1-sigma calibrated) while acknowledging that the age of the structure remained open to question (Simms 1986:212).

The artifact assemblage from Topaz Slough included over 400 Fremont ceramic sherds, six projectile points, other lithic tools, debitage (n = 171), five pieces of ground stone, and numerous concentrations of FCR. The small faunal assemblage suggested that human use of animal resources focused on jackrabbits, at least one large mammal, and possibly snakes. An elevated number of seeds from the cheno-ams family probably indicated a food source, but the researchers cautioned that their presence may have been due to the use of greasewood and saltbush as firewood or building material. Based on the presences of interior hearths, their contents, and botanical samples, Simms suggested that 42MD742 was occupied during the summer, fall, or early winter and interpreted Topaz Slough as a multi-activity habitation site whose inhabitants collected plant and small animals from a nearby wetland habitat.

Crater Bench Dune (42MD3285)

Less than a kilometer northeast of Topaz Slough, the Crater Bench Dune site is also located in the Sevier Desert on the western edge of the Old River Bed (Figure 2). When first recorded in 2008, FCR, ceramics, debitage, and lithic tools were found scattered over the surface of a series of low dunes for more than a kilometer (Table 1). Data recovery occurred in 2009 as part of the UNEV Pipeline Project, but testing took place only in the southern portion of the site due to restrictions on working outside of the construction corridor (Yoder et al. 2012).

Ten backhoe trenches and 59 m² of hand excavation lead to the recovery of a moderate artifact assemblage, the remains of an ephemeral structure, and a number of FCR concentrations (Yoder et al. 2012:285–337). The structure was circular, shallow, and basin-shaped measuring 2.5 m in diameter (Figure 3). A small number of artifacts and a moderate amount of charred cheno-ams (n = 54) and bulrush (*Scirpus*) seeds (n = 65) were found in the fill and on the floor. Two radiocarbon assays from charcoal in the fill dated the structure to A.D. 541–619 (Table 2), and bracketing dates from the strata below (1960±40 B.P.; 18 B.C.–A.D. 81, 1-sigma calibrated) and above (1240±40 B.P.; A.D. 689–861, 1-sigma calibrated) confirmed its chronological placement.

Thousands of pieces of FCR were scattered across the surface of Crater Bench Dune, with some forming distinct concentrations. Geological observations suggested that past and ongoing erosion had removed much or all of the deposits associated with the surface FCR features resulting in a palimpsest, however buried intact deposits in more stable portions of the dune did exist.

The artifact assemblage included specimens from both surface and subsurface deposits and as

Figure 3. Basin-shaped depression of ephemeral structure at Crater Bench Dune (42MD3285).

such came from at least two (and likely more) distinct occupations. Artifacts included debitage (n = 751), two projectile points, 46 Fremont gray ware sherds, and seven pieces of ground stone likely used in food preparation. No culturally modified faunal bone was recovered.

Radiocarbon (Table 2), optically stimulated luminescence (OSL), obsidian hydration, and relative dating (projectile points and ceramics) suggested that while portions of the site were used during both the Archaic and Late Prehistoric periods, the area excavated was primarily utilized during the Formative Period by Fremont groups. Researchers hypothesized that prehistoric peoples occupied Crater Bench Dune for relatively short periods of time during the summer and/or fall months while gathering and processing plant resources (Yoder et al. 2012:332–333).

Gunnison Bend (42MD3014)

Gunnison Bend is located in the Sevier Desert, less than a mile north of the Sevier River (Figure 2). Situated on a low sand knoll, the immediate surroundings are relatively xeric, although limited riparian and marsh environs are nearby and geomorphological studies demonstrate that the area has been much wetter in the past (Yoder et al. 2012:233). Data recovery occurred in 2009 as part of the UNEV Pipeline Project.

Five backhoe trenches and 110 m² of hand excavation lead to the recovery of a moderate artifact assemblage, the remains of a light brush structure, two pits, and two basin-shaped depressions (Table 1) (Yoder et al. 2012:223–285). The structure was roughly circular, shallow, and basin-shaped, measuring approximately 3 m in diameter (Figure 4). Two shallow storage/trash pits measured 60–70 cm in diameter,

Figure 4. Excavation in progress of ephemeral structure (dark stain in foreground) at Gunnison Bend (42MD3014).

and two larger depressions measuring 1–2 m may have been activity areas or resource processing features. Botanical remains from the features included charred and uncharred cheno-am seeds, saltbrush, three different grasses (*Poaceae*) (ricegrass [*Achnatherum hymenoides*], dropseed grass [*Sporobolus*], and little barley grass [*Hordeum pusillum*]), bulrush, and sunflower (*Helianthus*) (Table 1).

The moderate flaked stone assemblage (n = 2093) was composed almost entirely of obsidian, and the small faunal assemblage was dominated by the remains of hares and rabbits (*Leporidae*) (although a few duck [*Anas* sp.] bones were also recovered). Other finds associated with the primary period of occupation included six projectile points, 113 Fremont gray ware sherds, and a single fragment of ground stone likely used in food processing. While even today the site is close to a mesic environment, the presence of *Phragmites* in the botanical samples implied a similar situation in the past. Radiocarbon (Table 2), OSL, and obsidian hydration dating showed that the primary occupation was from approximately A.D. 800–1100 (although a small Archaic component was also present). The features, location, and artifact assemblage suggested that the Gunnison Bend site was used for brief occupations focused on the collection and processing of nearby plant and small animal resources (some of which were marsh or riparian related) (Yoder et al. 2012:272–275).

The Thursday Site (42MD1053)

The Thursday Site is a large, multicomponent site located at the northern end of the Sevier Lake bed just east of the Sevier River inlet (Figure 2). The depositional context consists of semi-stabilized sand dunes among winding alluvial channels. Artifact concentrations and cultural features are scattered, "over a 3-mile arc with clusters occurring near river paleochannels and in association with deltaic deposits" (Shearin et al. 1996:155) (Table 1). A journal article and a series of brief preliminary reports discuss the fieldwork that took place primarily in 1992 (Shearin 1994; Shearin et al. 1996), 1994 (Shearin 1995a), 1995 (Shearin 1996), and 1996 (Shearin 2001), most of which was performed by volunteers and interns (with professional oversight).

Over 80 circular surface stains averaging two to three meters in diameter initially lead researchers to believe that the site represented a deflated "Fremont adobe village," however, after testing in two different areas it became apparent that this was not the case (Shearin 1995a:5,16). Partial-to-complete excavation of eight stains revealed most to be very shallow, saucer-shaped depressions likely deflated by wind erosion. Most of the stains contained no artifacts, but one of the features (F64) contained a small subfloor storage pit and had high amounts of cattail (*Typha*) pollen and cheno-am seeds, one of the features (F22) was associated with two possible post holes, and two others features (F77 and F84) contained a total of 27 charred cheno-am seeds and 213 bulrush seeds. Artifacts recovered from surface and subsurface investigations included a small flaked stone assemblage (n < 400; mostly obsidian), a few Fremont ceramic sherds, and two ground stone fragments. The moderate faunal assemblage was composed primarily of fish (46 percent) and small mammal (53 percent) species, with the small mammal category being dominated by muskrat (*Ondatra zibethicus*). Radiocarbon dates from four of the features indicated that the area was primarily used between A.D. 400 and A.D. 1000 (Table 2), although limited earlier use also occurred (see Shearin et al. 1996:164).

Interpretation of the saucer-shaped features and pits varied in each of the preliminary reports, and at one time or another were called possible hearths, pit structures, activity areas, or plant processing features. The radiocarbon dates, in addition to the large number of features, suggest that the site was utilized discontinuously for over 1,000 years with most occupations focused on foraging marsh resources (including small seeds and game).

The Bennett Site (42MD1052)

Located in the Tule Valley, the Bennett site is situated in semi-stabilized sand dunes near Coyote Springs, an important water source for the area (Figure 2). Lithic debitage, FCR, Fremont gray ware ceramics, ground stone, faunal bone, and small areas of dark charcoal staining were all present on the ground surface when first recorded (Table 1). A short preliminary report (Shearin 1995b) documented test excavations performed in 1993 on a southern component (Archaic) and a northern component (Formative).

The northern portion of the site was tested with backhoe trenching followed by hand excavation of a number of features. The preliminary report states that at least two structures were present (possibly pit houses), although additional description was not given. The westernmost structure dated to A.D. 719–880 and a single sample from this feature contained 2,779 charred cheno-am seeds. Two hearths in or near the easternmost structure dated to A.D. 662–890 and 1162–1284 respectively (Table 2), and a single sample from this structure contained 612 charred cheno-am seeds and a single charred maize kernel.

While the preliminary report offers no flaked stone analysis, illustrations suggest that at least three drills, 13 bifaces, and 32 projectile points were recovered (Shearin 1995b:13–17). A total of 125 Fremont gray ware sherds were also recovered, and while the report mentions faunal bone being found on the surface it makes no mention of the amounts or of additional finds or analyses.

Based on the site's location, the presence of structures, the concentration of cheno-ams, the number of projectile points, the ceramic assemblage, radiocarbon dates, and the maize kernel all suggest that the Bennett site was used by Fremont groups focusing on the collection of small seeds (cheno-ams) and hunting of game. The Bennett Site differs from the others discussed above, however, both in the greater number of projectile points (hinting at a greater emphasis on hunting) and small seeds recovered as well as the possibility of more substantial residential structures (indicating greater length of occupation).

Site Comparisons

In the following discussion I avoid placing much interpretive weight on comparisons of the exact number and density of artifacts between sites as each was excavated under varying circumstances, by different researchers, over a span of 25 years. For example, the amount of square footage excavated, site surface artifacts collected, screen size used (1/4 inch versus 1/8 inch), number and volume of botanical and pollen samples taken, etc., varied significantly so that a direct comparison may be misleading. Instead, I focus more on rough measures and the presence or absence of artifact categories.

Subsistence

Given the evidence available, it appears that subsistence activities at each location were focused on the collection of plant resources (most likely small seeds) and secondarily small game. Each of the sites is found near a playa, extant or previously existing river/wetland environment, or intermittent water source. Topographic location in combination with botanical evidence argues that when occupied each of the sites was within a short distance to a riparian or marshy environment (with the exception of Buzz Cut Dune). The Thursday Site is located where the Sevier River debouches into the north end of Sevier Lake; the Bennett Site is on the southeastern edge of a series of still active springs; Gunnison Bend is less than a mile north of the Sevier River and Crafts Lake; Crater Bench Dune and Topaz Slough are on the western edge of the Old River Bed; and while 42TO504 is located on the southern end of an overflow outlet of the Great Salt Lake (currently a drier environment than the other sites), the recovery of *Phragmites* suggests that prehistorically the playa which it abuts likely held standing water (Smith 1994:62).

Just as important as their proximity to water is the fact that all of the sites are found in dune settings. These locations can trap moisture and promote plant growth, which can turn dunes into "concentrated islands of small mammal and reptilian resources" (Simms 1986:213). This means that subsistence resources like desert plants (with edible small seeds) and small game are more likely to be concentrated in these areas. Macrobotanical and pollen samples indicate that all of the sites had plant remains used for human consumption (Table 1). The list is dominated by small seeds from the cheno-ams group with a variety of other species present (peppergrass, bulrush, ricegrass, dropseed, little barley grass, sunflower, and cattail). While collecting and processing small seeds is labor and energy intensive (Simms 1984, 1987; Jones and Madsen 1991; Barlow and Metcalfe 1996), large concentrations or easy availability can make them more economically worthwhile. Four of the seven sites also contained maize, but the small quantity present in combination with site location implies that it was not grown on site, but was brought in from farming locations elsewhere.

The presence of FCR in significant quantities at all of the sites except for the Gunnison Bend and Thursday sites is suggestive of food processing. FCR concentrations were usually on the sites' surfaces and were often the result of deflation, but in a few cases were indicative of subsurface features and deposits. FCR can be associated with the cooking of plant and animal resources through two basic techniques (Wedel 1986; Fowler 1986). In the first, rocks are heated and then used to boil or heat liquid foods in baskets or hide-lined pits. In the second, hot rocks are used to roast plants or animals by placing them in a pit and covering them with soil. The use of FCR in roasting roots and tubers (a.k.a. underground storage organs) is typical of many areas, but ethnographically this was more common in the Northern than the Eastern Great Basin (Fowler 1986). Direct botanical evidence for the utilization of underground storage organs can be difficult to identify in the archaeological record for a number of reasons, and starch grain analysis (Cortella and Pochettino 1994; Therin et al. 1999) requires a developed regional reference collection and has therefore not been regularly employed at most excavations in Utah. This may be changing however, as recent work by Rhode and others (Rhode et al. 2011a, 2011b) has shown that the investigation of FCR concentrations in western Utah can benefit from the use of starch grain analysis and luminescence dating. At a site (42TO567) on the eastern edge of the Great Salt Lake desert, Rhode et al. (2011a, 2011b) found that FCR had been used during multiple time periods to process plant resources such as ricegrass, maize, and an unidentified species of underground storage organ. While the evidence recovered from the sites above suggest plants, particularly small seeds, were the most likely resources being processed in conjunction with FCR concentrations, the possibility remains that they may have also been used in cooking roots and tubers.

FCR has also been used in replicative experiments to try and estimate how long a location was occupied. At Playa View Dune, a site on the eastern edge of the Great Salt Lake desert that contained a large amount of FCR, Kristen Jensen and her colleagues used experimental archaeology to estimate how quickly boiling stones break down, their declining efficiency rate, and the size at which FCR fragments could no longer be efficiently reused (Jensen et al. 1999; Simms et al. 1999). Jensen and her colleagues then used the size and amount of FCR at Playa View Dune to calculate how long the site was occupied and postulated that either the Archaic inhabitants occupied the location for nearly a month or the intensity of cooking activities that took place exceeded the group's immediate needs.

Jensen's findings suggested that FCR fragments weighing less than 110 g and/or measuring less than 2 to 3 cm would likely have been discarded by prehistoric users because of a substantial reduction in heat-retention ability below this threshold. While five of the seven dune sites discussed previously contained small to moderate amounts of FCR, excavators at both Buzz-Cut Dune and Crater Bench Dune noted thousands of pieces scattered across their surfaces and in distinct concentrations. FCR at Crater Bench Dune was relatively uniform, with most fragments made of black vesicular basalt measuring roughly 2 to 3 cm in size and weighing 8 to 9 g (Figure 5). FCR density varied, but reached a maximum of approximately 30 pieces per square meter in the area of the site investigated. Average FCR weight from Crater Bench Dune falls well below the 110 g discard threshold reported by Jensen, but FCR size roughly correlates. The extreme difference in weight is likely due to the fact that FCR at Crater Bench Dune was made of lightweight vesicular basalt, whereas Jensen et al. (1999) used heavier porphyritic rhyolite cobbles in their experiments. Madsen and Schmitt (2005:41–71) report on several major FCR concentrations at Buzz-Cut Dune, with densities in some areas reaching as high as 75 pieces per square meter. Fire-cracked rock at the site was primarily basalt and quartzite, although limestone, granite, rhyolite, and schist were also used. While the general size was not discussed, based on photos from the report it appears that FCR pieces averaged 3 to 5 cm in diameter, and Madsen and Schmitt (2005:42) note that some small fragments measured approximately 2 cm in diameter. The small size of FCR at both Crater Bench Dune and Buzz-Cut Dune may suggest that the inhabitants of the sites were reusing the FCR to its maximum extent, and that the FCR record was built up over multiple occupations.

Ground stone has many uses in prehistory and ethnographically, but its presence at sites in the Great Basin is most often correlated with the processing of small seeds. It is worth noting that

Figure 5. Fire-cracked rock on surface of Crater Bench Dune (42MD3285).

grinding stones were present at all seven of the sites discussed above, but their overall numbers were low (< 10 pieces at each site with the exception of Buzz-Cut Dune). The small amount of ground stone is presumably a reflection of the short, light occupation of each site and correlates with the small size of the artifact assemblages generally. Another possibility (not exclusive of the first) is that some of the resources collected were not processed on site but were taken to other locations for consumption.

The hunting of small game was seemingly the other major focus of subsistence activities at the dunes. Projectile points were found at six of the seven sites and imply that occupants hunted in nearby areas and brought broken or spent arrows back to retool (Table 1). The amount of faunal remains varied by site but was usually dominated by rabbits and hares. The one exception to this pattern was the Thursday Site where muskrat and fish made up the majority of the faunal assemblage. The low to moderate amount of animal bone recovered may be the result of human behavioral choices (e.g. frequency of hunting, butchering and processing practices, length of occupation) but could just as easily be due to post-depositional processes (e.g. open context and alkaline soils).

Habitation and Length of Occupation

The type of features and artifact assemblages found at most of the sites suggest that they were occupied for short periods of time, somewhere between a few days to a few weeks. At six of the seven sites some of the features were interpreted as ephemeral, light brush structures, described by the researchers as, "a possible wickiup" (Yoder et al. 2012:241); "probable wickiup or light structure" (Yoder et al. 2012:309); "wickiup-like" (Simms 1986:208); "temporary, possibly brush-enclosed, structures" (Madsen and Schmitt 2005:71); and "light brush structure" (Smith 1994:55). Some of these structures were more complex, with internal features like hearths, but others were less formal and may have been more of a windbreak or sun shade. Each of the researchers felt that a light habitation structure was the most likely interpretation, with the exception of the Thursday Site where the researchers vacillated between calling the soil stains hearths, habitations, activity areas, or plant processing features; and the Bennett Site where the excavators hinted that the features may have been pit structures.

During excavation the structures appeared as thin (< 15 cm thick), basin-shaped soil stains with dark-colored fill containing charcoal flecking or inclusions. Each was generally circular in shape with diameters averaging 2 to 3 m. Most of the structures had no internal features, but some held hearths (Buzz-Cut Dune, Topaz Slough) and one contained a subfloor pit (Thursday Site). As the investment of time, energy, and resources to build a light brush structure is considerably less than for a more substantial habitation (e.g. pit house or masonry surface structure), it seems likely that the inhabitants of the dune sites planned on only utilizing the area for a short period of time. This is also supported by the low number (or lack) of permanent storage features associated with each habitation.

The presence and types of artifacts recovered from the structures varied, but most had modest assemblages supporting the hypothesis that occupations were brief. This should come as no surprise as artifact counts and the distribution of features associated with wickiups, while variable, is often low. Simms (1989) has emphasized how duration of occupation, site function, seasonality, and reoccupation have significant impacts on site structure and assemblage, particularly at sites with ephemeral structures. For example, surface mapping and excavation at the Bustos Wickiup site in Nevada revealed the presence of hearths, activity areas, and other features between ephemeral structures, but a low number of artifacts (Simms 1989). Simms suggested the site was reused multiple times as a pinyon nut collection camp and that the low density of artifacts was attributable to short occupations and site function (in that most of the resource collection and processing took place off-site).

Two sites that may differ from this overall pattern are the Bennett and Thursday sites. At the Bennett Site two habitations were described as "potential pit structures" (Shearin 1995b:3). The features were only partially excavated and no further details were given in the extremely brief preliminary report; so evaluating the excavators' interpretation is difficult. But if the structures were true pit houses then a greater investment and longer occupation would be implied. The Thursday Site may also hold more substantial structures, as researchers noted a few large soil stains that might represent pit houses. However, of the eight features that were tested all were found to be less than 3 m in diameter, shallow, and basin shaped; so while pit houses may be present, without additional testing this remains speculative.

Five of the seven dune sites also had non-FCR related features (pits, exterior hearths, activity areas, depressions, etc.) scattered around or in direct association with the habitation structures. Some of these were likely used in the processing, storage, or disposal of plant and animal resources; but their low numbers and informal nature further indicate relatively short occupations.

Chronology and Culture

Radiocarbon, optically stimulated luminescence, obsidian hydration, and relative dating (projectile points and ceramics) demonstrate that all of the sites were utilized during the Formative Period, and it is this time period that both I and the original researchers have focused on. That being said, most of the sites were multicomponent with occupations before and/or after the Formative Period, implying this pattern of dune use has a long history in the region. Interestingly, only two of the Fremont-related radiocarbon dates have age ranges that postdate

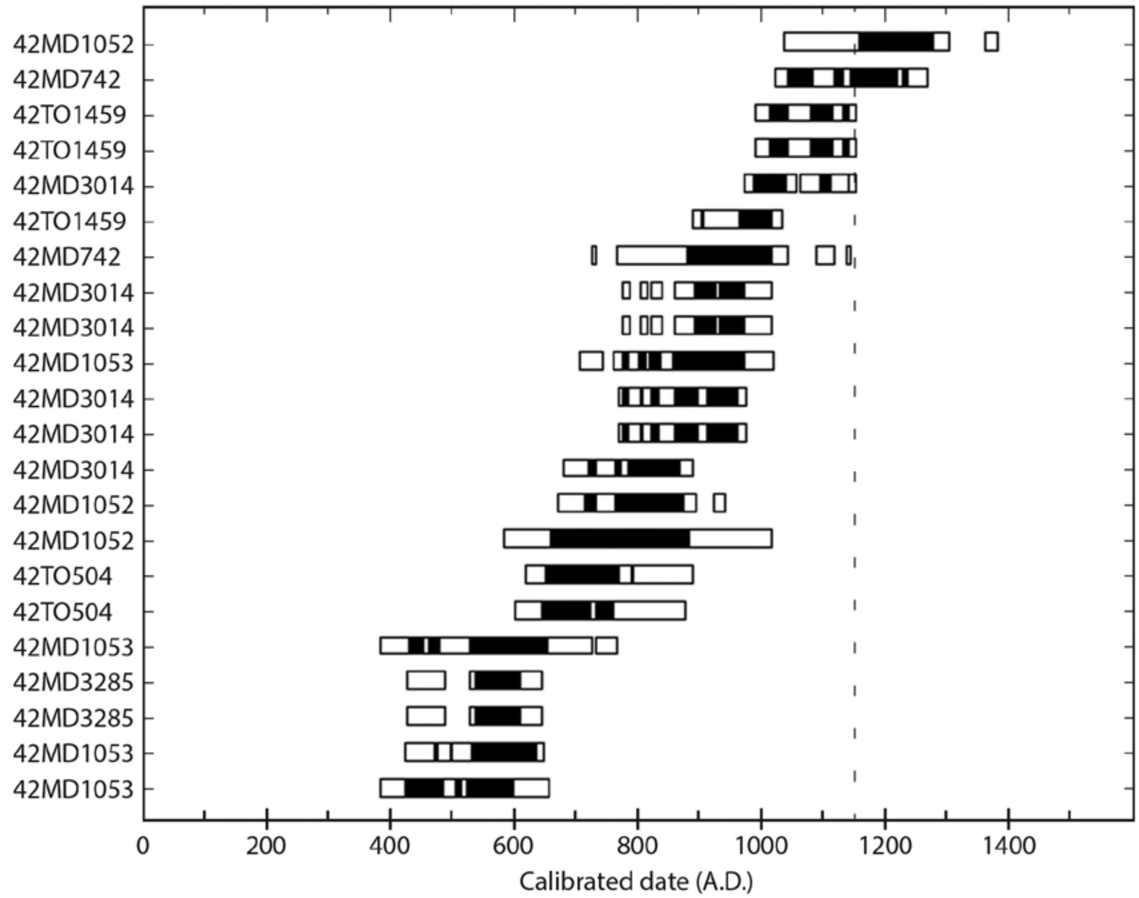

Figure 6. Plot of two-sigma calibrated age ranges of radiocarbon dates from sites discussed in text. Dark part of bars equals one-sigma; dashed vertical line set at A.D. 1150.

A.D. 1150 (Figure 6). This seems somewhat at odds with Coltrain and Leavitt's (2002) evidence suggesting a decline in the practice of agriculture and an increase in foraging behavior by some Fremont groups after A.D. 1150, or with Barlow's (2002) inferred proposition that farming among Fremont populations was abandoned as soon as foraging became more economically viable at the end of the Formative Period. In both cases it could be argued that an increase in foraging should lead to a greater use, not less, of short term foraging sites like those discussed above. But the apparent reduced use of dune sites after A.D. 1150 may be more an artifact of a small sample size than of any real pattern; and even if it is not, it is in line with a general decrease in the number of sites across the Fremont area after this time (Massimino and Metcalfe 1999; Talbot and Wilde 1989). In addition, less summer moisture and a series of major droughts around and after A.D. 1150 (for summaries, see Grayson 2011 and Coltrain and Leavitt 2002) may have reduced the productivity of dune sites making them a poor economic choice and led to their declining use.

Given that the sites are all within the core Fremont area, structures and features date to the Formative Period, all of the sites contain Fremont ceramics, and four have evidence of maize, it is clear that they were occupied by Fremont groups. Whether the people utilizing each location were task groups from more sedentary farming villages or were more highly mobile foragers is beyond the scope of this article (but see Madsen and Schmitt 2005:129-136; Yoder 2013).

Conclusion

Taken together, the evidence presented above indicates that dune sites played a meaningful role in Fremont subsistence practices. The pattern that emerges suggests Fremont groups traveled to dune environments during the summer and fall as small seeds ripened. The groups carried pottery with them to cook, store, and serve their food, and some of them brought maize as a supplement for the trip. Once at the site, light ephemeral brush structures were built of local materials. From this residential base individuals gathered seeds (e.g. saltbush, ricegrass, dropseed, pickleweed, seepweed, peppergrass, bulrush, sunflower, little barley grass, and various cheno-ams) and other plants from the surrounding area. Small game such as rabbits, hares, and rodents were pursued, and in more aquatic areas animals like muskrats, ducks, and fish were taken. On rare occasions a deer, mountain sheep, or pronghorn would be encountered and hunters might bring portions back to the camp to be shared. Some resources were cooked in hearths, roasting features, or by stone boiling, while others were processed with grinding stones or eaten raw. In a few days or weeks the resources at the site would be expended and the group would move on to a new location; leaving behind a light artifact scatter, a few smoldering hearths, a pit or two, and a shelter that would quickly collapse and decompose (if it hadn't already been burned). Such sites may have been an integral part of the yearly subsistence round for committed foragers, or could have been used by task groups from farming villages.

This pattern of dune use by Fremont groups is not restricted to the few sites discussed here. Numerous surface scatters of artifacts and features similar to those mentioned above have been recorded in the deserts of western Utah in comparable settings (Lindsay and Sargent 1979; Simms and Isgreen 1984; Smith 1994; Bassett and Hunsaker 1996; Simms et al. 1999; Schmitt et al. 2002; Schmitt and Page 2007; Bright et al. 2006; Self et al. 2008) and some of these are likely to hold intact buried deposits and the remains of ephemeral structures. Nor should we think that the Fremont are distinctive in their use of dunes for small seed and game procurement. Five of the seven sites reported had earlier and/or later components during which the inhabitants probably utilized the area in a similar manner (Table 1), and many of the untested sites in the reports just listed have diagnostic artifacts suggesting they span the Holocene.

Both Simms and Sharp predicted future work would expose more assemblages like Topaz Slough and 42TO504 that would help to expand our understanding of Fremont subsistence and land use. Their predictions have proven to be true; and given the ever increasing amount of survey and excavation data generated by cultural resource management, future work in western Utah will not only expand our understanding of the Fremont's use of the dunes, but of Archaic and Late Prehistoric peoples' as well. ■

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Virgin Anasazi Archaeology and the Southern Parkway Project

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In 2011, as part of the Utah Department of Transportation's Southern Parkway project, William Self Associates, Inc., conducted data recovery at six sites located within 2 km of each other on a southern terrace of the Virgin River. Together, these sites, which include five habitations and one rockshelter, represent discontinuous occupations spanning a large portion of the Virgin Anasazi sequence, from the Basketmaker II (300 B.C.–A.D. 400) through Pueblo II (A.D. 1000–1150) periods. The heaviest period of use along the terrace appears to be from late Basketmaker III through early Pueblo I. This data is particularly important in light of the paucity of published excavation data and secure radiometric dates for the region. The project provides a unique opportunity to examine localized Virgin Anasazi spatial and behavioral patterns, and a chance to make broader-scale contributions to our understanding of the Virgin Anasazi in the St. George Basin.

Of the six major branches of the Ancestral Pueblo cultural tradition, the Virgin Anasazi are the westernmost and, perhaps, the least well understood (Lyneis 1995). Originally referred to as the Nevada Branch Anasazi (Gladwin and Gladwin 1934), the Virgin Anasazi inhabited a wide range of the southern and eastern Great Basin and northwestern Colorado Plateau, extending north to the Zion Park uplands, east towards the Kaiparowits Plateau in Utah, south to the Colorado River in Arizona, and west–southwest along the Muddy River in southeastern Nevada. Occupation spanned from the Basketmaker II period (300 B.C./A.D. 1–400) through the late Pueblo II (A.D. 900–1150)/early Pueblo III period (A.D. 1150–1225), although some settlements may have been occupied as late as A.D. 1300 (Allison 1996). For archaeological analyses, the Virgin region is typically subdivided into three environmentally distinct areas—the Plateaus, the St. George Basin, and the Lower Virgin area—linked by several major rivers—the Colorado, Muddy, and Virgin rivers—that pass through the subareas. Although the distinctions between these three areas are primarily predicated upon differences in the regional environments, the local environment has differentially influenced Virgin Anasazi cultural developments in each of the three subregions, and variation in terms of architecture, material culture (e.g., ceramic wares and types), chronology, and subsistence strategies are present in and further define the subregions culturally (e.g., Fairly 1989; Lyneis 1995; Talbot 1990; Watson 2008).

While the Virgin Anasazi remain the least well understood of the Ancestral Pueblo traditions, archaeological research in the Virgin region has expanded tremendously during the last 30 years,

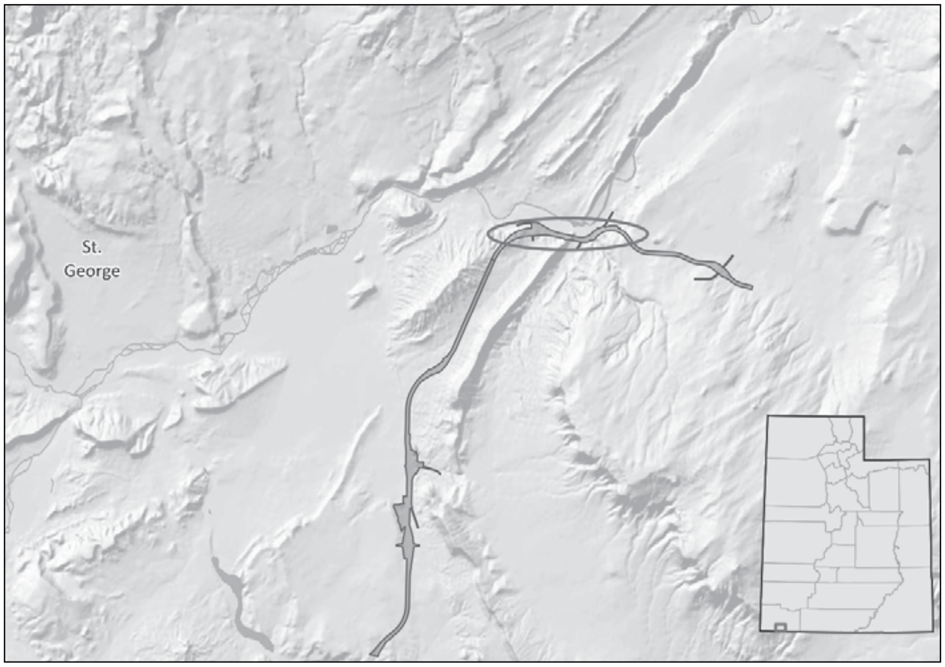

Figure 1. Location of the Southern Parkway Virgin River sites.

particularly in the St. George Basin and on the eastern Plateaus as the number of development and land management projects in these regions has increased significantly. One such recent project is the Utah Department of Transportation's Southern Parkway project, which includes the construction of a 26-mile, four-lane divided public highway extending roughly from St. George to Hurricane in southwestern Utah. In 2011, as part of this project, William Self Associates, Inc. (WSA), mitigated six NRHP-eligible Virgin Anasazi sites located in the project corridor within approximately 2 km of each other on a southern terrace of the Virgin River in the St. George Basin (Figure 1) (Medeiros et al. 2014; Yoder et al. 2011). The sites include one rockshelter (42WS5196), two unexcavated habitation sites with architecture (42WS5162, 42WS5169), and three excavated habitation sites with architecture (42WS3887, 42WS5164, 42WS5167), and are hereafter collectively referred to as the Virgin River Site Complex.[1] Together, the six sites represent primary, discontinuous occupations spanning a large portion of the Virgin Anasazi sequence, from the Basketmaker II (300 B.C.–A.D. 400) through Pueblo II (A.D. 1000–1150) periods, although the heaviest period of use along the terrace appears to be from late Basketmaker III through early Pueblo I (ca. A.D. 600–800). Several sites also have evidence of less substantial occupations dating to the Late Prehistoric period (ca. A.D. 1200–1900) (Table 1).

The sites range in size from just 0.03 up to 7.5 acres and were variously impacted by archaeological investigations and construction associated with the Southern Parkway project, depending upon how much of each site was located within the area of potential effect (APE) (between 2 and 100 percent). Archaeological investigations included mapping, surface collection, exploratory trenching, phased data recovery, and extensive artifact analyses. The investigations resulted in the documentation of more than 100 features, including multiple pithouses, ephemeral brush structures, storage cists, and thermal features; the recovery of substantial artifact assemblages of flaked

Table 1. Suggested Periods of Occupation at the Virgin River Sites.

Site	Suggested Periods of Occupation					
	AMS Radiocarbon	Architecture	Ceramics Types	Jar Rim Eversion	Projectile Points	Obsidian Hydration
42WS3887	Basketmaker III to Pueblo I	Basketmaker III to Pueblo I	Basketmaker III to Pueblo I	Pueblo I to Pueblo II	Archaic to Late Prehistoric	Archaic to Formative
42WS5162	no samples	Pueblo I	Basketmaker III to early Pueblo I	Pueblo I	Basketmaker III to unknown	not measurable
42WS5164	Basketmaker III to early Pueblo I	Pueblo I	Basketmaker III to Pueblo I	Basketmaker III to Pueblo II	Archaic to Pueblo III	Archaic to Late Prehistoric
42WS5167	Basketmaker II and Basketmaker III	Basketmaker III	Basketmaker III to early Pueblo I	Basketmaker III to early Pueblo I	Archaic to Basketmaker III	Archaic to Formative
42WS5169	no samples	Pueblo I to Pueblo II	Basketmaker III to Pueblo I, Pueblo II	Basketmaker III to Pueblo I, Pueblo II	Basketmaker III to unknown	not measurable
42WS5196	no samples	none	Basketmaker III to Pueblo I, Pueblo II, Late Prehistoric	Pueblo II	Archaic to Pueblo III	not measurable

stone, ceramics, and ground stone and smaller assemblages of worked shell and bone; macrobotanical, palynological, and faunal remains; and the return of 30 radiocarbon dates, all but one of which were obtained from maize cupules or cob segments recovered from intact, buried deposits.

In this article, we present an overview of our investigations at the three of the six sites associated with the Virgin River Site Complex—excavated habitations 42WS3887, 42WS5164, and 42WS5167—and discuss project results in terms of our understanding of the Virgin occupation along this single terrace of the Virgin River, with particular reference to site structure, diet and subsistence, and cultural interaction and exchange during the late Basketmaker III and early Pueblo I periods.

42WS3887

42WS3887 is a Virgin Anasazi habitation dating to the Basketmaker III to Pueblo I period. 42WS3887 sits on a bedrock ridge composed principally of Kayenta Formation, Springdale Sandstone Member sandstone and siltstone. The ridge overlooks the Virgin River to the west and portions of the ridge are covered in Quaternary alluvial deposition of variable depth. Prehistoric features were often visible on the surface of the site; many were located less than 25 cm below the modern ground surface. Some of the features were excavated prehistorically through the alluvial deposits and into the bedrock that form the ridge.

Thirty prehistoric features were documented at the site during data recovery, including one pithouse, multiple thermal features, a slab-lined cist, a midden, and multiple compact surfaces/use zones (Figure 2; Table 2). An assemblage of 35,758 artifacts was recovered from the site, including ceramics, flaked stone, ground stone, faunal remains, and shell (Table 3). Data recovery for this project also recorded extensive evidence of looting damage at the site, which may have destroyed major features. Several features, including the pithouse and slab-lined cist, were partially excavated due to time constraints. Other rock alignments, which may represent storage features, were not excavated.

Figure 2. 42WS3887 site map.

Determination of when 42WS3887 was occupied is based on a number of factors including absolute dating—radiocarbon dates from 12 samples ranging from A.D. 660 to 880—and relative dating based upon ceramic and projectile point typologies for the region (Table 4; also see Table 1). The radiocarbon assays and artifact analyses are in general agreement and suggest the site was occupied primarily during the late Basketmaker III period, although occupation may have extended into the early Pueblo I period. The site may also have a minor Southern Paiute component based on a concentration of sherds in the northern portion of the site.

Table 2. Summary of Surface Features Recorded at 42WS3887.

Feature Type	Feature Number
Looters' pit	8, 9, 10, 11, 12/13, 15, 16, 17, 18, 19, 20
Modern rubble pile	14
Midden	30/34/58
Pithouse	31
Compact surface	33, 38, 39, 41, 53, 54, 55, 59, 60, 63, 65, 68, 73, 78, 81
Thermal features	45, 46, 47, 49, 51, 56, 66, 74
Earthen basin	61
Slab-lined depression	64
Slab-lined cist	69
Surface rock alignment	70, 71

42WS5164

42WS5164 is a Virgin Anasazi habitation representing either one multi-season occupation or a series of seasonal reoccupations that date from the late Basketmaker III to early Pueblo I period. 42WS5164 sits on a shallow upland Quaternary stream terrace overlain by an aeolian sand sheet; shifting sand dunes cover the site. A few prehistoric features were visible on the surface of the site, but many were identified more than 50 cm below the modern ground surface.

Investigations for the current project resulted in the recording of 71 prehistoric features and subfeatures including two pithouses, several possible wattle-and-daub surface structures or work surfaces, multiple storage features, and a human burial (Figure 3; Table 5). These features are spatially segregated in three clusters located in the northern, central, and southern portions of the site. The northern and central features appear to be related to the same occupation, based on feature characteristics and distribution and overlap between associated radiocarbon dates; it is unclear, however, if the features in the southern portion of the site relate to the same occupation. Data recovery also led to the collection of 10,093 artifacts, including flaked stone, ground stone, ceramics, faunal remains, and shell (Table 6).

Several lines of evidence contributed to placing 42WS5164 in the regional chronology: absolute dating in the form of radiocarbon dates from four samples ranging from A.D. 640 to 880 (Table 7), and relative dating based upon ceramic and projectile point typologies as well as typical architectural and site structure patterns for the region (see Table 1). The radiocarbon assays and artifact analyses are in general agreement and suggest the site was occupied primarily during the late Basketmaker III to early Pueblo I period. However, certain architectural characteristics of features at the site as well as the site layout are more typical of Pueblo I sites than of Basketmaker III sites (discussed below). In considering the suite of chronological data available, it seems most likely that the major period of occupation at 42WS5164 straddles the Basketmaker-to-Pueblo transition.

42WS5167

42WS5167 is a Virgin Anasazi habitation that has at least two temporally discrete, possibly seasonal occupations dating to the Basketmaker II and late Basketmaker III periods. Like 42WS5164, 42WS5167 sits on a shallow upland Quaternary stream terrace overlain by an aeolian sand sheet; shifting sand dunes cover the site. A few prehistoric features were visible on the

Table 3. Recovered Artifact Assemblages from 42WS3887 by Feature.

Feature	Feature Type	Debitage	Cores	Projectile Points	Bifaces	Unifaces	Hammerstones	Ground stone	Ceramics-Painted	Ceramics-Unpainted	Fauna (NISP)	Mineral	Shell	Other	Total
F31	Pithouse	396	1	3	3	–	–	4	101	652	1,558		2		2,720
F30/58/34	Midden	1,645	10	15	12	–	–	7	251	3,874	5,585	1	4	2	11,406
F33	Compact surface	–	–	–	–	–	–	–	–	–	–	–	–	–	0
F38	Compact surface	–	–	–	–	–	–	–	–	–	–	–	–	–	0
F39	Compact surface	–	–	–	–	–	–	–	–	–	–	–	–	–	0
F41	Compact surface	3	–	–	–	–	–	–	–	12	2	–	–	–	17
F45	Thermal feature	6	–	1	–	–	–	–	2	8	12	–	–	–	29
F46	Thermal feature	–	–	–	–	–	–	–	–	–	–	–	–	–	0
F47	Thermal feature	–	–	–	–	–	–	–	–	–	–	–	–	–	0
F49	Thermal feature	6	–	–	–	–	–	–	–	5	100	–	–	–	111
F51	Thermal feature	1	–	–	–	–	–	–	1	–	18	–	–	–	20
F53	Compact surface	7	–	–	–	–	–	–	2	14	4	–	–	–	27
F54	Compact surface	–	–	–	–	–	–	–	–	–	–	–	–	–	0
F55	Compact surface	1	–	–	–	–	–	–	1	–	15	–	–	–	17
F56	Thermal feature	–	–	–	–	–	–	–	1	1	–	–	–	–	2
F59	Compact surface	6	–	–	–	–	–	–	3	17	2	–	–	–	28
F60	Compact surface	–	–	–	–	–	–	–	–	–	–	–	–	–	0
F61	Earthen basin	–	–	–	–	–	–	–	2	–	–	–	–	–	2
F63	Compact surface	30	–	–	–	–	–	–	–	–	–	–	–	–	30
F64	Slab-lined depression	–	–	–	–	–	–	–	–	–	–	–	–	–	0
F65	Compact surface	–	–	–	–	–	–	–	–	–	–	–	–	–	0
F66	Thermal feature	–	–	–	–	–	–	–	–	–	–	–	–	–	0
F68	Compact surface	–	–	–	–	–	–	–	–	–	–	–	–	–	0
F69	Slab-lined cist	15	–	–	–	–	–	1	12	33	13	–	1	–	75
F70a	Surface rock alignment	–	–	–	–	–	–	–	–	–	–	–	–	–	0
F71a	Surface rock alignment	–	–	–	–	–	–	–	–	–	–	–	–	–	0
F73	Compact surface	32	–	–	–	–	–	–	10	49	–	–	–	–	91
F74	Thermal feature	1	–	–	–	–	–	–	–	–	17	–	–	–	18
F78	Compact surface	–	–	–	–	–	–	–	–	–	–	–	–	–	0
F81	Compact surface	47	–	–	–	–	–	–	11	95	–	–	–	–	153
Non-feature contexts		3,927	19	26	39	–	–	35	791	9,779	6,390	1	4	–	21,011
Total		6,123	30	45	54	0	0	47	1,188	14,539	13,716	2	11	2	35,757

a = Not excavated

Table 4. Radiocarbon Dates from 42WS3887.

Sample No.	FN	Major Feature	Context	Material	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age	Calibrated Date (2-sigma)
β311758	1540	Pithouse F31	F80: hearth fill	Maize cupule	1050 +/- 30 BP	-10.0 o/oo	1300 +/- 30 BP	A.D. 660 to 770
β311757	1537	Pithouse F31	F76: floor zone	Maize cob fragment	1060 +/- 30 BP	-10.9 o/oo	1290 +/- 30 BP	A.D. 660 to 780
β311756	1534	Pithouse F31	F76: floor zone	Maize cupule	1060 +/- 30 BP	-10.4 o/oo	1300 +/- 30 BP	A.D. 660 to 770
β311755	1518	Pithouse F31	F27: sandy loam fill	Maize cupule	1020 +/- 30 BP	-9.9 o/oo	1270 +/- 30 BP	A.D. 670 to 780 and A.D. 790 to 800
β311754	1507	Use zone F29	F29: use zone	Maize cob fragment	1060 +/- 30 BP	-11.1 o/oo	1290 +/- 30 BP	A.D. 660 to 780
β311753	1504	Thermal feature F74	F75: fill	Maize cupule	1010 +/- 30 BP	-9.8 o/oo	1260 +/- 30 BP	A.D. 670 to 780 and A.D. 790 to 810 and A.D. 850 to 850
β311752	1488	Slab-lined cist F69	F72: fill	Maize cupule	1060 +/- 30 BP	-10.7 o/oo	1290 +/- 30 BP	A.D. 660 to 780
β311751	1432	Thermal feature F56	F57: fill	Maize cob fragment	1030 +/- 30 BP	-10.2 o/oo	1270 +/- 30 BP	A.D. 670 to 780 and A.D. 790 to 800
β311750	1358	Thermal feature F51	F52: fill	Maize cupule	990 +/- 30 BP	-10.6 o/oo	1230 +/- 30 BP	A.D. 690 to 880
β311749	1254	Thermal feature F49	F50: fill	Maize cupule	970 +/- 30 BP	-11.0 o/oo	1200 +/- 30 BP	A.D. 720 to 740 and A.D. 770 to 890
β311748	1157	Thermal feature F45	F48: fill	Maize cupule	1000 +/- 30 BP	-10.8 o/oo	1230 +/- 30 BP	A.D. 690 to 880
β311747	1107	Thermal feature F47	F85: fill	Maize cupule	1050 +/- 30 BP	-10.9 o/oo	1280 +/- 30 BP	A.D. 660 to 780

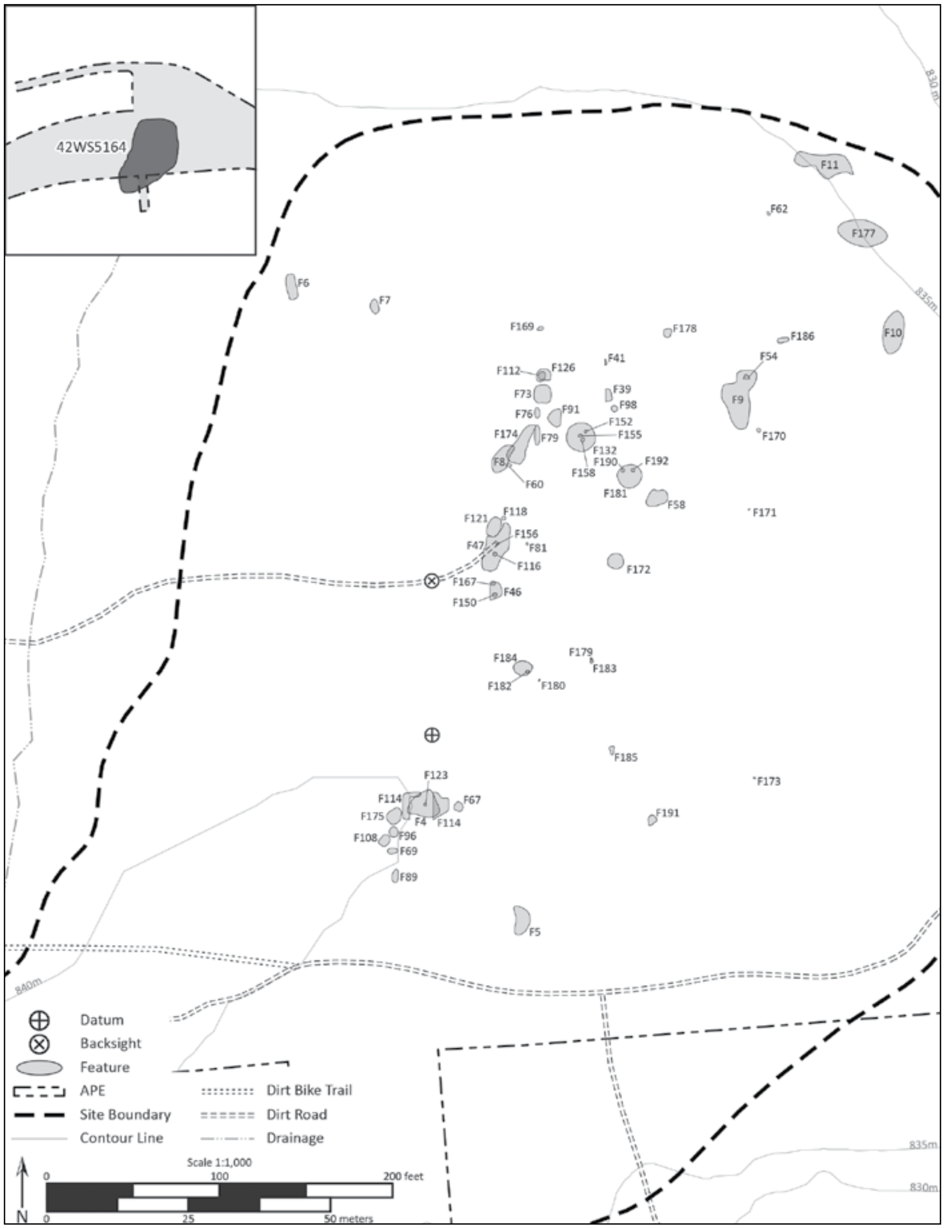

Figure 3. 42WS5164 site map.

surface of the site; many were identified more than 50 cm below the modern ground surface. Investigations for this project led to the recording of 45 prehistoric features and subfeatures (Figure 4; Table 8) and to the recovery and analysis of 17,713 artifacts including flaked stone, ground stone, ceramics, faunal remains, and shell (Table 9).

Two occupation periods were identified at 42WS5167 through both absolute and relative dating (Table 10; also see Table 1). The absolute dating consists of radiocarbon dates from 14 samples ranging from A.D. 60 to 320 and from

Table 5. Summary of Surface Features Recorded at 42WS5164.

Feature Type	Feature Number
Rock/slab or FCR concentrations	4, 5, 6, 7, 8, 10, 11, 58, 60, 62, 69
Charcoal/dark stain	35, 36, 37, 40, 41,61, 63, 90, 93, 94, 95
Thermal feature	9, 54, 67, 81, 98, 118, 123
Slab-lined cist	39, 79, 91, 96, 112, 121
Use zone/compact surfaces	38, 66, 99, 106, 125
Pithouse	132
Wattle-and-daub surface structure	46, 47, 73, 76, 108

A.D. 610 to 770, and the relative dating is based upon ceramic and projectile point typologies as well as typical architectural and site structure patterns for the region. The radiocarbon assays and artifact analyses are in general agreement and suggest the site was occupied during the late Basketmaker II period, and more substantially during the late Basketmaker III period.

The Basketmaker II occupation consisted of one pithouse (F20), a thermal feature (F92), and a possibly associated midden (F37). Pithouse F20 shared some characteristics with other Basketmaker II structures but in general this period has not been well documented in the St. George Basin. The small number of features and the lack of storage features clearly attributable to this period suggest a relatively short-term occupation at the site, although this is somewhat at odds with the level of investment in the pithouse construction.

The Basketmaker III occupation was more substantial and consisted of at least three pithouses (F15, F22, and F31), a wickiup (F42), multiple storage features (F112, F113, F117, and F118), at least two external thermal features (F24 and F38), and several use zones (F30, F35, and F41). This occupation is fairly consistent with other sites in the area. Based on the amount of available storage and macrobotanical evidence, occupation at the site during this period was most likely short-term during the growing and harvest season. Given the resolution of the AMS dates for the site, it is not possible to determine if the Basketmaker III pithouses were part of the same occupation or separate seasonal occupations.

Discussion

The following discussion considers these three sites from the Virgin River Site Complex in terms of site structure, diet and subsistence, and cultural interaction and exchange. The overall discussion is focused on the localized expression of these three research topics within the project area, but the sites and these topics are also considered from a regional perspective.

Settlement Patterns and Site Structure

The Virgin River Site Complex represents discontinuous occupations stretching from Basketmaker II through Pueblo II. The available radiocarbon dates and ceramic chronologies are not detailed enough to determine if these three sites were occupied at the same time, but it is possible to assess how the layout and features at these sites compare to other known Virgin Anasazi sites in the region.

Basketmaker II

A Basketmaker II occupation was only identified at 42WS5167. Basketmaker II sites in the Virgin area fall into one of two categories, rockshelter sites with semisubterranean storage cists and open pithouse sites (Lyneis 1995). Excavated rockshelter sites include Cave du Pont, located eight miles northeast of Kanab, Utah, and dated with dendrochronology to A.D.

Table 6. Recovered Artifact Assemblage from 42WS5164 by Feature.

Feature	Feature Type	Debitage	Cores	Projectile Points	Bifaces	Unifaces	Flaked Stone Tool (unanalyzed)	Hammerstones	Ground stone	Ceramics	Fauna (NISP)	Human Bone	Mineral	Shell	Other	Total
4	Rock/slab or FCR concentrations	39	11	1	1	–	–	–	–	106	1	–	–	–	1	160
5	Rock/slab or FCR concentrations	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
6	Rock/slab or FCR concentrations	3	–	–	–	–	–	–	–	2	–	–	–	–	–	5
7	Rock/slab or FCR concentrations	6	1	–	–	–	–	–	–	–	–	–	–	–	–	7
8a	Rock/slab or FCR concentrations	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
9	Thermal feature	285	–	–	2	–	–	–	3	45	–	–	–	–	–	335
10	Rock/slab or FCR concentrations	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1
11	Rock/slab or FCR concentrations	–	–	–	–	–	–	–	1	–	–	–	–	–	–	1
35	Charcoal/dark stain	9	–	–	–	–	–	–	–	–	–	–	–	–	–	9
36	Charcoal/dark stain	34	–	–	–	–	–	–	–	1	–	–	–	–	–	35
37a	Charcoal/dark stain	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
38	Use zone/compact surface	497	10	2	3	–	–	2	4	599	–	–	3	–	3	1,123
39	Slab-lined cist	27	1	1	–	–	–	–	1	18	34	–	–	–	–	82
40a	Charcoal/dark stain	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
41	Charcoal/dark stain	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
46	Wattle-and-daub surface structure	23	7	1	–	–	–	1	3	50	2	–	–	–	–	87
47	Wattle-and-daub surface structure	36	3	1	1	–	–	–	9	288	1	–	–	–	–	339
54	Thermal feature	19	–	–	–	–	–	–	–	1	–	–	–	–	–	20
58	Rock/slab or FCR concentrations	41	2	–	–	–	–	1	1	21	–	–	–	–	–	66
60a	Rock/slab or FCR concentrations	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
61	Charcoal/dark stain	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
62	Rock/slab or FCR concentrations	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0

a = Not excavated; b = Recovered during monitoring

Table 6. continued.

Feature	Feature Type	Debitage	Cores	Projectile Points	Bifaces	Unifaces	Flaked Stone Tool (unanalyzed)	Hammerstones	Ground stone	Ceramics	Fauna (NISP)	Human Bone	Mineral	Shell	Other	Total
63	Charcoal/dark stain	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
66	Use zone/compact surface	43	5	–	–	–	–	–	1	181	–	–	–	–	–	230
67	Thermal feature	19	1	–	–	–	–	–	3	47	–	–	–	–	1	71
69	Rock/slab or FCR concentrations	53	1	–	–	–	–	–	2	287	–	–	–	–	–	343
73	Wattle-and-daub surface structure	84	1	–	–	–	–	–	–	43	5	–	–	–	–	133
76a	Wattle-and-daub surface structure	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
79a	Slab-lined cist	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
81	Thermal feature	5	–	–	–	–	–	–	–	2	–	–	–	–	–	7
90a	Charcoal/dark stain	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
91	Slab-lined cist	73	1	–	–	–	–	–	1	46	23	–	–	–	–	144
93a	Charcoal/dark stain	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
94a	Charcoal/dark stain	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
95a	Charcoal/dark stain	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
96	Slab-lined cist	4	–	–	1	–	–	–	–	38	2	–	–	–	–	45
98	Thermal feature	4	–	–	–	–	–	–	–	5	25	–	–	–	–	34
99	Use zone/compact surface	2	–	–	–	–	–	–	1	3	–	–	–	–	–	6
106	Use zone/compact surface	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
108	Wattle-and-daub surface structure	2	–	–	–	–	–	–	1	59	6	–	–	–	–	68
112	Slab-lined cist	25	2	1	–	–	–	–	2	44	1	–	26	–	–	101
118	Thermal feature	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
121	Slab-lined cist	29	2	–	–	–	–	–	2	202	5	–	–	–	–	240
123	Thermal feature	–	–	–	–	–	–	–	1	–	–	–	–	–	–	1
132	Pithouse	156	1	5	4	–	–	–	3	284	31	–	–	–	1	485
172b	Charcoal/dark stain	4	–	–	–	–	–	–	–	28	–	–	–	–	–	32
177b	Wickiup	5	–	–	–	–	–	–	–	–	–	–	–	–	–	5
181b	Pithouse	72	–	2	–	–	2	–	13	218	146	–	–	–	–	453
191b	Human burial	–	–	–	–	–	–	–	–	–	–	9	1	–	–	10

a = Not excavated; b = Recovered during monitoring

Table 6. continued.

Feature	Feature Type	Debitage	Cores	Projectile Points	Bifaces	Unifaces	Flaked Stone Tool (unanalyzed)	Hammerstones	Ground stone	Ceramics	Fauna (NISP)	Human Bone	Mineral	Shell	Other	Total
Non-feature contexts	–	3,134	16	1	14	1	–	1	30	1,971	214	–	–	4	29	5,415
Total		4,733	66	15	26	1	2	5	82	4,589	496	9	30	4	35	10,093

a = Not excavated; b = Recovered during monitoring

217 (Lyneis 1995; McFadden 2007; Nusbaum 1922); South Fork, located on the Colorado Plateau and dated with dendrochronology to as early as 81 B.C. (Lyneis 1995; McFadden 2007); Rock Canyon Shelter on the Arizona Strip (Janetski and Wilde 1989); Black Dog Cave in the Lowland Virgin area of Nevada (Harrington 1942); ZNP-21, in Zion Park on the eastern edge of the St. George Basin (Schroeder 1955); and Shadow Shelter in the Sand Hollow Basin, just east of the current project area, and dated via radiocarbon assay to A.D. 340 (1670 ± 50 B.P.) (Talbot and Richens 2002:42). An ephemeral Basketmaker II occupation consisting of an eroded hearth and lacking architecture was also identified via radiocarbon assay at Sand Hollow in Component 26 (1940 ± 50, index date A.D. 70) of the Dune Complex (42WS2820) (Talbot and Richens 2002:171–172).

Open pithouse sites dating to the Basketmaker II period are not common in the St. George Basin. The remains of a burned Basketmaker II pithouse were excavated at the Obsidian Cache Site (42WS4474) northwest of Washington, Utah. A charcoal sample yielded a 2-sigma calibrated AMS radiocarbon date range of A.D. 30 to 220, and a maize sample yielded a 2-sigma calibrated date range of A.D. 60 to 240 (Eskenazi and Roberts 2008). A large, shallow, basin-shaped pithouse was also excavated at 42WS3544 in Sand Hollow. The feature was dated by two radiocarbon assays to between 44 B.C. and A.D. 332 (Winslow 2010). Four probable Basketmaker II pithouses were excavated at 42WS2195, near the Arizona-Utah border southwest of Hildale. Only one of the pithouses was radiocarbon dated (A.D. 533–613), but all four pithouses were aceramic, slab-lined, and stratigraphically below a later-dating (late Pueblo I/Pueblo II) L-shaped alignment of storage rooms, a fifth pit structure, occupation surfaces, and other features (Nielson 1998). Multiple pithouses thought to date to the Basketmaker II period have also been recently excavated as part of the Jackson Flats Reservoir data recovery project. Dating and analysis of these structures is currently ongoing (Roberts 2013).

Numerous potentially Basketmaker II habitation sites have also been noted in the lower Virgin area in southeast Nevada. These sites have been poorly reported but typically consist of one to five pit structures without associated storage features (Harrington 1937; Larson 1978; Lyneis 1995; Schroeder 1953; Shutler 1961). At least six aceramic pithouse sites in the Moapa Valley have also been assigned to the Basketmaker II period (Harrington 1937; Schroeder 1953; Shutler 1961). In the Arizona Strip, two shallow, basin-shaped Basketmaker II pithouses dated to between A.D. 100 and 340 via six radiocarbon assays along with two isolated, and undated, unlined bell-shaped storage cists were reported at the Little Jug site in the Tuweep area (Thompson and Thompson 1978, 1983, cited in Walling and Thompson 2004:15).

Table 7. Radiocarbon Dates from 42WS5164.

Sample No.	FN	Major Feature	Context	Material	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age	Calibrated Date (2-sigma)
β311762	2044	Pithouse F132	F140: floor zone	Maize cob fragment	1010 +/- 30 B.P.	-11.1 o/oo	1240 +/- 30 B.P.	A.D. 680 to 880 (B.P. 1270 to 1070)
β311761	1946	Slab-lined cist F121	F122: fill	Maize cupule	1020 +/- 30 B.P.	-10.2 o/oo	1260 +/- 30 B.P.	A.D. 670 to 780 (B.P. 1280 to 1170)/A.D. 790 to 810 (B.P. 1160 to 1140)/ A.D. 850 to 850 (B.P. 1100 to 1100)
β311760	1823	Wattle-and-daub structure F47	F117: fill of slab-lined hearth	Maize cupule	1000 +/- 30 B.P.	-11.1 o/oo	1230 +/- 30 B.P.	A.D. 690 to 880 (B.P. 1260 to 1060)
β311759	1516	Thermal feature F98	F100: fill	Maize cupule	1170 +/- 30 B.P.	-12.9 o/oo	1370 +/- 30 B.P.	A.D. 640 to 680 (B.P. 1310 to 1270)

In general, examples of Basketmaker II occupations west of Cave du Pont are rare (Lyneis 1995). F20 at 42WS5167 is the most formally constructed and securely dated Basketmaker II pithouse presently reported in the St. George Basin. The pithouses described at Sand Hollow (42WS3544) and the Obsidian Cache Site (42WS3544) are very basic and lack evidence of a bench or formal preparation of walls, floor, or hearth. Due to the small sample size of excavated Basketmaker II pithouses, it is not yet possible to determine if regionally specific forms or characteristics exist. However, in general the F20 pithouse is more similar in basic form to those reported for Basketmaker II in southeastern Nevada (Figure 5). Like the Nevada examples, pithouse F20 is nearly circular with a diameter of approximately 6 m and a hearth located slightly off-center. However a poorly preserved bench was also identified in F20, a trait not reported for the Nevada pithouses. Further, the central hearth in F20 was stone-lined while adobe-lining is reported for the Nevada pithouses. The walls and floor of pithouse F20 were also formally prepared with plaster. It is not clear from the limited reports of other Basketmaker II pithouses if this is a common or rare trait.

Basketmaker III

42WS3887 and 42WS5167 have occupations thought to date to the Basketmaker III period. Basketmaker III sites typically consist of small, deep, benched, and slab-lined pithouses with shallow antechambers. Storage features consist of deep, semi-circular cists lined with vertically set slabs. Cists are often found in clusters but can also be dispersed. Basketmaker III sites tend to be less structured compared to later Pueblo period sites (Dalley and McFadden 1985; Lyneis 1995). Prior to A.D. 900 sites often consist of scattered or clustered cists on the north side of a pithouse (Talbot 1990). Typical Basketmaker III habitation sites in the Virgin area consist of one to five pithouses with accompanying subterranean or semi-subterranean slab-lined

Figure 4. 42WS5167 site map.

storage cists (Fairley 1989; Lyneis 1995). Several examples of Basketmaker III habitation sites have been excavated in and near the St. George Basin. Closest are the Big Dune Site and Road Runner Village, both located between Virgin and Grafton, Utah (Baker and Billat 1992). Basketmaker III occupations have also been identified in Zion Park on the edge of the St. George Basin (Schroeder 1955). Other Basketmaker III sites can be found throughout the region, including on Little Creek Mountain and near Kanab, Utah, further south on the Arizona Strip, and in southeastern Nevada (Fairley 1989).

Table 8. Summary of Surface Features Recorded at 42WS5167.

Feature Type	Feature Number
Surface stain	5
Pithouse	15, 20, 22, 31, 62
Wickiup	42
Use zone	18, 30, 35, 41, 45, 114
Midden	37
Thermal feature	38, 44, 92, 110
Slab-lined cist	112, 113, 125
Unlined pit	117, 118

In general, the site structure of 42WS3887 and feature types are consistent with site structures typical of the Basketmaker III across the St. George Basin and the greater Ancestral Pueblo region, particularly in the Kayenta area (Dalley and McFadden 1985; Fairly 1989; Geib 2011; Lyneis 1995; Powell and Smiley 2002; Talbot 1990; Young and Gilpin 2012). As at other Virgin sites, there was no evidence at 42WS3887 of ceremonial/private spaces or architecture. Although not completely excavated, pithouse F31 at 42WS3887 shares many features seen in other Virgin sites including a prepared bench, a central clay-lined hearth, and subfloor pits (Figure 6). The structure is associated with at least one typical Basketmaker III slab-lined storage cist. Unexcavated rock alignments F70 and F71 may represent two additional slab-lined cists. Both features consisted of three partially exposed upright sandstone slabs. The number and size of the storage facilities and the single pithouse suggest seasonal occupation of the site by a small group likely during the agricultural season.

The majority of the features at 42WS5167 have associated AMS radiocarbon dates that fall towards the end of the Basketmaker III period, and the site displays many of the typical characteristics for the Basketmaker III. Features assigned to this period include pithouses F15 and F22, probable wickiup F42, the F15 post-abandonment basin (F23) and hearth (F24), thermal feature F44, and unlined pit F117. Based on ceramic types, construction characteristics, and stratigraphic relationships, a number of other features also likely date to the end of the Basketmaker III period: pithouse F31; use zones F30, F35, and F41, thermal feature F38, unlined pit F118, and slab-lined storage cists F112 and F113.

The three Basketmaker III pithouses are fairly similar to each other in terms of construction, although F15 is somewhat larger than F22 and F31. AMS radiocarbon dates, ceramic chronology, and architectural characteristics suggest the pithouses may have been in use at the same time. All three pithouses are circular with prepared floors, partially preserved benches, collared and clay-lined central hearths, and basins and pits in the floors. Pithouses F15 and F31 (Figure 7) were also partially slab-lined at the time of excavation. No antechambers or ventilators were noted for the three pithouses.

42WS5167 is most similar to Roadrunner Village in terms of living structures. Both sites had three pithouses that may have been in use at roughly the same time. The pithouses at the sites have several architectural similarities including general shape and size, but there are several noteworthy differences as well. Benches were present in all the pithouses at 42WS5167 but in only one pithouse at Road Runner Village. Slab-lined walls and prepared clay floors are also more common at 42WS5167. Formal collared, clay-lined hearths were also identified in all the pithouses at 42WS5167. Only one pithouse at Road Runner Village had a clear hearth and it was not lined. In general, the pithouses at 42WS5167 are more formal than those at Road Runner Village. Some differences such as slab-lining and clay preparation of surfaces may simply be necessities when constructing pithouses in sandy soils as opposed to caliche (Road Runner Village). Other features such as the benches and hearths reflect an increased investment in pithouse construction perhaps indicating a more intense, longer term or year round occupation of the site. The slab-lined cists F112 and F113 are

Table 9. Recovered Artifact Assemblages from 42WS5167 by Feature.

Feature	Feature Type	Debitage	Cores	Projectile Points	Bifaces	Unifaces	Ground stone	Ceramics-Painted	Ceramics-Unpainted	Fauna (NISP)	Mineral	Shell	Other	Total
5	Surface stain	145	–	–	1	–	1	2	36	–	–	–	–	185
15	Pithouse	2,550	13	18	18	2	43	128	2,354	517	–	1	1	5,645
18	Use zone	174	1	1	1	–	–	2	21	3	–	–	–	203
20	Pithouse	790	1	8	20	–	14	1	6	44	1	1	–	886
22	Pithouse	252	8	2	3	–	5	50	496	40	–	–	771	1,627
30	Use zone	516	2	1	1	–	1	13	289	1	–	–	–	824
31	Pithouse	249	8	2	–	–	3	12	219	40	–	–	1	534
35	Use zone	41	–	–	–	–	–	–	35	4	–	–	–	80
37	Midden	1,754	–	–	1	–	–	–	–	1	–	–	–	1,756
38	Thermal feature	27	–	–	–	–	–	3	27	17	–	–	–	74
41	Use zone	82	–	–	1	–	–	4	117	66	–	–	–	270
42	Wickiup	394	4	3	5	1	9	47	1,099	356	–	–	1	1,919
44	Thermal feature	47	–	–	–	–	–	3	33	1	–	–	–	84
45	Use zone	1,951	–	–	1	–	2	2	44	1	–	–	–	2,001
92	Thermal feature	26	–	–	–	–	–	–	–	2	–	–	–	28
110a	Thermal feature	–	–	–	–	–	–	–	–	–	–	–	–	0
112	Slab-lined cist	35	1	–	1	–	3	–	37	13	1	–	–	91
113	Slab-lined cist	32	1	–	–	–	2	2	18	–	–	–	–	55
114a	Use zone	–	–	–	–	–	–	–	–	–	–	–	–	0
117a	Unlined pit	–	–	–	–	–	–	–	–	–	–	–	–	0
118a	Unlined pit	–	–	–	–	–	–	–	–	–	–	–	–	0
125a	Slab-lined cist	–	–	–	–	–	–	–	–	–	–	–	–	0
Non-feature contexts		809	4	5	7	–	26	27	569	4	–	–	–	1,451
Total		9,874	43	40	60	3	109	296	5,400	1,110	2	2	774	17,713

a = Not excavated

Table 10. Radiocarbon Dates from 42WS5167.

Sample No.	FN	Major Feature	Context	Material	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age	Calibrated Date (2-sigma)
β-311765	709	Midden F37	F37: midden	Maize cupule fragment	1600 +/- 30 B.P.	-12.1 o/oo	1810 +/- 30 B.P.	A.D. 130 to 260 (B.P. 1820 to 1690) and A.D. 300 to 320 (B.P. 1650 to 1630)
β-311770	886	Pithouse F15	F54: collared clay-lined hearth	Maize cupule	1070 +/- 30 B.P.	-11.1 o/oo	1300 +/- 30 B.P.	A.D. 660 to 770 (B.P. 1290 to 1180)
β-311769	808	Pithouse F15	F16: fill	Maize cob segment	1170 +/- 30 B.P.	-11.5 o/oo	1390 +/- 30 B.P.	A.D. 610 to 670 (B.P. 1340 to 1280)
β-311768	769	Pithouse F15	F51: floor zone	Maize cupule	1080 +/- 30 B.P.	-10.6 o/oo	1320 +/- 30 B.P.	A.D. 650 to 720 (B.P. 1300 to 1230) and A.D. 740 to 770 (B.P. 1210 to 1180)
β-311766	711	Pithouse F15	F23: basin above post-abandonment fill	Maize cupule	1180 +/- 30 B.P.	-10.9 o/oo	1410 +/- 30 B.P.	A.D. 600 to 660 (B.P. 1350 to 1290)
β-311763	443	Pithouse F15	F24: hearth in basin (F23) above post-abandonment	Maize cupule	1110 +/- 30 B.P.	-10.7 o/oo	1340 +/- 30 B.P.	A.D. 650 to 690 (B.P. 1300 to 1260) nd A.D. 750 to 760 (B.P. 1200 to 1190)
β-315702	1126	Pithouse F20	F75: floor zone	Outer rings Douglas Fir log	1830 +/- 30 B.P.	-21.6 o/oo	1890 +/- 30B.P.	A.D. 60 to 180 (B.P. 1890 to 1770) and A.D. 190 to 210 (B.P. 1760 to 1740)
β-311773	1060	Pithouse F22	F64: floor zone	Maize cupule	1110 +/- 30 B.P.	-11.3 o/oo	1330 +/- 30 B.P.	A.D. 650 to 710 (B.P. 1300 to 1240) and A.D. 750 to 770 (B.P. 1200 to 1180)
β-311764	554	Thermal feature F44	F44: thermal feature	Maize cupule	1100 +/- 30 B.P.	-11.3 o/oo	1320 +/- 30 B.P.	A.D. 650 to 720 (B.P. 1300 to 1230) and A.D. 740 to 770 (B.P. 1210 to 1180)
β-311775	1099	Thermal feature F92	F92: intrusive hearth in upper fill of F20	Maize cupule	1590 +/- 30 B.P.	-10.9 o/oo	1820 +/- 30 B.P.	A.D. 130 to 250 (B.P. 1820 to 1700)
β-311777	1207	Unlined pit F117	F117: unlined pit	Maize cupule	1100 +/- 30 B.P.	-11.4 o/oo	1320 +/- 30 B.P.	A.D. 650 to 720 (B.P. 1300 to 1230) and A.D. 740 to 770 (B.P. 1210 to 1180)
β-311772	993	Wickiup F42	F43: fill	Maize cob segment	1110 +/- 30 B.P.	-10.7 o/oo	1340 +/- 30 B.P.	A.D. 650 to 690 (B.P. 1300 to 1260) and A.D. 750 to 760 (B.P. 1200 to 1190)
β-311771	922	Wickiup F42	F58: hearth	Maize cupule	1120 +/- 30 B.P.	-10.6 o/oo	1360 +/- 30 B.P.	A.D. 640 to 680 (B.P. 1310 to 1270)
β-311767	732	Wickiup F42	F43: fill	Maize cupule	1080 +/- 30 B.P.	-10.2 o/oo	1320 +/- 30 B.P.	A.D. 650 to 720 (B.P. 1300 to 1230) and A.D. 740 to 770 (B.P. 1210 to 1180)

Figure 5. F20, a Basketmaker II pithouse at 42WS5167, post-excavation.

Figure 6. F31, a Basketmaker III pithouse at 42WS3887, post-excavation.

Figure 7. F31, a Basketmaker III pithouse at 42WS5167, post-excavation.

also similar in construction to those described at Road Runner Village and other Basketmaker III sites in the Virgin area (Figure 8). Walls were supported by large upright sandstone slabs with smaller slabs and clay used to fill and seal. Floors were constructed with small fitting slabs capped with clay.

The number of storage features identified at 42WS5167 is quite small compared to other sites, however. This is at odds with the number of formal pithouses at the site. Other sites of similar size, namely Road Runner Village, have considerably more storage space. Macrobotanical analysis indicates a focus on maize agriculture. If the pithouses were in use simultaneously, then it is possible that storage features were missed during excavation, or they were not preserved.

Pueblo I

42WS5164 has at least one occupation likely dating to the Pueblo I period. Pueblo I sites in the Virgin region tend to contain larger, deep pithouses often with benches and slab-lining. Storage features consist of large, deep, round or oval-shaped cists and rooms often with low masonry exterior walls. These structures generally occur contiguously in slight arcs but are sometimes spaced apart. Pithouses are sometimes found at one end of the arc, sometimes attached to storage structures (Dalley and McFadden 1985; Fairley 1989; Lyneis 1995). The Pueblo I period also includes the appearance of wattle-and-daub or jacal surface structures for storage and occasionally for habitation (Fairley 1989). Several other Pueblo I sites have been excavated in and around the St. George Basin including the Little Man 3 Site (Dalley and McFadden 1988), multiple sites at Quail Creek (Walling et al. 1986), the Red Cliffs Site (Dalley and McFadden 1985), the Kanab Site (Nickens and Kvamme 1981), and the Plain View Site (Eskenazi 2006).

The site layout at 42WS5164 is typical of the Pueblo I period, with several traits common of the early Pueblo I period including the combined use of subterranean cists and wattle-and-daub surface storage rooms, the use of low masonry walls, and curvilinear alignments roughly west or

Figure 8. F112, a Basketmaker III slab-lined cist at 42WS5167, post-excavation.

northwest of the pithouses (see Figure 6) (Dalley and McFadden 1985; Fairley 1989; Lyneis 1995). In the southern portion of the site, if F4 is in fact the remains of a surface structure, it may form the beginnings of a linear arrangement with surface structure F108 and slab-lined cist F96. In the central area of the site, surface structures F46 and F47 and slab-lined cist F121 likely date to the same occupation and the layout of the three features is also curvilinear (Figure 9). In the northern area of the site, slab-lined cist F112, surface structure F73, and slab-lined cist F91 form a curvilinear arrangement with pithouses F132 and F181 off the southeastern end.

The described features at 42WS5164 are quite similar to those described at other Pueblo I sites in and near the St. George Basin. Pithouse F132 was nearly circular with a pit diameter of 4 m (Figure 10). A prepared bench encircled the pit and was at least partially slab-lined on the south side. The floor was prepared with several centimeters of clay, and a collared, clay-lined hearth was located near the center. F181 was a roughly circular, slab-lined pithouse with a diameter of 4–4.6 m that lacked a formal bench (Figure 11). Two 10–12 cm thick adobe wings were also identified in the southeastern portion of the pithouse floor. These construction characteristics were also identified in the pithouses at 42WS388 (Quail Creek), the Red Cliffs Site, and the Kanab Site. The pithouse at Little Man 3 is similar in overall size and shape but lacks many of the more formal features described at other Pueblo I sites. This is likely due to the difficulty of constructing a formal pithouse in the extremely gravelly substrate at the locality (Dalley and McFadden 1988). The Plain View Site also lacks a formal pithouse perhaps indicating that this site was used only for short-term visits during food processing and storage activities (Eskenazi 2006). One unusual characteristic of pithouse F132 at 42WS5164 was the basalt stones recovered from the floor pits F152 and F158. Shivwits tribal representatives suggested the stones and pits (heating pits) may have been used to help heat the pithouse during

Figure 9. F121, a large slab-lined cist dating to the late Basketmaker III or early Pueblo I period at 42WS164, post-excavation.

Figure 10. F132, a pithouse dating to the late Basketmaker III or early Pueblo I period at 42WS5164, post-excavation.

Figure 11. F181, a likely dating to the late Basketmaker III or early Pueblo I period at 42WS5164, post-excavation.

colder months, an architectural trait common in winter houses found in the Four Corners area, and recently reported for the Jackson Flat Reservoir project outside Kanab (Roberts 2013, 2014). The boulder recovered from F152 showed evidence of burning while the boulder recovered from F158 did not.

The subterranean slab-lined cists at 42WS5164 are extremely similar to cists reported at the Plain View Site, at 42WS388 (Quail Creek), and at the Kanab Site. These cists vary in size and preservation, but all have the same construction characteristics. The cists reported at Little Man 3 differ somewhat. They are typically not as deep and boulders are used for lining walls rather than sandstone slabs. Like the pithouse, these differences can be attributed to the difficulty of digging at the locality and the local availability of boulders. The storage cists at the Red Cliffs Site are similar in subterranean construction, but at least three also incorporated low masonry walls. This trait may be present at 42WS5164 but it is not as clearly preserved. An increased amount of stone does occur in the immediate area surrounding F121 that may be the remains of an exterior stone wall. Cists F112 and F96 both have several boulders along their perimeters that appear to have been used to secure the sandstone slab walls.

Diet and Subsistence

Overall, the environmental data are consistent with what is generally known about Virgin Anasazi subsistence in the St. George Basin, and suggest an emphasis on maize and other agricultural products beginning in the Basketmaker II period, opportunistic consumption of a number of wild plants, and regular consumption of a variety of wild animals with emphasis on lagomorphs and artiodactyls (Allison 1990; Baker and Billat 1992; Lyneis 1992, 1995; Martin 1996; Walling et al. 1986; Watson 2008). The environmental data also suggest that occupants of the sites utilized a variety of local ecotones for both plant and animal resources, including agricultural fields located in the lowlands along the Virgin River or nearby springs, a well-developed riparian habitat with perennial water, and drier, upland communities such as semi-desert grasslands. The sites were most likely occupied at least from late summer through early fall, when many of the wild plant resources mature, and likely also in the spring during the early agricultural season. None of the environmental data provides direct evidence of cold-season occupation of the sites, but such occupations also cannot be ruled out.

Macrobotanical and Pollen Assemblages

The macrobotanical assemblage in particular provides ample evidence for the cultivation of maize at all three sites, including kernels, cupules, and/or cob fragments recovered from pithouses, slab-lined cists, thermal features, and middens dating to both the Basketmaker II and Basketmaker III periods (Adams 2014). At 42WS5164, a single grain of maize pollen was recovered from a pithouse floor (Davis 2014). The presence of even a single grain of maize pollen from a reliable context (the floor of a pithouse) is significant and suggests that agricultural fields were likely located near the site, as maize pollen, although wind-pollinated, does not travel far from its source due to "its large size, lack of buoyancy, and shape" (Clary 1994:297). This assumption is supported by arable land studies conducted for the project that indicate agricultural fields were likely located very near the sites discussed here (Medeiros et al. 2014).

Limited evidence of domesticated beans was also recovered from both 42WS3887 and 42WS5164, suggesting that maize was not the only domesticated plant cultivated and consumed by the sites' inhabitants. At both 42WS3887 and 42WS5167, a variety of wild plant foods such as cheno-ams, beeweed, bulrush, four-wing saltbush, Fabaceae, husk tomato/solanum, prickly pear cactus, stickleaf, members of the sunflower family, bulrush, and wild legumes are also represented in samples dating to the Basketmaker III period. At 42WS5167, evidence for the collection of wild plant foods was limited for the Basketmaker II period, with only four-wing saltbush and husk tomato/Solanum represented in the samples. Cheno-ams, beeweed, and husk tomato/solanum in particular grow as weeds in disturbed areas such as agricultural fields near site vicinities, and their growth may have been encouraged by the site occupants to supplement their diet.

Unlike 42WS3887 and 42WS5167, no wild plant foods are represented in the macrobotanical samples from 42WS5164, and the concentrations present in the pollen samples are generally too low to indicate intentional use by the site's occupants. Given the proximity of the three sites to each other, and therefore a shared natural environment, in conjunction with no known preservation issues at 42WS5164 as compared to either 42WS3887 or 42WS5167 and extensive sampling at all three sites, it may be that agriculture was more successful for the occupants of 42WS5164, and that they did not require as much reliance on the natural environment for wild resources to supplement the diet (Adams 2014).

Faunal Remains

Overall, the faunal remains from the Virgin River Site Complex are not typical of other reported Virgin Anasazi faunal assemblages. They are well-preserved, unusually diverse, and the assemblage from 42WS3887 is the largest single assemblage reported from a Virgin Anasazi site in the St. George Basin with 13,716 specimens recovered. A total of 1,113 specimens were recovered from 42WS5167 while 350 specimens were recovered from 42WS5164.

A recent study by Watson (2008) found that faunal-based subsistence strategies in the St. George Basin, where there is greater species diversity and biodensity compared to other areas of the Virgin region, "focused on a combination of high-yield species such as deer and bighorn sheep and highly abundant species such as jackrabbit and cottontail" (Watson 2008:453). Faunal remains recovered from the Virgin

River Site Complex support Watson's findings. Leporids and, to a lesser degree, artiodactyls (primarily white-tailed or mule deer), dominate the assemblages and represent the most significant components of the meat-based diet (Mayfield and Pavao-Zuckerman 2014). A high lagomorph index calculated for all four sites (0.68 NISP) indicates that a larger number of cottontails were being hunted and utilized as compared to hares or jackrabbits within the Virgin River Site Complex. Cottontails are smaller and slower than hares and jackrabbits, so the abundance of food as well as the ability to hide within nearby agricultural fields would have created an environment where these species could thrive and multiply rapidly (Dean 2007; Driver and Woiderski 2008; Szuter 1991; Szuter and Baymen 1989).

The assemblages from both 42WS3887 and 42WS5167 also include carnivores and birds, including birds of prey, waterfowl, gamefowl, rails, and passerine (perching) and near-passerine birds; interestingly, no fish were identified in any of the assemblages. Most of the species identified are locally available (Red Cliffs Desert Reserve 2013), and indicate use of two primary ecotones: 1) a semi-desert grassland with some ground cover; and 2) a well-developed riparian forest with perennial water (the Virgin River).

Cultural Interaction and Exchange

The Virgin River Complex sites each possess limited evidence for cultural interaction and/or long distance exchange. The evidence is variously tied to the presence of non-local ceramic wares, non-local raw materials in the flaked stone and ground stone assemblages, and a small quantity of shell. None of the architecture/features at the sites display traits characteristic of other cultural traditions typically associated with the Southwest, Mojave Desert, or Great Basin. Overall, the available evidence suggests that occupants of the sites within the Virgin River Site Complex maintained ties with the whole of the Virgin region, and also to several groups, including the Fremont, Kayenta Anasazi, and possibly the Hohokam and/or groups in the Mojave Desert and along the California coast. However, these inferences are based on very small assemblages of exotic artifacts recovered from the sites, and should be considered tentative without additional data.

Ceramics

Non-local ceramic wares are present in very small quantities at both 42WS5164 and 42WS5167; none were recovered from 42WS3887. One non-local ware, Shinarump Plain, is represented by a single sherd at 42WS5164. Although there is a significant amount of discussion regarding the characteristics that comprise this ware (see Collette 2009; Colton 1952; Lyneis 2008; Spencer 1934; Walling and Thompson 2004), generally it is believed to have been manufactured on the Eastern Plateaus, east of Kanab near Johnson Canyon.

Non-local wares at 42WS5167 include one Moapa Ware sherd, seven Shinarump Ware sherds, and two Tallahogan Red sherds. Both Moapa and Shinarump wares indicate ties to other areas of the Virgin region, albeit in different directions. Boulder Gray, which contains olivine temper, is manufactured in northern Arizona near Mt. Trumbull (Lyneis 2008), south of the St. George Basin, while Shinarump Plain is believed to have been manufactured on the Eastern Plateaus. Tallahogan Red is an early Kayenta red ware, generally dating to the Basketmaker III–Pueblo I periods, and is a widely distributed trade ware in the Four Corners area (Lucius and Wilson 1982:113–115). Notably, this type has not been previously reported in the St. George Basin (Richens et al. 2014). At the very least, the presence of Tallahogan Red indicates ties to the east, perhaps with the Kayenta Branch, but more likely with other Virgin groups living on the Eastern Plateaus, especially given the presence of Shinarump Plain and the recent reporting of Tallahogan Red at Virgin sites in this area (Roberts 2014).

Flaked Stone and Ground Stone

The majority of the flaked stone and ground stone assemblages is manufactured from a diverse assortment of locally available raw materials, including sedimentary (sandstone, chert, and limestone), igneous (andesite, basalt, granite, and rhyolite), and metamorphic (marble, quartzite) rocks. The project area, and the St. George Basin in particular, is geologically diverse (Hayden 2005; Higgins and Willis 1995), and these raw materials are generally available within 10–15 km of the project area (Hintze et al. 2000), and often are significantly closer. With few exceptions, raw materials were likely expediently and opportunistically procured from the general site environment, including from the Virgin River bed and numerous outcrops near the sites.

Three non-local raw materials, obsidian in the flaked stone assemblages, and lignite/subbituminous coal and turquoise in the ground stone assemblages, are also present. A total of 54 pieces of obsidian was recovered from 42WS3887, 42WS5164, and 42WS5167, with the majority (59 percent) coming from 42WS3887. The obsidian was geochemically linked to seven different obsidian sources in the Great Basin. Most of the obsidian (44 pieces), including debitage and flaked stone tools, was linked to the Panaca Summit/Modena source, which is the closest source to the project area located between 63 and 68 km to the northwest on the Utah–Nevada border. The remaining pieces of obsidian were linked to six sources—Black Mountain, Black Rock Area, Kane Springs Wash Caldera Varieties 1 and 2, Rock Canyon I, and Wild Horse Canyon. Rock Canyon I is also located reasonably close to the project area, between 69 and 75 km to the northeast. The other five sources are located significantly farther away, with the closest sources being Kane Springs Wash Caldera Varieties 1 and 2, located between roughly 100 and 106 km to the west, and the farthest being Black Rock Area, located roughly 185 km to the northeast. The obsidian sourced to both Panaca Summit/Modena and Rock Canyon I may have been acquired directly by the occupants of these sites, given the sources' relatively close proximity to the project area, but it may also have been acquired through trade. The obsidian pieces sourced to Kane Springs Wash, Black Mountain, and Wild Horse Canyon, all of which are located significantly farther away from the project area, were almost certainly obtained through trade as partially worked or complete artifacts. This inference is supported by the fact that all of the obsidian artifacts sourced to these distant and less represented obsidian sources at these sites are bifaces or projectile points, as opposed to debitage, cores, or pieces of shatter, which would be representative of onsite manufacturing (see Seddon 2001).

Two pieces of turquoise analyzed as part of the ground stone assemblage at 42WS3887, one unmodified piece and one disc bead, were sourced through lead and strontium isotope ratio analysis (Thibodeau 2014), and have isotopic ratios that are similar to or overlap with those found in turquoise collected from three geographically clustered sources: Halloran Springs (San Bernardino County, California), Crescent Peak (Clark County, Nevada), and Mineral Peak (Mojave County, Arizona). Neither piece could be definitively associated with any of these three mining districts, but it seems likely that the unmodified piece of turquoise originated from Crescent Peak, based on similarities in the lead ratios between this source and the raw turquoise. The Crescent Peak mine is located within the far southwestern reaches of the Lowland Virgin area, near modern-day Boulder City.

A number of black disk beads likely manufactured from lignite are also present in the ground stone assemblages from 42WS3887, 42WS5164, and 42WS5167. Lignite was often used by Ancestral Puebloan groups to manufacture items for personal adornment, including disk beads, pendants, and plaques (Jernigan 1978:147). Large surface deposits of lignite are found in the Four Corners area, especially in northern Arizona near Black Mesa, in southwestern Colorado, and in northwestern

New Mexico (Kirschbaum and Biewick 2000), near the Kayenta and Mesa Verde regions; these deposits are assumed to be the primary source of lignite used by Ancestral Pueblo groups and traded into other areas of the Southwest (Jernigan 1978:147, 215). It is possible that these coal fields are also the source of the lignite used to manufacture the beads recovered from these sites, and would suggest trade ties to the east, most likely with the Kayenta. However, Janetski (2002:357) has suggested that the lignite used to manufacture beads recovered from Five Finger Ridge, a Fremont habitation in Clear Creek Canyon, south-central Utah, may have been obtained from Salina Creek, 60 km northeast of Clear Creek Canyon and about 250 km northeast of the project area. There is evidence of interaction between the Virgin Anasazi in the St. George Basin and the Fremont to the north (for an overview, see Janetski 2002), and it is possible that the lignite beads found in the Virgin River Site Complex were actually obtained through trade with the Fremont rather than with other Ancestral Puebloan groups. Further compositional analyses would need to be undertaken to verify the origin of the beads.

Shell

Small assemblages of shell were also recovered from 42WS3887, 42WS5164, and 42WS5167. The assemblage from 42WS3887 includes several *Olivella* shell beads (simple lopped type A1 [Bennyhoff and Hughes 1987:85, 116–119]) as well as a number of unidentified shell fragments. The assemblage from 42WS5164 includes one *Olivella* shell bead and one unidentified shell fragment. The assemblage from 42WS5167 includes three fragments and seven ornaments, however none of the shell was identified to genus/species. *Olivella* shell was traded throughout the Southwest, including into the Virgin region, by both the Hohokam, who obtained it from the Gulf of California, and by central and southern California groups, who obtained it from the Pacific Coast (Gumerman and Dean 1989; Jernigan 1978; Lyneis 1984, 1995; Vokes and Gregory 2007). The *Olivella* beads at 42WS3887 and 42WS5164 were not identified to species (e.g., *O. biplicata* or *O. dama*), so the origin of these particular shells cannot be determined.

Conclusion

The three sites discussed here present a broad picture of localized Virgin Anasazi occupation in the project area primarily dating to the late Basketmaker III and early Pueblo I periods, although the area was clearly used from at least the Basketmaker II through Late Prehistoric periods. The large number of radiometric dates from secure contexts proved integral to establishing chronological control for the project, and while contemporaneity of several of the sites cannot be discounted, differences in site structure and architectural characteristics, temporally diagnostic artifacts, site location, and absolute dates suggest that the primary occupations of these sites may in fact represent sequential, seasonal, persistent reuse of the area over a period of roughly 100 to 200 years, possibly by the same extended social group(s). Following Schlanger (1992), the Virgin River Site Complex, when the sites are considered together, may represent a persistent place on the cultural landscape, one with desirable/unique environmental qualities including suitable and nearby agricultural land, rich and locally available wild flora and fauna resources, and permanent water, that encourage and facilitate culturally relevant activities, practices, and/or behaviors, including a commitment to agriculture (Schlanger 1992:97). ■

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Endnotes

1. A seventh site, 42WS5170, is located approximately 115 m west of 42WS5169 and immediately north but outside of the Southern Parkway project corridor and was therefore not investigated as part of the project. However, the site should likely be included in the Virgin River Site Complex: based on architectural data and diagnostic artifacts identified during survey (Gourley and Jones 2008), 42WS5170 is believed to be a small habitation site dating to the Pueblo I period, similar to 42WS5162.

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"Ye People of Provo, Build That House": The Original Provo Tabernacle and the Building of a City in Zion

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During the winter of 2011–2012, the Church of Jesus Christ of Latter-day Saints (LDS Church) and Office of Public Archaeology (OPA) at Brigham Young University (BYU) conducted archaeological explorations in urban Provo, Utah. The purpose of the research was to uncover and document the extant remains of the Original or Old Provo Tabernacle (OPT; 42UT1844). As an example of a dynamic, full-scale investigation of the archaeology of the historical past of Utah County, the excavation of the OPT in historic downtown Provo, Utah, was among the most important recent archaeological projects in the state. OPT was a salvage project designed to record a site associated with the early settlement of Utah County by members of the Church of Jesus Christ of Latter-day Saints (LDS Church) prior to its destruction, but the project also revealed an intense and ongoing public interest in archaeological projects. This article presents an overview of the project—including its tragic impetus with the December 2010 burning of the (second) Provo Tabernacle—as well as a historical overview of the building. Included are a preliminary summation of results and a brief analysis of the artifacts recovered, with some discussion of the significance of these objects to the early LDS community in the area and the region.

In the early-morning hours of December 17, 2010, an off-duty police officer in Provo, Utah, reported a fire inside the historic Provo Tabernacle (Figure 1). By the time fire crews arrived the building was engulfed in flames. The blaze originated in the attic where a light fixture, displaced to accommodate stage lighting for a performance of the Christmas oratorio *Gloria*, ignited a wooden speaker enclosure (Provo Fire and Rescue [PFR] 2011:ii). By the time of the fire report, the building's roof structure had already sustained massive damage. Shortly after crews arrived on scene, the roof collapsed. By daybreak the large assembly hall in the center of the building was entirely destroyed resulting in an estimated $15 million dollars in property damage (PFR 2011:vii). The only portions of the historic tabernacle to remain were the brick façade and the towers in each of the four corners.

Loss of the Provo Tabernacle was a shock to the residents of Utah County. Originally built to serve as the central meeting place for members of the Church of Jesus Christ of Latter-day Saints (LDS Church), the gothic revival style Tabernacle was a fixture in historic downtown Provo. For generations, this building served as the center of Provo community life—both religious and secular—even after it became functionally obsolete within the LDS Church.[1] It hosted graduations, funerals, community meetings, religious services, political rallies, and musical performances—much like the one planned to occur the night of the fire. As the fire spread throughout the building and crews rushed

Figure 1. Fire crews working to put out the fire at the historic Provo Tabernacle, December 17, 2010 (Photo courtesy of Provo resident Alison Broadbent).

to extinguish the flames, many Provo residents looked on; snapping pictures, reminiscing, and shedding tears. In the weeks following the fire, heartfelt expressions of grief, loss, and nostalgia flooded social media and news reports as the community mourned the loss of one of the oldest and most meaningful buildings in Utah County. "This is unbelievable, such a tragic experience," Provo resident Carl Bacon was quoted as saying, "So many meetings have been held here. This is a marvelous historic site, a sacred place for us" (Penrod et al. 2010).

As the community mourned, the LDS Church (the property owner) initiated a research project to assess what, if any, historic resources remained on the property and what the most appropriate course of action might be. While this research project involved LDS Church employees in many departments, the majority of the research occurred within the Historic Sites Division of the Church History department. As crews meticulously dug through the fire-ravaged remnants of the tabernacle, research staff at the Church History Library in Salt Lake City combed through the historical records of early Provo for any relevant information about the settlement and the tabernacle. In the course of research, it became apparent that an earlier "meetinghouse" or "Original Tabernacle" once stood just north of the burnt-out building and it was likely that some of this structure may still remain buried beneath the grassy park (Figures 2 and 3).

In an October 1, 2011 address delivered during the LDS Church's Semiannual General Conference, President Thomas S. Monson of the LDS Church, announced the intention to repurpose the burnt tabernacle as a temple. "After careful study," Monson (2011:5) said, "we have decided to rebuild it [the Provo Tabernacle] with full preservation and restoration of the exterior, to become the second temple of the Church in the city of Provo." Following the announcement, work on the building accelerated with renewed vigor. The highest authority of the LDS Church

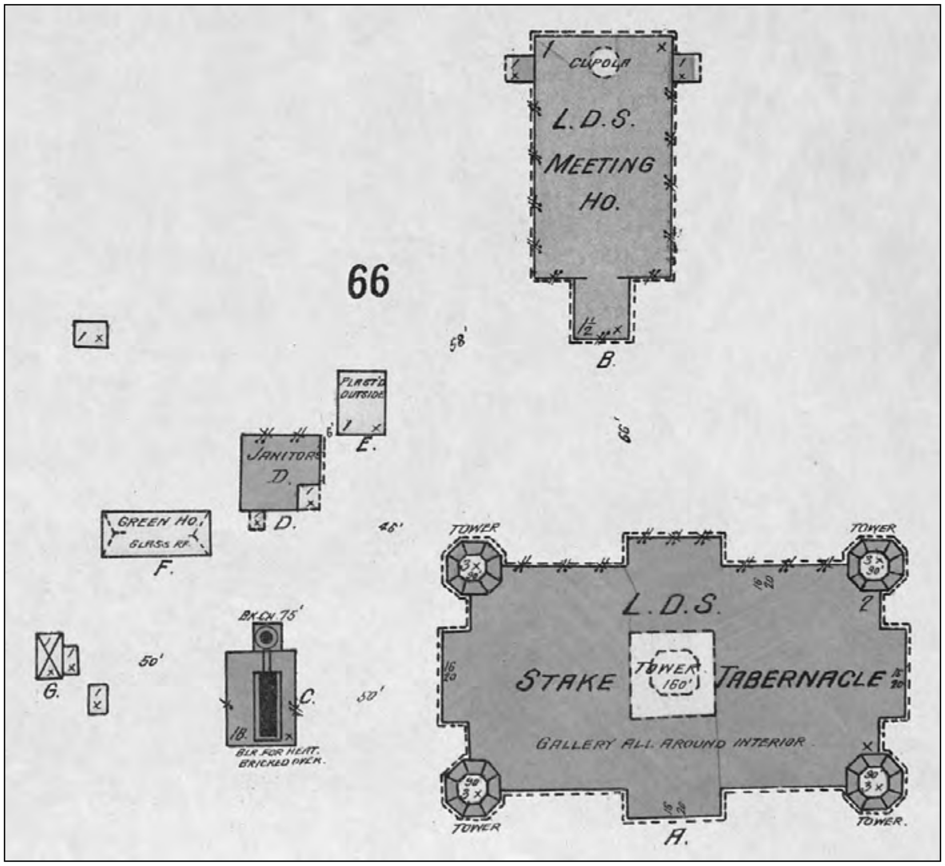

Figure 2. 1908 Sanborn Fire Insurance map showing the proximity of the "LDS Meetinghouse" (OPT) and the LDS Stake Tabernacle (Image courtesy of J. Willard Marriott Library, University of Utah, Salt Lake City).

had announced the intention to preserve and restore the historic character of the exterior of the one historic building; however, the construction project and the conversion of the interior to a temple threatened the possible remains of another. It was decided that if any remnants of the earlier building did exist, they should be found, excavated, and recorded.

Results of the archaeological work conducted as a result of that decision is the focus of this article. Consistent with the theme of this issue of *Utah Archaeology*, this article provides an overview of one of the major, and perhaps most publicly followed, archaeological projects in Utah over the past several years. Through a combination of documentary and archaeological evidence, this article presents an analysis of the building's significance to the community it once served. Archaeological work conducted at the OPT represents not only a major archaeological project in the state of Utah, but is perhaps the most significant example of historical archaeology conducted within the state in recent years. The evidence, both from the ground and the archives, speaks to the important role historical archaeology must play in our understanding of the post-contact history of Utah and the western United States.

As the center-place in Provo for both religious and secular life since the mid-19th century, the excavation of the OPT provides unique insights into the Provo community and its strong LDS

Figure 3. Photograph of Provo's two tabernacles, ca. 1900 (BYU Archives, L. Tom Perry Special Collections, Harold B. Lee Library, Provo, Utah).

roots. This article begins by providing some necessary contextual information with a primary focus on the historical and doctrinal impetus for the construction of the OPT. This will be followed by an overview of the project, its design, and the methods and procedures—before, during, and after the excavation—which were followed to see it through to completion. The OPT project was a massive, multi-disciplinary effort which included documentary research, geophysical survey, excavation, laboratory analysis, and state-of-the-art technological methods for recording and interpreting archaeological evidence. Presentation of some preliminary results of the excavations will follow the methods. Finally, all the information is collated and analyzed to illustrate some of the new details and conclusions that have come to light as a result of the archaeological work on the OPT.

Context and Historical Background

In order to fully grasp the significance of the OPT excavations, it is important to understand a few things about the community in which it resides. The city of Provo, Utah, situated a little over 50 miles south of Salt Lake City, lies at the heart of what cultural geographers refer to as the Mormon culture region (Figure 4; Meinig 1965; Nostrand and Estaville 2001; Zelinsky 1961). Wilbur Zelinsky (1961:164–165) stated that the Mormon culture region is one of "only two or possibly three . . . regions whose religious distinctiveness is immediately apparent to the casual observer and is generally apprehended by their inhabitants." In the five decades since Zelinsky made this observation, little has changed about the area, with an LDS population at an estimated 88.5 percent in 2010 (ARDA 2010). The Provo-Orem metropolitan area (a metropolitan statistical area which includes both Utah and Juab counties) boasts a population of

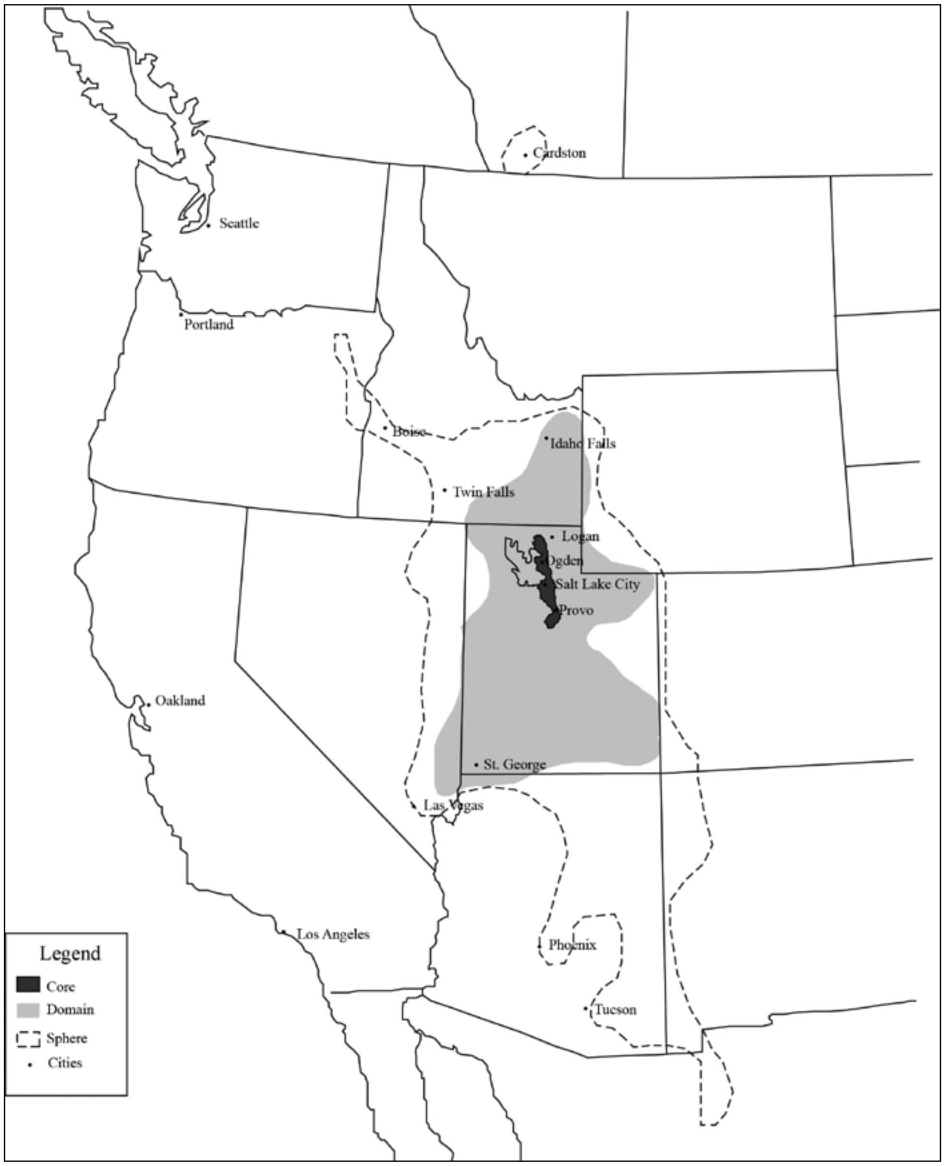

Figure 4. Map of the Mormon culture region (Adapted from Meinig 1965:214).

just over 526,000 (United States Census Bureau 2010). Finally, according to a Gallup poll released in March 2013, of 189 major metropolitan areas in the United States, Provo-Orem was "the most religious area" in the country with 77 percent of respondents self-identifying as "very religious" (Newport 2013). With such strong ties to the religious foundation of the area, and a general adherence to the dominant religious tradition, it is not surprising that Provo's tabernacles, both the original and its successor, hold a particularly important place in the heart and mind of the community.

As the earliest large-scale religious structure built by Latter-day Saints outside of Salt Lake City, the OPT served as the template for several later similar structures built in Mormon communities throughout the Intermountain West

(Chiat 1997). The OPT is significant for its role in the beginnings of a widespread settlement project which led to the creation of the Mormon culture region. The distinctiveness of the Mormon culture region is due in large part to the pattern of settlement utilized by Latter-day Saints as they spread throughout the western United States. I begin on the smallest scale: with the establishment of Provo and the role that the tabernacles' construction played in that project.

The Settlement of Utah Valley

During planning sessions prior to leaving Nauvoo and at times along the trail, Utah Valley was frequently discussed as a probable destination for settlement of members of the LDS Church and as the place where they would establish their primary settlement. Detailed written accounts of the area by European explorers began with the Spanish friars Silvestre Vélez de Escalante and Francisco Antanasio Dominguez, who visited the territory west of the Rocky Mountains in 1776. LDS Church leaders read accounts of Étienne Provost (for whom Provo was named), Jedediah S. Smith, John C. Frémont, and Jim Bridger with great interest (Leonard 2002; c.f. Chavez and Warner 1995; Frémont 1845; Hafen 1997). Based on these reports, most especially that of John C. Frémont in 1845, Mormon leaders determined that Utah Valley was perhaps the best place to establish a community. Frémont's description centered on the importance of Utah Lake "bordered by a plain, where the soil is generally good . . . [which] would abundantly produce the ordinary grains."

Establishing a community in the area faced one major problem: the presence of the *Timpanogot* or Laguna band of the Ute tribe. Due in large part to their control of the natural resources afforded them by Utah Lake, the *Timpanogot* were one of the most powerful Native American groups in the area. They controlled much of the trade between natives and Europeans and were considered "troublesome" by many of the previous explorers (c.f. Frémont 1845:272). For these reasons, in June 1847, current LDS Church President Brigham Young and his vanguard company met with explorer Jim Bridger near the Little Sandy River to determine a location for initial settlement. Despite his belief that "the Utah Lake is the best country in the vicinity of the Salt Lake," Bridger advised against attempting to settle in Utah Valley first (Clayton 1921:275–278). William Clayton, the Mormon diarist who recorded the meeting, reports that Bridger believed the *Timpanogot* were a "bad people" who would "rob and abuse . . . if they don't kill" any man who they caught alone. Bridger instead directed the Mormons to settle in Salt Lake Valley where the native population was small enough that they had "no need to fear them" because they could "drive the whole of them in twenty-four hours" (Clayton 1921:275–278). One month later and heeding the advice of Jim Bridger, the Mormon vanguard company established their first settlement in the Salt Lake Valley. In the years that followed, thousands of immigrants flooded the area. Expanding ever-outward from their established center-place in the Salt Lake Valley, Latter-day Saint colonizers soon established colonies throughout the region (Arrington 1958).

While it is apparent that Mormon leaders heeded Bridger's advice, it is also clear that they remained undeterred in their desire to establish a settlement near Utah Lake. Mormon leaders wasted little time in beginning to explore the area. On July 27, 1847, just three days after arriving in the Great Salt Lake Valley, Orson Pratt "led a small party southward, climbed the ridge of the Oquirrh Mountains, and obtained a view of Utah Valley" (WPA 1941:217; c.f., Church of Jesus Christ of Latter-day Saints [LDS] 1896–2001: July 28, 1847). Jesse C. Little, a member of Pratt's party, confirmed Frémont's assessment, and reported "there was a fine country east of the lake and that the land there was well adapted for cultivation" (LDS 1896–2001: August 2, 1847). In December Parley P. Pratt led an exploratory party south on the Jordan River to Utah Lake to

Figure 5. “View of Fort Utah, on the Timpanogos” (from Howard Stansbury [1855], An Expedition to the Valley of the Great Salt Lake of Utah, inset between pp. 142–143; image in the public domain.).

assess the potential for establishing a fishery in the area.

Despite these early forays into Utah Valley no effort was made to settle the area for more than two years. Reticence to settle the area was likely due to ongoing clashes with the *Timpanogots*. The earliest days of Mormon settlement in present-day Utah County were punctuated by frequent, often violent, and normally deadly confrontations between the European settlers and their Indigenous neighbors. Armed clashes with the native population, most especially at Battle Creek (1849), caused some Latter-day Saints to fear settling the area.[2] For others, the defeat of the Utes at Battle Creek emboldened settlement possibilities in the valley and served as evidence that Mormons had the strength to “subdue the Ute threat” (cf., Carter 2003; WPA 1942).

The Founding of Provo

In late March 1849, John S. Higbee was directed by President Brigham Young to lead thirty families in the establishment of a colony near Utah Lake. Building a fort was of paramount priority given the increasingly poor relations with Ute bands in the area. Constructed on the Provo River Plain on the eastern shores of Utah Lake, Fort Utah, served as a protective central place for new LDS immigrants (Figure 5). Conflicts with natives, the frequent passage of European immigrants from the East *en route* to California, and the dispatch of federal troops to the region combined to keep Latter-day Saints in Utah Territory in an almost constant state of agitation (Walker et al. 2008). For the better part of the next two decades, the constant threat of attack and potential loss of life, limb, and livestock made the development of Utah County by Mormon settlers slow and difficult (Holzapfel 1999:40–41).

In spite of ongoing conflicts, Mormon leaders proceeded undeterred. On the morning of September 19, 1849, Brigham Young, Heber C. Kimball, and Willard Richards, the First

Figure 6. The First Presidency, ca. 1852; close-up taken from a broadside engraved by Frederick Piercy and printed at Liverpool in 1853 (Image courtesy of the Church History Library, Salt Lake City, Utah).

Presidency of the Church, left Fort Utah in the newly formed settlement of Provo (Figure 6). The purpose of the journey was to survey the local area and to choose a location suitable for a larger settlement. Assistant Church Historian and Recorder Thomas Bullock, who accompanied the excursion, reported a

> very eligible place, about two miles southeast of the Fort where it was decided to build a city a mile square, to be laid off in blocks of four acres each, divided into eight lots of half an acre each, reserving the center block of four acres for a chapel and schoolhouses. [LDS 1896–2001: September 19, 1849; see Figure 7].

It was not until August 16, 1852, when George A. Smith, a member of the Quorum of the Twelve Apostles and the head of the Church in Provo, and several other local leaders met at the future site of the public square that construction proceeded. The first building on their list for construction was the "Provo Meeting House" which they measured off "to be 80 feet long by 45 feet 6 inches wide" (Provo Stake Minutes, August 16, 1852). Brigham Young instructed George A. Smith that the building should be "a substantial house, one that would be a credit to the place" (*Deseret News* [DN], September 4, 1867). During this meeting Young gave Smith a copy of the plans for the building, designed by Church architect Trumon O. Angell, which were drawn "with a view of preserving among the youth of Zion a sample of the kind of edifice in which many of their fathers and mothers, as members of the Presbyterian Church, worshipped before they heard the gospel." (Jenson 1941:907; Figures 8 and 9). When the plan was first shown to church members at Provo, it was "not favorably received." Local members considered it too much like a Presbyterian meeting house, and "because there was not . . . material in the country to erect and finish such a house" (DN, September 4, 1867). In order to complete the project, the members at Provo would have to create both an economic system and the necessary infrastructure to support this monumental undertaking.

Economics in Early-Mormon Utah

The resource-rich Utah Valley which had attracted the LDS Church was deeply valued for many generations before Europeans ever saw the valley and was the source of the conflict between the Mormons and the Ute. There are clear differences in values towards the land

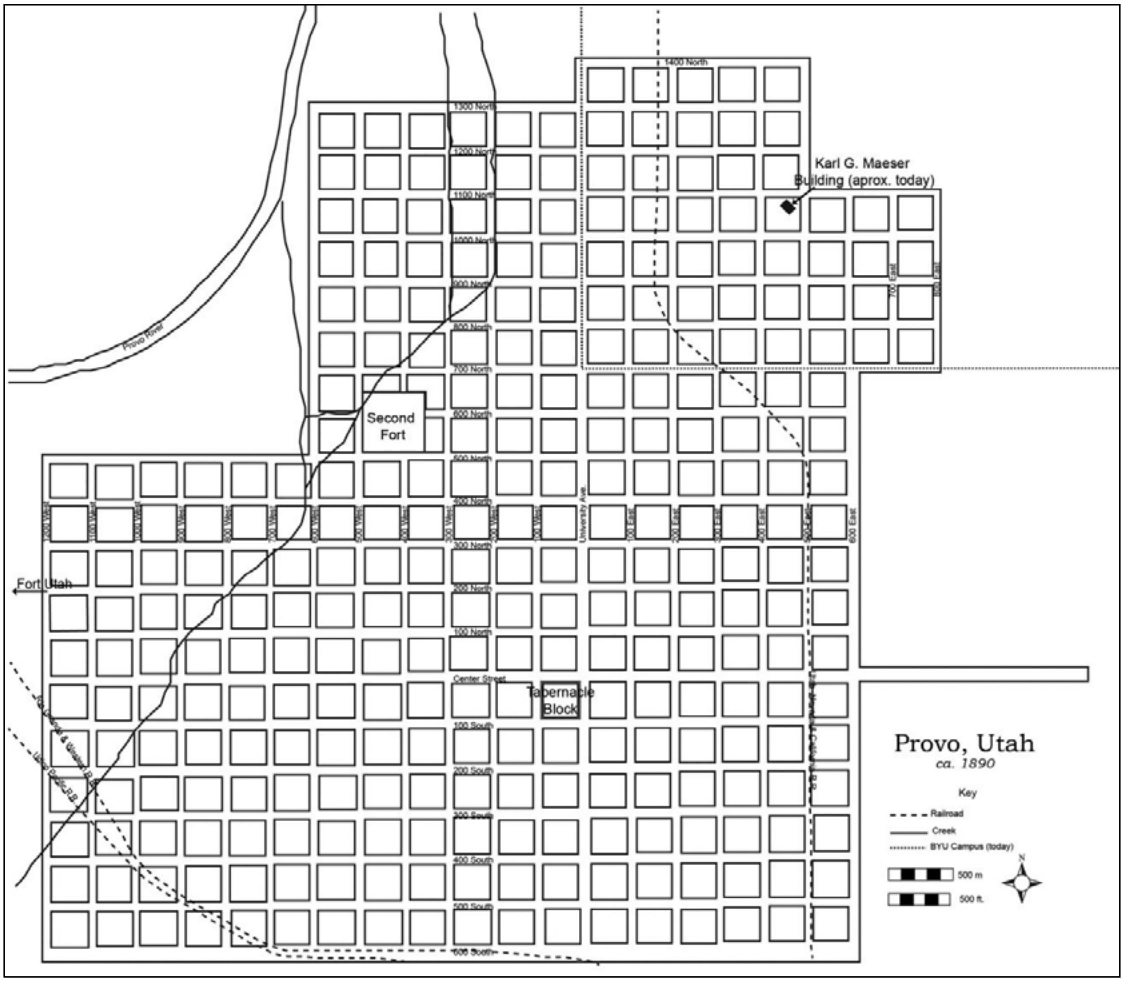

Figure 7. Map of Provo, Utah, ca. 1890 (Adapted from 1890 edition of Sanborn Fire Insurance Co. Maps, J. Willard Marriot Library, University of Utah, Salt Lake City). The approximate locations of BYU campus and the Karl G. Maeser Building have been added for ease of reference.

when comparing between the loosely affiliated, semi-permanent, hunter-gatherer Utes and the rigidly hierarchical, agrarian Mormons with a need for permanence and personal ownership. Conflict resulting from their contact is equally understandable. In order to accomplish their vision of Zion, it was incumbent upon the Mormons moving into Utah Valley to acquire and move resources in relatively quick and efficient ways. This required building and maintaining public infrastructure (especially roads), dividing labor, and instigating a method of economic transaction which would support the division of labor through the use of the LDS Church's tithing office.

While bank notes, drafts, bonds, and other currency systems existed during the period, they were not commonly used and frequently viewed with distrust and apprehension by many. Tithing offices established by Mormon leaders in each of their new settlements created an alternative means of controlling labor and goods. Overseen by the local bishops who answered to the presiding bishop in Salt Lake City, each tithing office accepted donations from local members to fulfill their individual mandate to "pay one-tenth of all

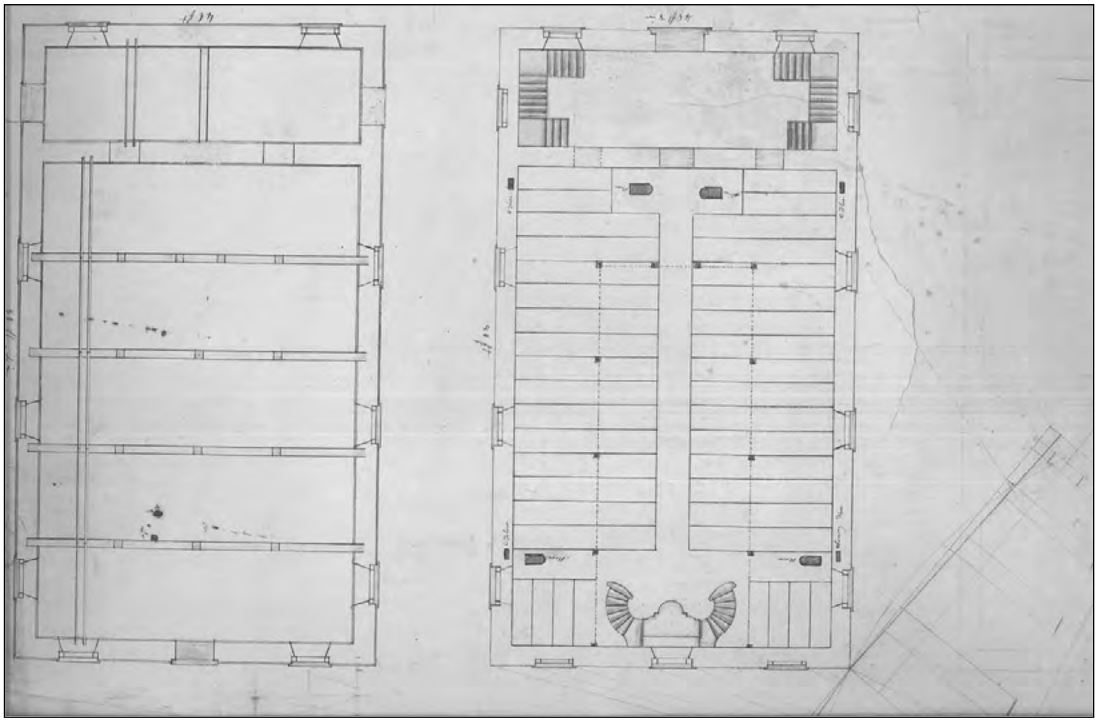

Figure 8. Truman O. Angell’s original sketch of the basement (left) and the upper chamber (right) of the OPT (Image courtesy of the Church History Library).

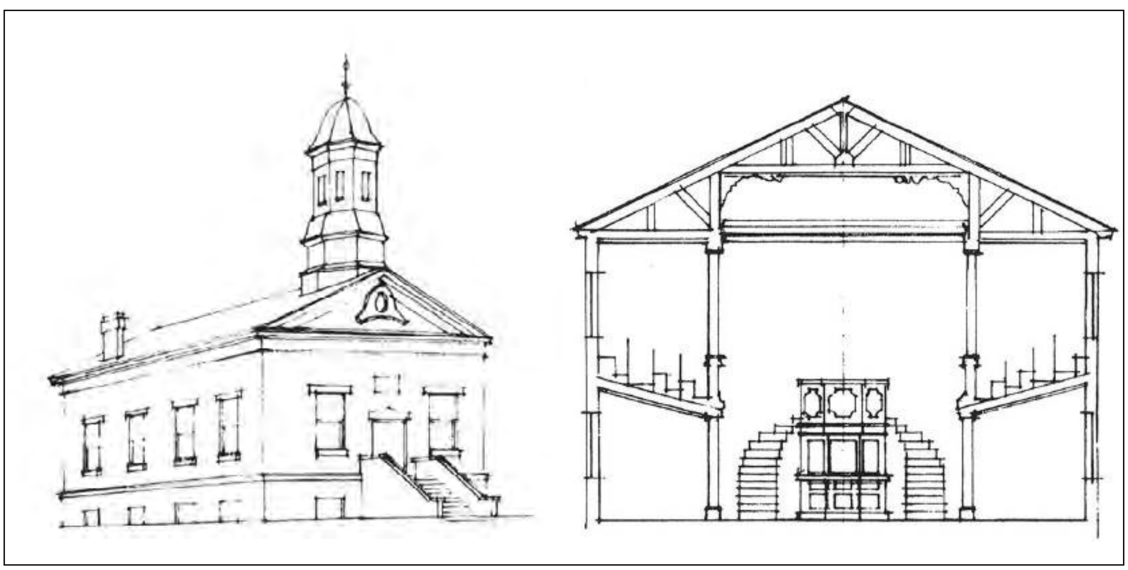

Figure 9. Sketches of the exterior (left) and the likely rostrum arrangement (right) from OPT (Jackson 2003:75). The design for the rostrum was taken from one of Scottish architect Peter Nicholsen’s many design books (Original image by Richard W. Jackson, used with permission).

their interest annually" (LDS 2013, Doctrine and Covenants [D&C] 119:4). Tithed goods were held in the local "bishop's storehouse" and included bushels of grain, processed meats, livestock, lumber or other building materials, and any other items which members chose to donate to fulfill their tithing obligations. In addition to collecting tithes the tithing office also accepted items which individuals needed to trade. Members of the local community could trade labor or commodities for items in the storehouse. If the item desired was not available in the local bishop's storehouse, bishops could request the item from other storehouses throughout the region. In this way, the tithing office served the vital economic function of commodity monetization thereby facilitating trade both locally and regionally.

A crucial function of the tithing offices was to supply labor and material for massive construction projects like the OPT. Wages were paid to laborers in the form of credits or drafts to be used to purchase items from the bishop's storehouse. In the early days of Provo, the bishops, through the mechanism of the tithing office, were able to build two forts, several houses for widows and leaders, a schoolhouse in each ward, the first Provo city hall, and the OPT. During the 1850s and 1860s in Provo, individuals received between $1.50 and $4.00 for a day's labor (depending on the task and required skill). At the height of the building projects in Provo, the tithing office paid for loads of lumber, stone, sand, lime, water, and other building materials to be brought to the storehouse at $4.00 per load (Presiding Bishops' Records [Provo], 1851–1909).

This model was the forerunner for the mercantile cooperative system which would begin to replace it as the dominant mode after 1867. Provo, and indeed the OPT, played a significant role in the establishment of the cooperative system throughout the Mormon culture region, a system which, from an economic standpoint, is perhaps the most innovative and unique aspect of the LDS settlement pattern. Without the Provo Tithing Office, the OPT would never have been possible.

Building the OPT

According to newspaper reports, construction progressed during the brief period of peace between the Walker War (1853–1856) and the occupation of the territory by federal troops under the command of General Albert S. Johnston in 1857 (Christensen 1983; Walker et al. 2008). During this period, construction of the foundation began with stone quarried from a nearby canyon and then cut, dressed, and set in place. Plans to acquire the raw materials for the OPT's adobe walls were halted, however, by the advance of Johnston's army (DN, September 4, 1867). At the start of the four-year federal occupation of the Utah territory (1857–1861), Provo became the place of refuge for Saints fleeing Salt Lake City. This temporarily redirected building efforts toward the construction of shelter to meet the expanded demand (Holzapfel 1999; WPA 1942). At the outbreak of the American Civil War, Johnston's Army was called by the federal government to return to the east.[3] By this time, the project changed significantly with Brigham Young directing that the location of OPT be moved to nearly half a mile further east than originally planned. George A. Smith was released from his duties as president of the Provo Stake and local leaders called upon local craftsmen to oversee and carry out the project themselves.

Over the next several years, funding the project was a major undertaking. Bishops called for frequent donations of time, material, and talent to the completion of the project. In 1863, the local bishops raised $6,221.00, just enough to put a roof on the building and to place the "principle timbers of the tower" (*Latter-day Saints' Millennial Star* [LDSMS] 1867:662). "I pray ye people of Provo," implored Brigham Young in 1864, "build that house" (LDSMS 1867:662). Without sufficient funds, however, the building project stalled. Additional collections and frequent mention of the need to complete the structure spurred efforts to finish the

Figure 10. Finished Original Provo Tabernacle, photo taken prior to 1883 (Image courtesy of the Utah State Historical Society).

it. Voluntary assessments and collections carried out by Provo bishops between 1852 and 1867 to build the OPT totaled $74,544.00 (LDSMS 29:663; roughly $1.22 million, when adjusted for inflation [Friedman 2013]). Much of this, however, was not used to build the tabernacle structure itself. "[A]lthough the figures are large," wrote the *Millennial Star* (1867:663) correspondent, "much of the outlay has occurred to a disadvantage." The reporter cites the need to build and maintain roads in the local canyons for the "hauling of stone from quite a distance" and the losses caused by the delays in the construction project for consuming the majority of the budget. Despite this the *Millennial Star* (1867:663) concludes that the OPT was "without exception the finest place of worship in the Territory, a magnificent building—an edifice that reflects the highest credit upon the people who have reared it."

The Completed OPT

Completed and dedicated in 1867, the OPT was a three-story building with a large central tower and belfry on the north end of the building facing center street (Figure 10). The building's final footprint was 81 ft x 47 ft with the tower standing 80 ft The thick adobe walls of the structure stood atop a partially-exposed limestone foundation. The front entrance was on the north where a staircase led from the ground level to a pair of recessed double doors. A large bell and imported Mason & Hamlin clock adorned the tower. The interior included a large finished basement "well lighted and designed for all public Mass and Priesthood meetings, as also scientific and educational meetings." The upper room, with seating on the main floor and in the gallery above, could accommodate an estimated 1000 people. The entire interior was carpeted through "the work of the faithful sisters" which was said to "give an air of taste and comfort to all." A 20 ft x 20 ft entry way with offices for clergy, commonly called a "vestry," was attached at the rear of the building (LDSMS 1867:66).

For the August 24, 1867 dedication Brigham Young traveled in company with a cadre of other prominent Mormon leaders to attend the two day services. Accompanying Young were Heber C. Kimball (Young's counselor in the First Presidency), Apostles Orson Hyde, Orson Pratt, John Taylor, Wilford Woodruff, George A. Smith, and George Q. Cannon, and Presiding Bishop Edward Hunter. The dedicatory prayer was offered by John Taylor who blessed the building "from the foundation to the topstone; that it may be a place in which [the spirit of God] may dwell" (Christensen 1983:70). While this may have seemed sufficient, he then proceeded to bless, with extreme specificity, the land, the walls, the fixtures, and everything else pertaining to the building. Prayers included the adobes, clay, lime, water, joists, columns, flooring, lintels, rafters, shingles, tin, zinc, the nails in the floors and in the walls, the lath and plaster, and the mortar. The tower, vestry, porch, cornices, bell, benches, and doors were also mentioned specifically. So inclusive and specific was the dedicatory prayer that Elder Taylor even mentioned the 'ball and the vane that rest upon the top of the tower" (Christensen 1983:70).

During subsequent meetings, Brigham Young made it clear to the Saints in Provo that the tabernacle was too small to meet the needs of the rapidly expanding community. Construction of the second tabernacle began in 1883 and completed in 1898 (Christensen 1983). For several years, from 1898 to 1919, the two tabernacles stood side-by-side. Once the second tabernacle was built, the OPT was used for a variety of purposes. From the documentary records we know that it served as a schoolhouse, a gymnasium, a temporary storage shed for the local woolen mills, however, little else is known about the function of the building during the nearly forty years that it shared the block with the second tabernacle. After many years of mixed use, the OPT had fallen into ill repair. In 1919, the OPT was razed with little fanfare. A public park was built atop the buried foundations to ensure the safety of the citizens (Christensen 1983).

Project Overview

Although its time as the center place of Provo was short-lived, the OPT was of major significance to the city and the county which it helped to establish. From its pulpit at least five, and possibly six, future or current presidents of the LDS church addressed the local membership (Christensen 1983:49). Several other prominent leaders of the Church including apostles, seventies, and other officers delivered messages to the assembled Saints. During its lifetime, at least two wards—the Provo First and Provo Sixth—used the building as their meeting house. The building also played host to several other community events including political meetings, artistic performances, and lectures. Despite the brevity of its position as the prominent gathering place in the community, the OPT represents a significant turning point in the founding of the west and in the Mormon ideas of community building.

When archaeological investigation of the tabernacle began in November 2011, there were no visible remains present on the surface. For this reason, Dr. John McBride, Professor of Geophysics in the Department of Geological Sciences at BYU, conducted a ground-penetrating radar (GPR) study at the site (McBride et al. 2012). Historical documents, particularly the Sanborn Fire Insurance Maps (Figure 2), indicated the approximate location of the foundation just to the north of the second tabernacle. After compiling the GPR data, it was apparent that the remains of a large, rectangular structure existed below the surface. A comparison of the GPR data with the Sanborn map indicated that this structure was the same size and dimensions and in roughly the same location as the "LDS meetinghouse" from the Sanborn map (McBride et al. 2012; Figure 11).

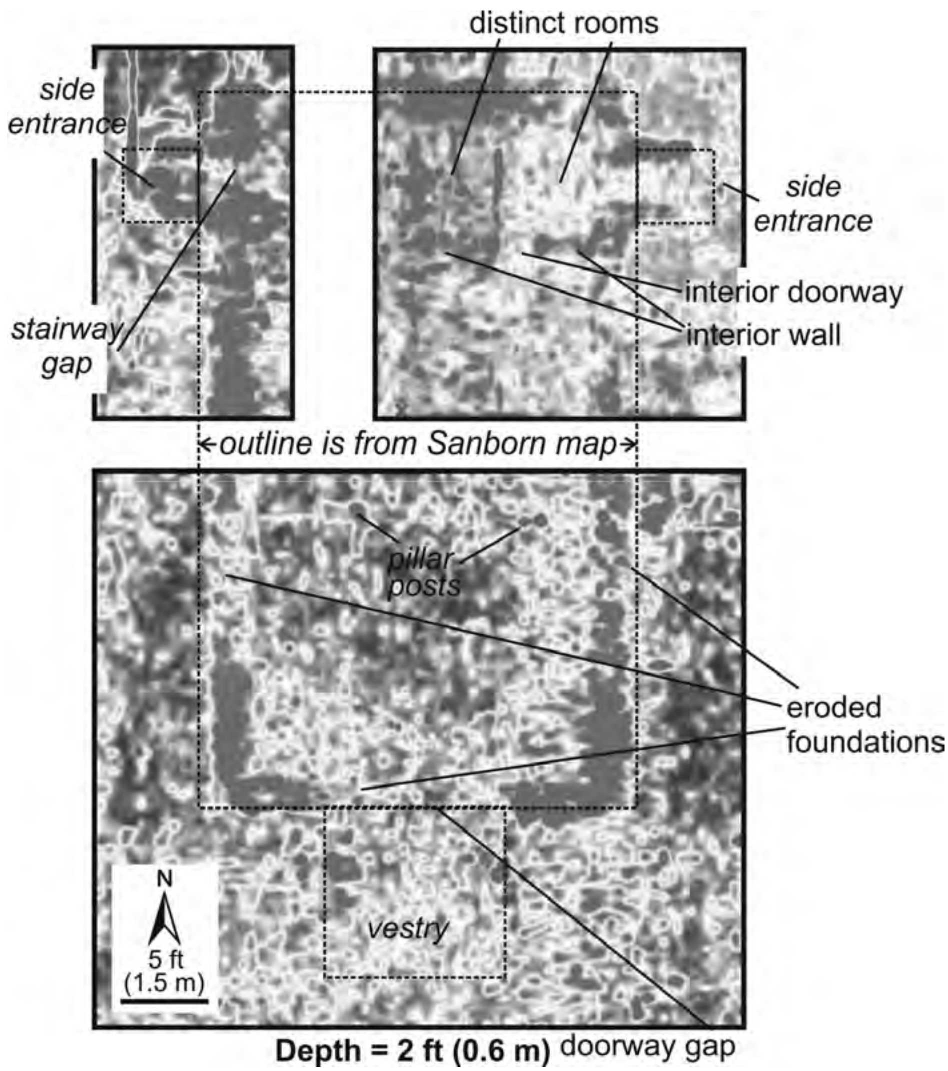

Figure 11. Compiled ground-penetrating radar image (plan view) of the subsurface structure at a theoretical depth of 2 ft. (0.6 m) from the GPR study conducted November 2011. Labels indicate initial, pre-excavation, interpretations of the buried features (Image courtesy of Dr. John H. McBride).

During initial archaeological testing in late November 2011, crews established a site datum on the outside southwest corner of the OPT foundation and designated the point as 100N 100E. This datum provided consistent horizontal and vertical controls for the test pit excavated in the southeast corner of the foundations revealed by the GPR data. The test pit progressed from a backhoe trench to hand-work when crews identified intact features (Figure 12). This test pit confirmed the southern and eastern walls of the OPT, and the location of the interior and the exterior of the structure. Archaeologists screened sediments through a ¼ inch mesh in order to assess the general artifact contents of the deposit. Recovered artifacts tended to confirm that the structure dated, at least, to the early twentieth century; coinciding with the historically known 1919 demolition. With these promising results, plans progressed for a full-

Figure 12. Initial test pit, in the southwest corner of the OPT (Photo courtesy of the Office of Public Archaeology).

scale archaeological excavation of the site. The LDS Church contracted with the Office of Public Archaeology (OPA) at BYU in February 2012, to carry out the full excavations. Information gleaned from the initial test pit assisted in the planning and execution of the excavations including establishing the suspected site-wide soil stratigraphy.

Archaeological Explorations of the Original Provo Tabernacle

Located on University Avenue, between Center Street and First South, the tabernacle block is in the heart of Provo's historic downtown. Due to the high-profile nature of any urban archaeological project, it was initially hoped to involve interested members of the public in the excavations, but as an active construction site, safety and liability concerns made this impossible. Nevertheless, OPA involved more than 50 graduate and undergraduate students, primarily from the Department of Anthropology of BYU. Onsite crews ranged daily from just OPA staff and the few paid graduate assistants, to upwards of 20 student volunteers digging, screening, cleaning, and taking notes.

In lieu of a public volunteer program, OPA collaborated with the Museum of Peoples and Cultures (MPC) at BYU and the Historic Sites Group of the LDS Church to produce on-site explanatory signage to provide visitors with some detailed information about the project (Figure 13). In continued collaboration with the MPC, several public programs were designed to allow the community, as much as possible, to be involved in the archaeological work at the site (Figure 14). During the excavations, hundreds of interested members of the public visited the site, watched the excavations, and engaged students and staff in thoughtful and informative discussions.

Figure 13. One of the interpretive signs produced by OPA and the MPC to provide visitors to the site with information about the project (Photo courtesy of Charmaine Thompson).

Figure 14. Local boy scouts are given a tour of the site. This program was coordinated by Kari Nelson, curator of education at the MPC (Photo courtesy of Charmaine Thompson).

Research Design

A more complete and thorough presentation, analysis, and detailed summary than presented here can be found in the report prepared by the painstaking efforts of Deborah Harris, Richard Talbot, and the staff of the OPA (Harris et al. in press). The research design for the OPT project focused on answering six questions regarding the building. Those questions, briefly summarized, were: 1) is the architectural style of the OPT similar or distinct from other similar tabernacles built at the time, 2) where did the raw materials of the OPT originate, 3) what modifications or remodeling occurred to the original structure during its lifetime, 4) how was the Tabernacle basement used, 5) how did the function of the OPT change during the period when the two tabernacles occupied the block, and 6) were remnants of the associated outbuildings present (e.g. the caretakers cottage and baptistry) (Harris et al. in press). The plan of the excavation and the methods employed were chosen in the hopes of providing the best possible information to answer these questions.

General Site Stratigraphy

The general site stratigraphy, as stated, stemmed from the initial test excavations at the site in November 2011 (Figure 15). The OPT was located within the active construction site for the Provo City Center Temple and was under the custody and control of Jacobsen Construction. Jacobsen Construction prepared the site prior to the GPR or excavation, for construction-related traffic including trucks, cranes, and other heavy machinery by laying down a 15 cm thick layer of dense gravel. Below the gravel was a dark, loamy, compact soil 30–40 cm thick; round quartzite river cobbles were common in this layer and was culturally sterile (Harris et al. in press:39–41).

At approximately 45–55 cm below the ground surface archaeologists encountered the structural walls. Fill outside the structural walls appears imported, and was heavily compacted and sterile.

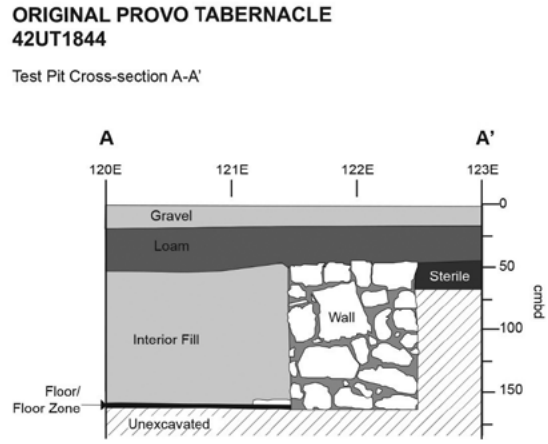

Figure 15. Cross-section of initial test pit showing the general strata identified and used in the planning of the excavation (Harris et al. in press; courtesy of the Office of Public Archaeology).

The interior fill was quite different. Beginning approximately at the level of the walls and extending between 110–120 cm deep, a layer composed of a loam similar to the previous layer was found to contain a significant amount of construction debris including cut stone, plaster, mortar, wood, nails, glass, ceramics, and metal fragments. At the base of this layer, crews encountered a "discontinuous banded layer of plaster fragments, many of which were 'nicely formed' examples of decorative or cornice plasterwork" (Harris et al. in press:39). There was a break in this fill, 2 cm thick and 120 cm below the surface, at the level of the floor.

Methods

In order to address the research questions, OPA devised a plan for excavation which initially only included partial excavation of the OPT foundation and testing and monitoring at the associated outbuildings. Full-scale excavations of the OPT foundation and the top meter of the historic well occurred between January 29 and April 3, 2012. While the initial project proposed excavations of approximately 50 percent of the OPT foundation, the amount of volunteer labor available to the project enabled OPA to

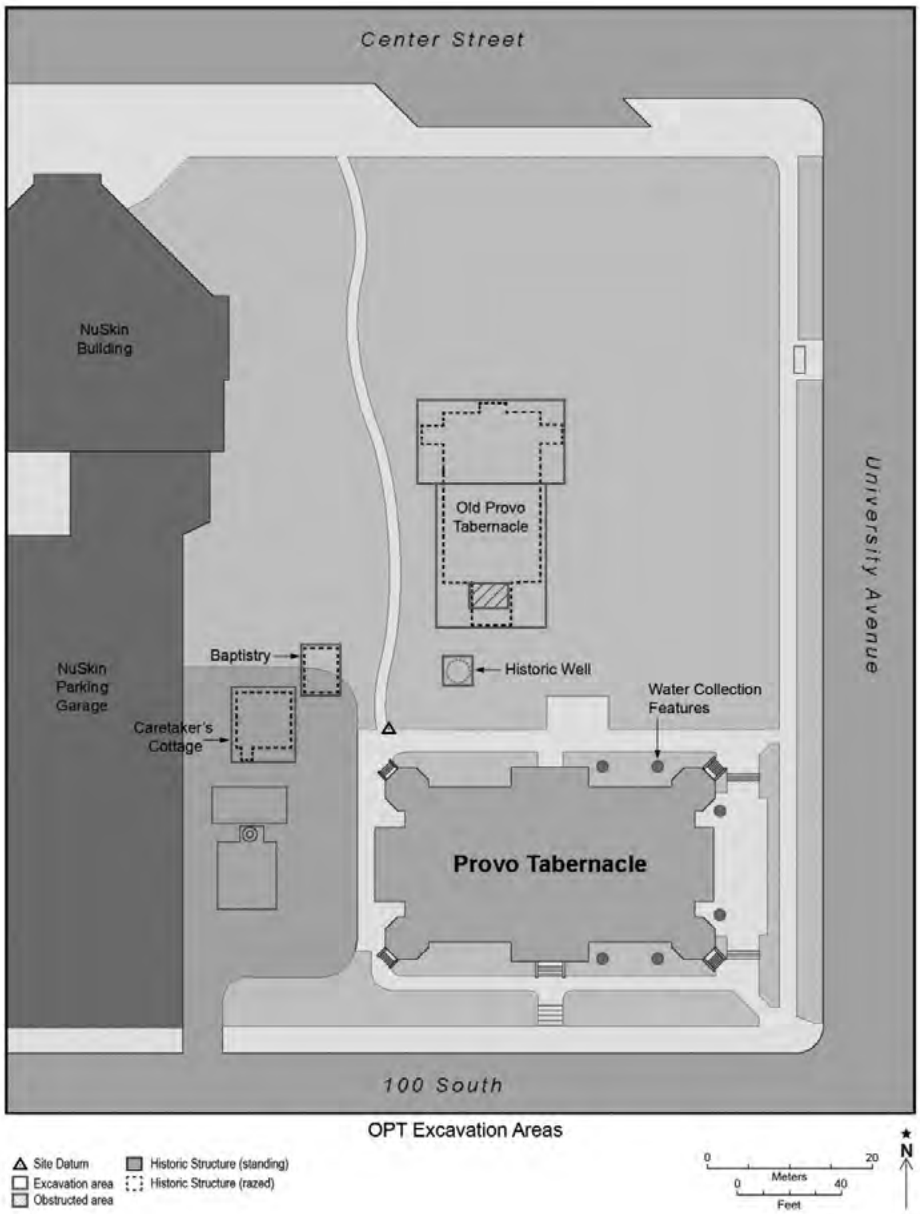

Figure 16. Excavation areas on the tabernacle block. Note the Caretaker’s Cottage, the 1870s Baptistry, the historic well, and the six water collection features associated with the second tabernacle (Harris et al. in press; courtesy of the Office of Public Archaeology).

excavate the entirety of the foundations and the top one meter (3.28 ft.) of the associated well. Monitoring of construction activities led to the identification and excavation of additional buried structures and features.[4] Features identified during monitoring were excavated during the course of the archaeological investigation on the tabernacle block, though for brevity, those features are not discussed in this article (Figure 16).

Prior to full-scale excavations at the OPT, OPA established an orthogonal grid, dividing

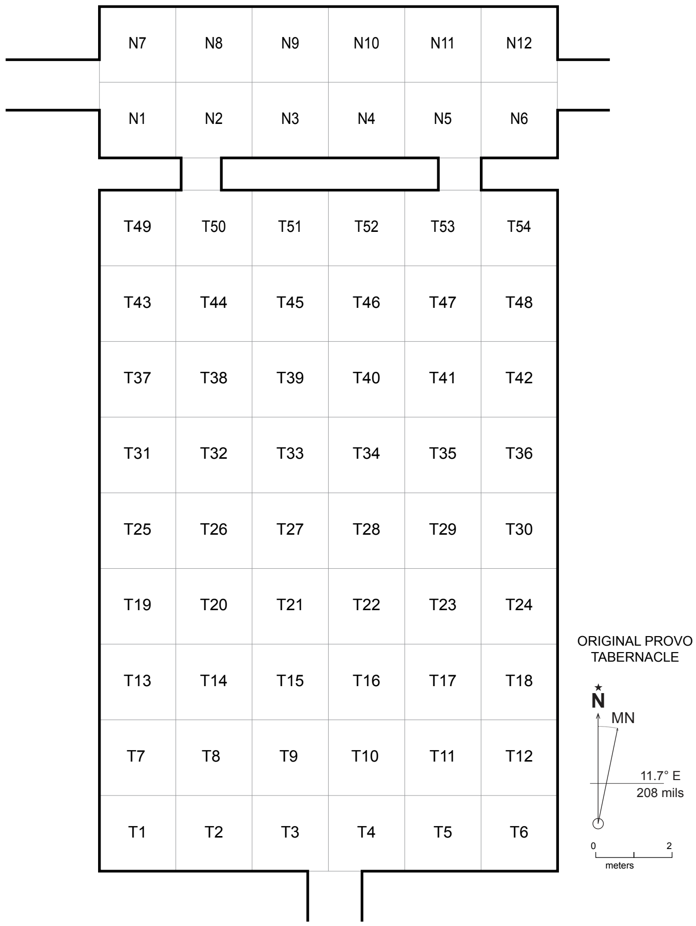

Figure 17. Schematic of excavation units within the OPT foundations (Courtesy of the Office of Public Archaeology).

the interior of the OPT foundations into 2 m x 2 m grid units (Figure 17). Grid units in the large southern chamber were designated "T" (for tabernacle) and numbered sequentially beginning in the southwest corner. Units in the northern, foyer section, were labeled "N" (for "north") and numbered in the same manner. The Jennings Feature System was employed to record interior features and sediments as the excavations proceeded. The interior fill of the OPT foundations were excavated by backhoe to a level approximately 30 cm above the anticipated floor zone. The remaining sediments were removed by hand and screened for artifacts. All screened sediments passed through ¼ inch mesh and artifacts were sorted and bagged by artifact class or by specific tool type for unique objects. Bags were labeled with the provenience information—including grid unit and level or other associated feature—and any special handling instructions. These bags were assigned field specimen (FS) numbers in the lab in order to maintain control of the massive collection of recovered artifacts.

As with most archaeological projects, hand-drawn maps of the site were produced throughout the project. All major features were mapped and profiles of significant sediments were created in order to aid in the developing understanding of the site. At the conclusion of the excavation, a three-dimensional rendering of the site was produced using data acquired from a Faro Focus 3D terrestrial LiDAR system (Figure 18). This technology provides millimeter-accurate "as built" three-dimensional models which can be measured, sliced, and manipulated in nearly anyway to meet the needs of the project. Using this data, project staff produced highly detailed maps and profiles during the post-excavation process (Figures 19 and 20).

Features

The foundation of the OPT was the primary feature excavated in the course of the initial project. Measuring approximately 16 x 8 m, the archaeologically documented foundation closely matched the 81 ft. x 47 ft. limestone foundation described in many of the contemporary accounts (Figure 21). Foundation walls of the OPT measured approximately 1.22 m (4 ft) thick and constructed primarily of locally quarried limestone, quartzite, and occasionally sandstone. Walls were a mixture of large boulders and smaller filler stones, cemented together with lime mortar. An interior cross-wall, 90 cm (2.95 ft) wide, approximately 4 m (15 ft) from the interior of the northern wall, formed a front "foyer area" and provided support for the massive, 80 ft tower. Two doorways in this interior wall were located approximately 2.1 m (6.9 ft) from both the east and west walls. Stairway entrances on the east and the west of the foyer area extended to the historic ground level (approximately 1.22 m [4 ft]) above the floor. Each stairway measured 3 m (9.8 ft) long, 1.37 m (4.5 ft) wide, with 41.9 cm (1.37 ft) wide stairs rising 5 cm (2 in.). Additional entrances existed in the northern wall (front) and in the 20 ft. x 20 ft. vestry in the center of the south wall.

While no remnants of the floor boards still existed some evidence of the width and distribution of the flooring was discovered in the front foyer area (Figure 22). Five alignments of cobbles ran the length of the building, north to south, bisecting the wall. Two of these alignments ran immediately at the base of the eastern and western walls. Within the three alignments running through the center of the building were eight of the nine pillar bases (or "plinth stones") that would have served as the foundation for each pillar that supported the balcony in the upper assembly hall (Figure 23). It is believed that these rock alignments formed the base upon which the floor of the basement originally sat. Additional concentrations of ash, artifacts, rocks, and variations in the sediment were also recorded during the excavation but reported in Harris et al. (in press).

Artifacts

OPA staff, BYU student research assistants, and volunteers completed all artifact analyses. At the laboratory and analysis rooms located at the MPC at BYU each artifact and bag received FS numbers, and were washed, sorted, and analyzed. Recovered artifacts consisted largely of building material (nails, plaster, electrical components, etc.), food storage (bottles and cans), tableware (ceramics and utensils), furnishings, tools, personal items, and other miscellaneous items. Brief descriptions of the building materials, ceramics, and miscellaneous items are provided below.

Building Materials

Comprising 89.55 percent of the total assemblage, building material dominated the artifact assemblage from the OPT excavations. The most numerous artifacts within this type included nails, screws, bolts, and other types of hardware fasteners. Of the 1711 field specimen numbers assigned for the entire project, nails accounted for 746 (43.6 percent) (Figure 24). Significant corrosion of the nails made identification impossible for the majority of these artifacts. Those identifiable nails (n = 5,395), however, were instructive. Cut nails dominated the assemblage at 90.4 percent of all identifiable nails (n = 4,878), while only 9.6 percent (n = 517) were wire nails. Wire nails were concentrated in

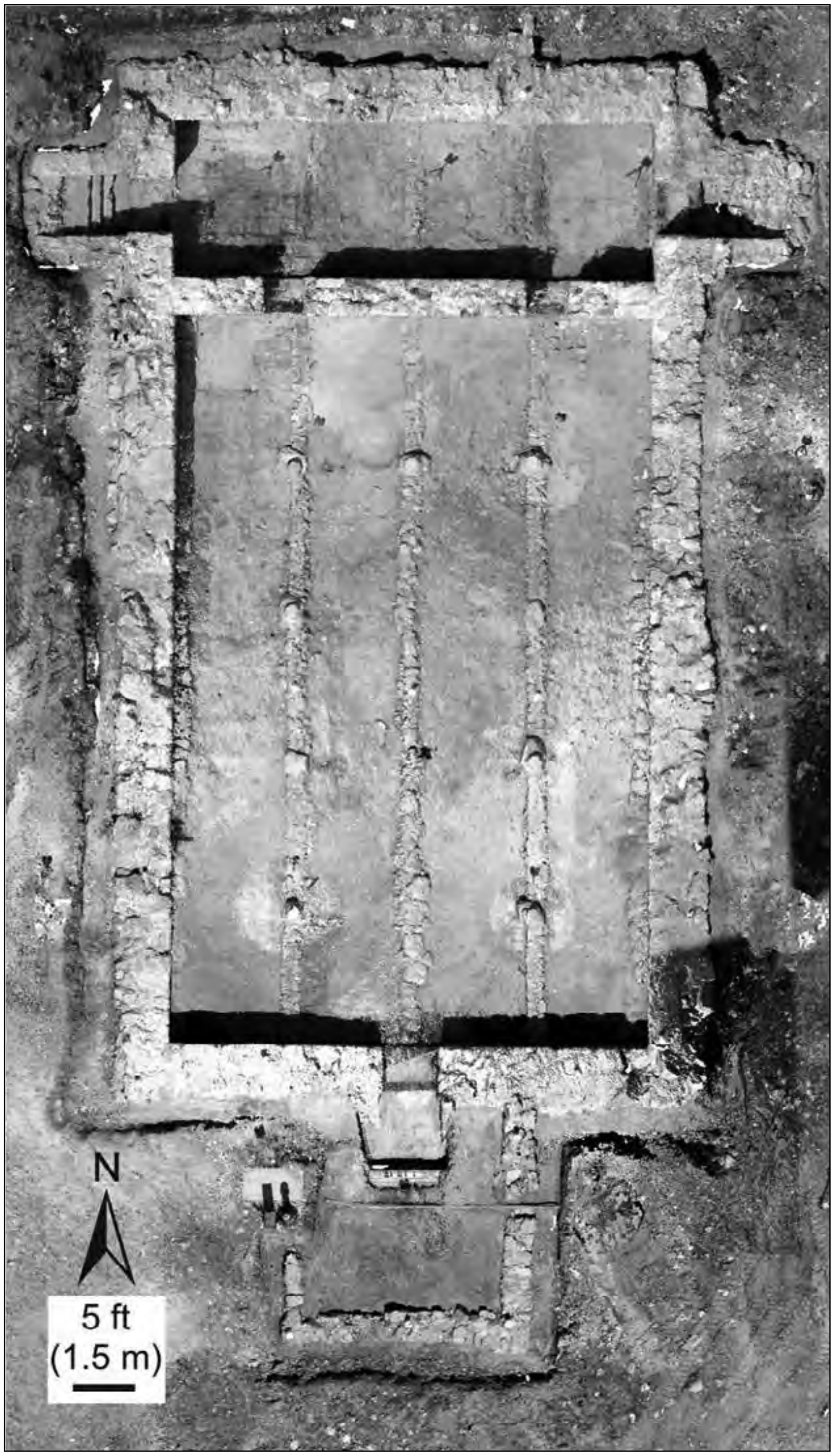

Figure 18. Compiled LiDAR image replicating an aerial view of the excavated OPT foundations (Scans performed by Skandit).

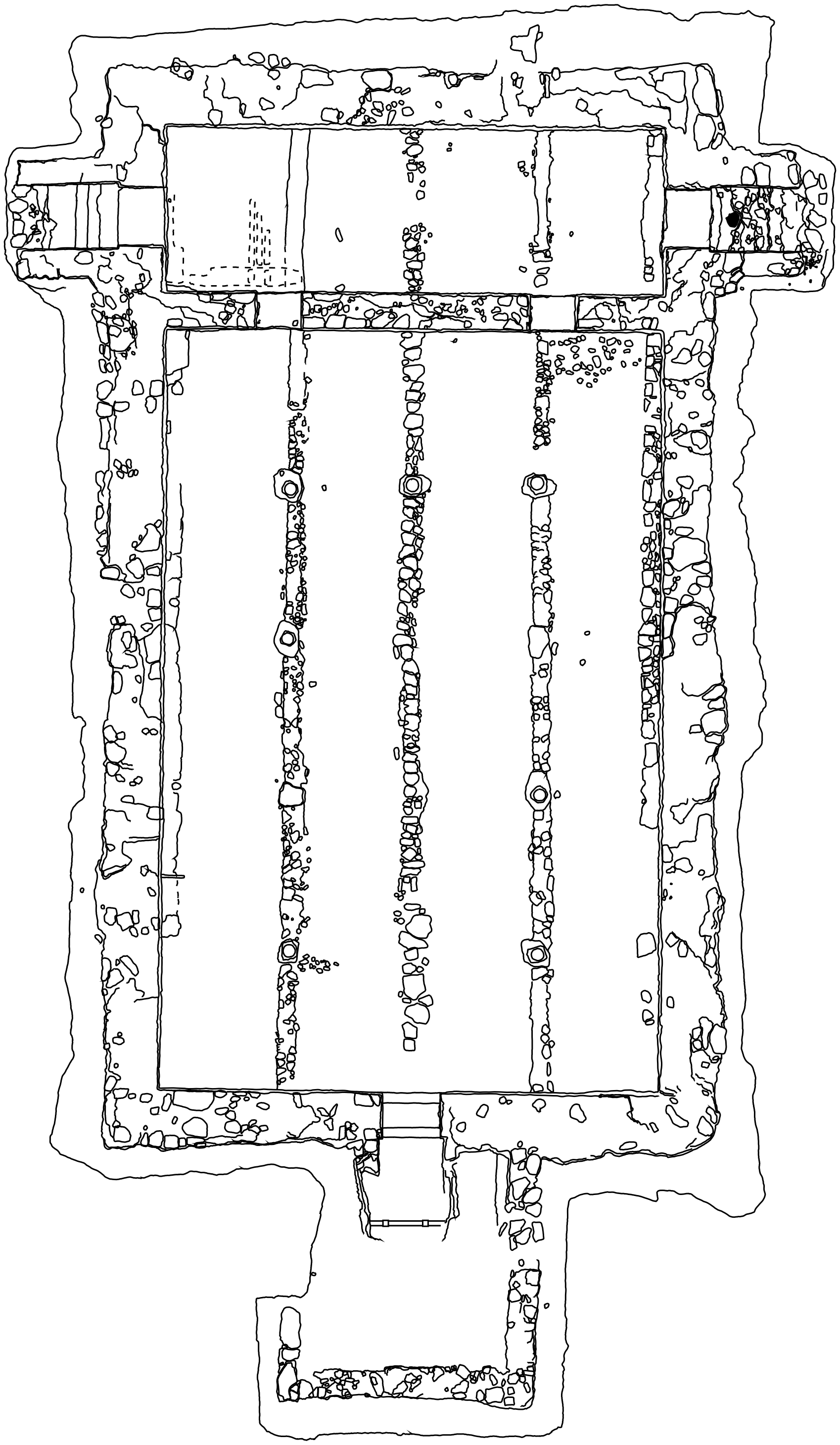

Figure 19. Plan map of the OPT drawn from the LiDAR data (Data provided by Skandit; map drawn by Scott Ure; courtesy of the Office of Public Archaeology).

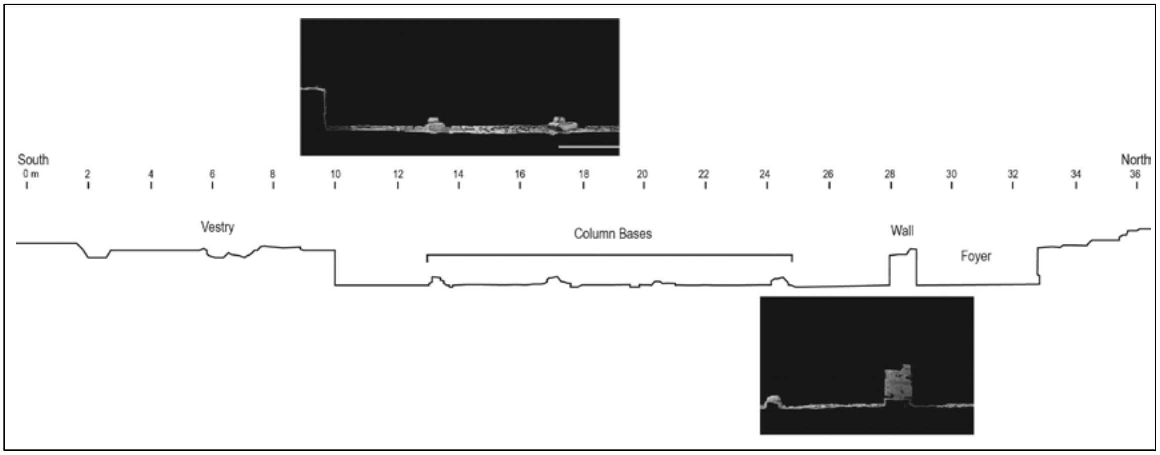

Figure 20. Profile of the interior of the OPT with LiDAR images showing the accuracy of the scan data. This profile was created long after the structure itself was destroyed by the construction project (Data provided by Skandit; image courtesy of the Office of Public Archaeology).

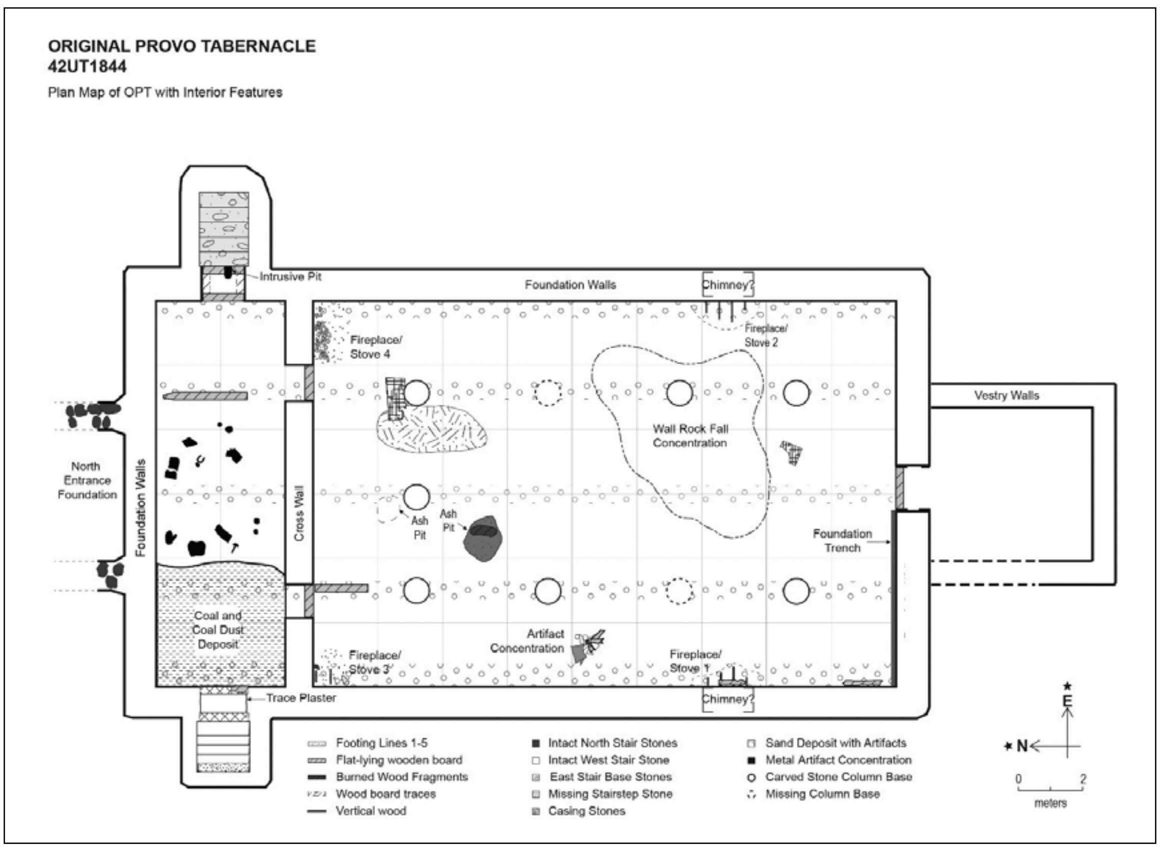

Figure 21. Map of all excavated features within the OPT foundations (Image courtesy of the Office of Public Archaeology).

Figure 22. Photographs of the marks in the subsurface layer created by the floorboards which once existed above. This evidence was found within a large ash and coal deposit in the northern foyer area of the OPT foundation (Photos courtesy of the Office of Public Archaeology).

Figure 23. The plinth stones and the rock alignments within the OPT foundations (Photos courtesy of the Office of Public Archaeology).

Figure 24. Example of nails (Image courtesy of the Office of Public Archaeology).

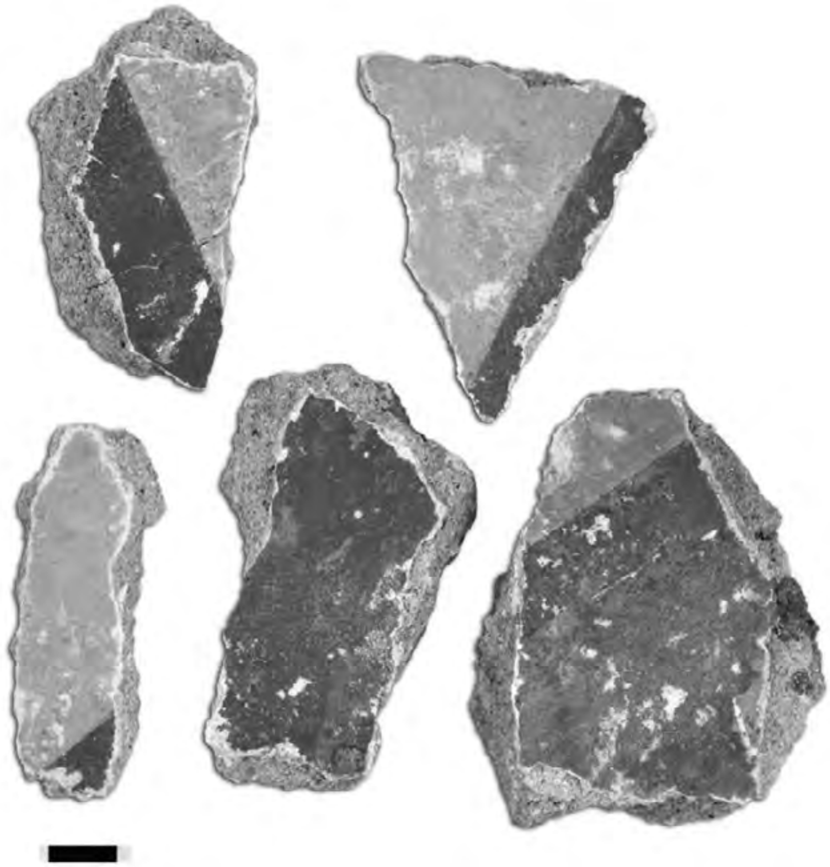

Figure 25. Plaster fragments (Image courtesy of the Office of Public Archaeology).

a linear area approximately 2 m (6.6 ft.) south of the interior cross wall. It is likely that this concentration is evidence of a late-nineteenth or early-twentieth century remodel in this area of the OPT. Nearly one half (n = 2,630 or 47.12 percent) were 9d nails; a penny weight consistent with nails used in general construction. The prevalence across the assemblage of the 9d nail was observable regardless of strata or type (wire or cut). The second most common nail was a 4d nail consistent with finer wood work and finish elements.

Other building materials included spikes, bolts, screws, washers, plaster fragments, bricks, window glass, and electrical components. Plaster fragments recovered showed evidence of the vibrant decorative paint which once existed in the building's interior (Figure 25). In 1891, 64 incandescent light bulbs and the necessary wiring were installed in the OPT at a cost of $150 (*Daily Enquirer,* May 7, 1891). Remnants of the early wiring including fragments of copper wiring, porcelain insulators, and ceramic fixtures were recovered in the excavation.

Ceramics

Ceramic analysis followed procedures outlined in Sutton and Arkush (2006) with appropriate adaptation according to Berge (1980). OPA identified five general types of historic ceramics at the OPT; earthenware, whiteware, improved whiteware, stoneware, and porcelain. The majority of ceramics recovered

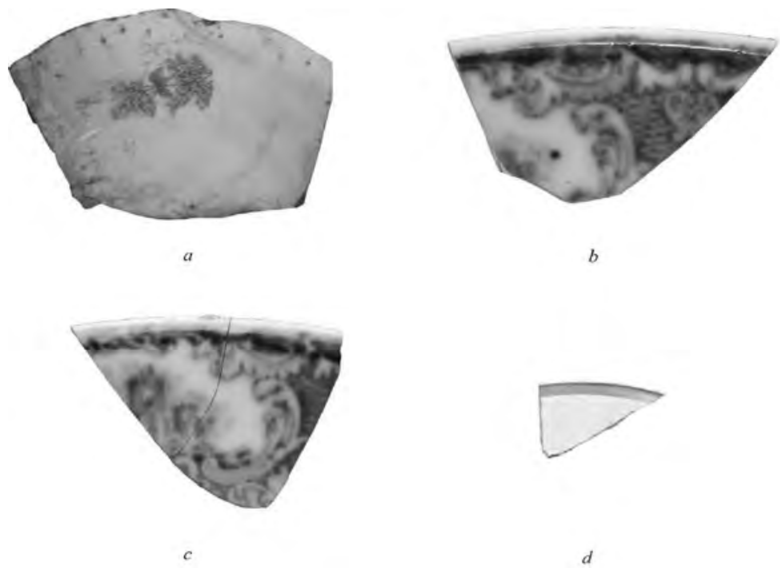

Figure 26. Ceramic examples from the OPT, including (a) floral decal, (b and c) flow-blue examples, and (d) hand-painted banding (Image courtesy of the Office of Public Archaeology).

in the OPT foundations were domestic types including improved whiteware, stoneware, and porcelain (Figure 26). A total of 397 sherds were recovered from the OPT basement, 79.3 percent (n = 315) of these were identified as improved whiteware including portions of plates, bowls, teacups, saucers, and platters. Additionally, 70 stoneware, seven porcelain, and four redware (earthenware) sherds were identified (Harris et al. in press:117). No chemical analysis was conducted on the ceramic assemblage. Decorative treatments varied within the assemblage, with all the porcelain and 313 of the improved whiteware possessing a clear glaze. From the recovered data, it can be inferred that the majority of the ceramics used in the OPT during its lifetime were utilitarian pieces intended for food consumption.

Miscellaneous Items

Miscellaneous items recovered from the OPT foundations included clothing items (buttons, snaps, belt buckles, and footwear), coins, toys, tools, various toiletries (combs and hair clips), sewing items, eyeglass lenses, jewelry. Many of these common items were small and likely dropped by children and adults attending meetings in the building. Buttons and clothing fasteners were surprisingly common. In total, archaeologists encountered 148 buttons or snaps from the OPT foundation, 115 from the main basement and 33 from the northern foyer entrance. Buttons ranged in composition from glass, metal, and shell to vulcanized rubber (Figure 27). Additional items related to clothing included a substantial number of straight pins, needles, safety pins, beads, and the remains of a pair of sewing scissors. A significant number of toys including small animal figurines, doll pieces, marbles, and a small battle axe were also recovered (Figure 28). Hairpins, combs, beads and jewelry pendants—including two nearly identical “D” shaped pendants—were also recovered (Figures 29 and 30). Writing implements were fairly common as well. The assemblage also contains nearly 60 slate pencils, writing slate, three wood pencils, several fragments of graphite lead, a

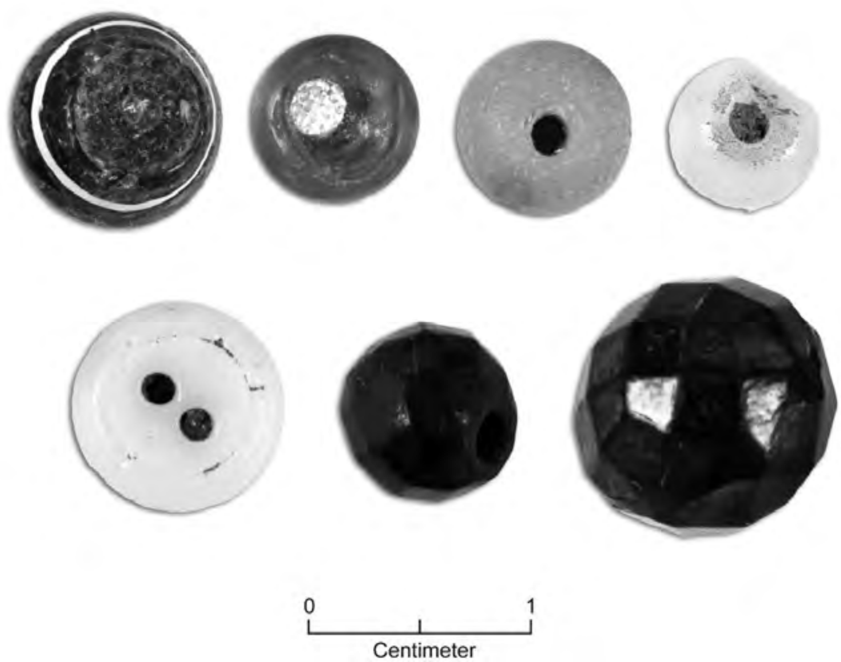

Figure 27. Several buttons recovered in the OPT foundations (Image courtesy of the Office of Public Archaeology).

Figure 28. Children's toys (Image courtesy of the Office of Public Archaeology).

Figure 29. Personal items included (a) hairpins, (b) combs, and (c) razor blades (Image courtesy of the Office of Public Archaeology).

Figure 30. One of several "D" shaped pendants recovered at the OPT (Image courtesy of the Office of Public Archaeology).

Figure 31. Slate pencils, inkwell, and fragments of slate writing boards recovered in the OPT (Image courtesy of the Office of Public Archaeology).

glass inkwell, and a fountain pen throughout the OPT foundations (Figure 31). Additional items included five shoes for a horse or mule (all found in the northern foyer area), bullets and cartridges, glass bottles for both medicine and spirits, tools, and a torch-like object believed to have been the decorative finial or weathervane that once sat atop the OPT bell tower (Figure 32). This may be the very "ball and vane" which Elder Taylor blessed specifically in the dedicatory prayer. Finally, many coins were found including denominations familiar to most and some still in current use (i.e., dimes and nickels), and a two-cent piece. A local trade token from Frumkin's store, good for one cigar or 12 ½ cents (a "bit"), was also recovered (Figure 33).

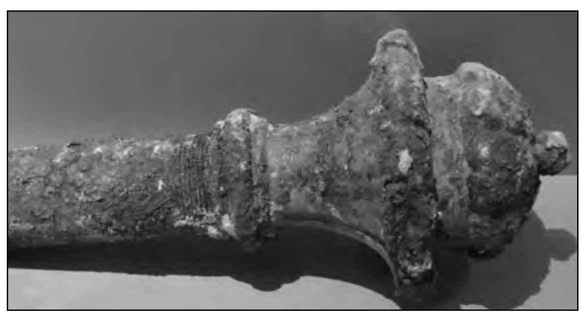

Figure 32. Possible finial which once adorned the top of the OPT tower (Image courtesy of the Office of Public Archaeology).

Research Conclusions

In response to the questions posed at the outset of the research project, artifacts and other information recovered during the excavations, historical research, and in-depth documentation provide some explication of those questions.

1. Is the OPT architecturally unique amongst LDS tabernacles of the period? The OPT represented a new architectural style without precedent in Utah and served as the prototype for a building type which, both

Figure 33. A few of the coins from the OPT excavations including an 1854–1873 silver 3 cent piece (bottom left), a 1902 Barber quarter (top right), and the Frumkin's cigar token, (middle left) (Image courtesy of the Office of Public Archaeology).

figuratively and literally, stood at the center of the Mormon ideal of city building.

2. Where did the raw materials originate? It is evident that the stone, lumber, lime, and other materials for the OPT came from local canyons. Roads providing access to these canyons constituted the single largest expenditure during the construction project.
3. What modification or remodeling occurred within the OPT? There was evidence that modest modification did occur within the OPT sometime near the turn of the twentieth century. This is most evident in the linear concentration of wire nails just south of the interior partition and may represent the addition of a "floating" partition.
4. How was the OPT basement utilized? The basement of the OPT was used at various times for public and private, religious and secular functions, storage, and generally as a place of meeting for the early Provo community. Archaeologists found evidence of community gathering which likely included food (both ceramic ware and faunal remains). Slate pencils, toys, buttons, brooches, pendants, fountain pens, coins, and the Frumkin's cigar token indicate that all members of the community of all ages participated in activities in the Tabernacle basement. These may have included educational activities (lectures or school), sewing projects, or other gatherings where food was shared. In addition to the cigar token, glass ware indicates that these gatherings may have included the consumption of tobacco and alcohol.[5]
5. How did the function of the OPT change during the period when the two tabernacles stood side-by-side? After the construction of the second tabernacle, the function of the OPT slowly transitioned from the center place of the stake where many important

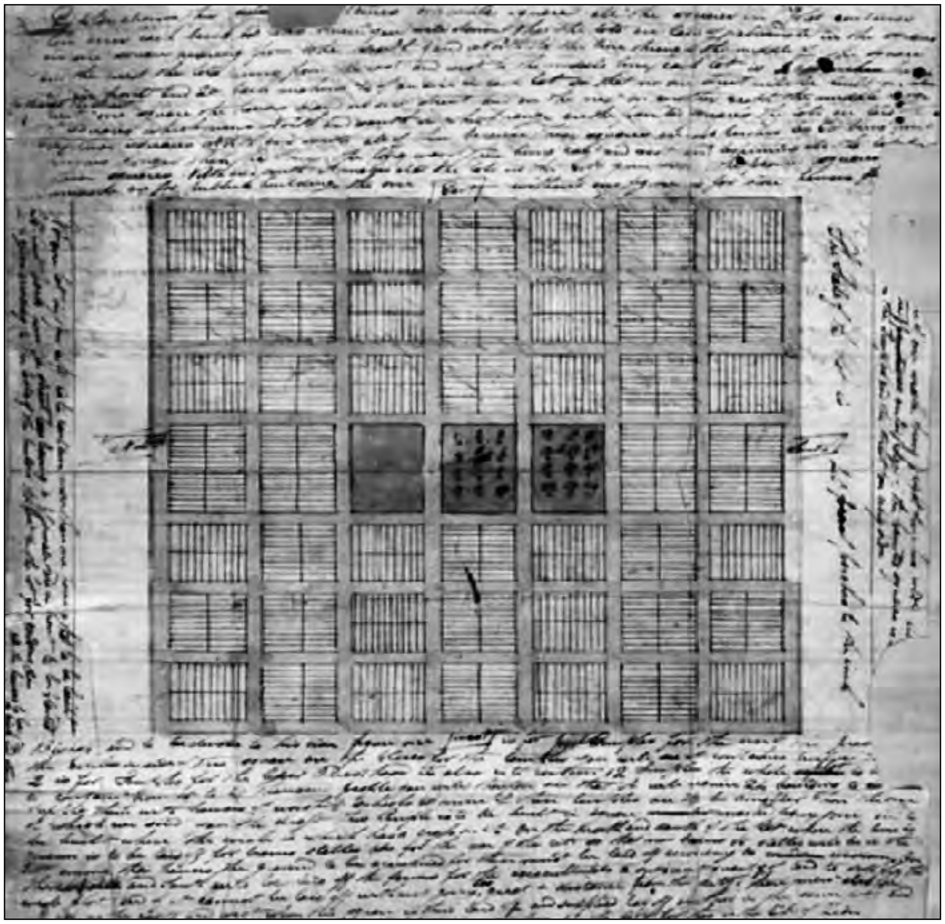

Figure 34. City of Zion Plat, 1833 (Courtesy of the Church History Library, Salt Lake City).

meetings were held, to a ward meetinghouse, to a normal school, and eventually to a storage space just prior to its destruction in 1919.

6. Were the remnants of associated outbuildings present? The remnants of several of the buildings associated with the OPT were also present (Talbot 2014).

Synthesis

The archaeological evidence of the OPT offers archaeologists, historians, and interested members of the public invaluable insight into the final years of the building. It shows how dramatically the building's purpose was changed by the construction of the second tabernacle. The OPT was built as a center place of the community. In its original form, the OPT served as the valuable intersection between religious and secular life in Provo, the zero on the Cartesian axis, and as the focal point of the society.

While Mormons built tabernacles in several previous locations, the OPT represented the first such structure outside the headquarters of the Church. In many ways, the OPT and the entire design of the city of Provo were conceived as an attempt to implement an ideal plan for a city revealed to Joseph Smith in 1833 commonly called the "City of Zion" (Figure 34). This plan, originally intended to be constructed in Jackson County, Missouri (D&C 57:1–3), outlined a settlement pattern which included

Figure 35. Three examples of LDS tabernacles built after the OPT; (right-to-left) St. George Tabernacle, Uintah (Vernal) Tabernacle (now the Vernal Utah Temple), and the Logan Tabernacle.

five components: 1) centralized squares reserved for the construction of community and religious buildings, 2) rigid, square-gridded city blocks which are cardinally aligned, 3) wide streets, 4) prescriptions for the placement of houses within the city blocks, and 5) farm land located outside the settlement (Arrington 1958, 1979; Arrington et al. 1976; Bennion 2001; Jackson 1977; Jackson and Layton 1976; May 1977; Meinig 1965, 1998; Nelson 1952). Roberts argued that this pattern would allow for greater "society" amongst the inhabitants of the city. "The farmer and his family," said Roberts (1957:1:312):

> will enjoy all the advantages of schools, public lectures, and other meetings. His home will no longer be isolated, and his family denied the benefits of society, which has been, and always will be, the great educator of the human race; but they will enjoy the same privileges of society, and can surround their homes with the same intellectual life, the same social refinement as will be found in the home of the merchant or banker or professional man.

The pattern of Mormon city building in the west, based on the City of Zion plan and the ideological desire to build society, left a distinctive, even unmistakable mark on the landscape. Bennion (2001:187) stated emphatically that, "nineteenth-century Mormons . . . wherever they settled, no matter what the terrain, the saints fashioned similar kinds of cultural landscapes." Religious structures were central to the shared Mormon vision of society. Outside of Salt Lake City where the temple is the literal center, tabernacles occupied the center position in the Mormon cultural landscape. In the outlying settlements, "The tabernacle" says Hamilton (1995:56), "was another aspect of the overall concept of sacred space and a physical symbol of the kingdom of God." As the first of such buildings, the OPT served as a prototype both for Mormon tabernacles thereafter and for the Mormon ideal of society (Figure 35).

The OPT provided the impetus and means for the construction of roads which provided access to the plentiful resources in the canyons nearby—resources which built up all of Utah Valley. Despite this, it is clear that the building itself was not as crucial to the construction of Mormon society as the ideology. When the second tabernacle was completed, it quickly supplanted the OPT both physically and symbolically as the center place of Provo's society. The symbolic reappropriation was so complete that knowledge of the very existence of the OPT had been lost to collective memory when the second building burned.

The archaeological excavations of the OPT point to a space whose purpose was varied, diverse, and significant. Despite being replaced as the symbolic center of Provo society, the OPT continued to serve a critical role in the community. As the setting for communal meals, normal schools, public lectures, weekly religious services, and recreational activities the OPT continued until its demise to draw the people of Provo together into the idealized society which Smith envisioned. The strong evidence that men and women, adults as well as children, participated in events held in the OPT further speaks to the changed but nonetheless significant role of the OPT in late-nineteenth and early-twentieth century Provo.

CONCLUSION

The OPT played a major role in the establishment of a pattern of Mormon settlement which has left an indelible impact on the landscape of the western United States. As the prototype for large, centralized, communal structures outside of Salt Lake City, the OPT provided a blueprint for the construction of similar buildings throughout the Mormon culture region. In the OPT and subsequent tabernacles built after this pattern, the Mormon concept of Zion, in general, and the notion of a compact society where education could flourish, in particular, found tangible expression. In addition to providing the symbolic center of the community, the construction of the OPT provided the needed impetus for the construction of a county-wide economic system which monetized commodities, provided for the flow of goods and services throughout the area, and allowed for the construction of necessary infrastructure to ensure that Provo remained a vibrant, self-sufficient community. Even in its waning years, and despite having lost its place in the center of religious and secular life (physical and symbolically) the OPT continued in its valuable function as a place of meeting and society for the people of Provo. It is not, therefore, too much of a stretch to say that the building of the OPT was the foundation upon which the city of Provo was built.

During his dedicatory prayer, Elder John Taylor specifically blessed each piece of the OPT; dedicating each to the glory of God (Christensen 1983). This included the nails, the plaster, the window glass, the stone in the foundation, the lime in the mortar, and all of the interior fixtures. During the OPT excavations, the remains of this building were unearthed and handled. Insights into the construction, use, and demolition of the building were found. Our understanding of Provo, the establishment of the community, and the building of society are greatly improved by the valuable information collected in the course of the excavation and laboratory analysis. ■

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Endnotes

1. Hamilton (1995:53–54) has argued that in the early history of the LDS Church "A tabernacle was an important unifying element in maintaining the Mormon concept of Zion and the Saints' requirement to bring it about. . . . Tabernacles were second in hierarchical importance to temples." The term "tabernacle" is an allusion to the biblical "tabernacle of the congregation," a tent-like temple carried by the children of Israel during their forty year sojourn in the wilderness under the leadership of Moses (Exodus 25–27). In the Old Testament, the tabernacle and the stakes and cords which secured it, became symbols of God's protective orientation toward his followers (see Isaiah 33:20; 54:2–7); hence, the term "stake" used to refer to the collection of local LDS congregations (or wards). Tabernacles were proposed and occasionally constructed as the center place of the "stakes of Zion" as early as Far West, Missouri, and Nauvoo, Illinois, (Hamilton 1995:55). Different in both form and function from temples (the most elaborate and sacred of all LDS building types), the tabernacles were designed to provide a location large enough for the majority of the membership in the stake to meet together. In most Mormon settlements no wards met regularly in the stake tabernacle which was reserved, instead, for stake conferences or other special meetings particularly when visiting members of the first presidency or quorum of the twelve apostles (the Church's governing bodies) addressed the members of the stake. While "stake" is still in common usage amongst Latter-day Saints, the tabernacle has been replaced by less elaborate "stake centers," which serve as both the center place of the stake and as the meetinghouse for local wards.
2. The strained relationship between the Mormons and the *Timpanogots* came to a head in the late-winter of 1849. On February 27, 1849 word came that renegade Utes had driven Mormon livestock, including cattle and horses, to Utah Valley. After several days of tracking the thieves, a well-armed party of no less than thirty Mormons found the four Ute men who had stolen the livestock with "one teenage boy, and a dozen women and children" hiding at the mouth of Battle Creek Canyon near present-day Pleasant Grove (Carter 2003:64). A four-hour gun battle between the thieves and the Mormons ensued. At the end of the conflict, all four renegade Utes were dead; the Mormons suffered no casualties.
3. A native of Texas, Albert S. Johnston (1803–1862), eventually served as a member of the Confederate States Army, commanding the CSA forces against the army of General U.S. Grant in the Battle of Shiloh (a.k.a. the Battle of Pittsburgh Landing) where he died April 6, 1862.
4. In addition to the OPT, several other structures had also previously existed on the site including a contemporaneous well, a caretakers cottage, and an 1870s baptistry. In addition to completely excavating the foundation of the OPT, the project completely excavated the well and the caretakers cottage. Testing was conducted at six water collection features (cisterns) related to the second tabernacle and the Hotel Roberts (one block south). I leave the important information on these remaining features for the forthcoming report (currently in press).
5. The "Word of Wisdom," Joseph Smith's 1833 revelation directing members of the LDS Church to not consume alcohol or tobacco, originally was not considered to be any more than a suggestion; literally a word to the wise. Around the turn of the twentieth century, Church leadership began to view it as a requirement for full participation in the Church's practices and ordinances; most specifically for admission to the temple. It was not uncommon for Church leaders to teach that the revelation was a commandment from God and to encourage members to practice the prohibitions it outlined. For instance, during an 1856 meeting of the School of the Prophets (an exclusive meeting where doctrinal instruction was given to leaders and future leaders of the Church) held in the OPT basement Brigham Young asked those present to stand if they were observing the Word of Wisdom. Many stood, several remained seated. President Young instructed those still sitting that they would be excluded from the further meetings of the School of the Prophets if they were not keeping the Word of Wisdom (Utah Stake Minutes 1856). Admission to the temple was not denied for failure to observe the Word of Wisdom until 1921 and some debate over what it meant to "keep" the Word of Wisdom continued until the mid-1930s (Alexander 1981).

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What Meaneth These Green Stones? Variscite Use in the Great Salt Lake Region

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Variscite is occasionally found in archaeological excavations in Northern Utah. Not much is known about this green stone used for ornaments. It is similar to turquoise and sometimes mistaken for it. Archaeologists have called for more study of this stone. This paper hopefully adds some information to this study.

Allison (2002) has called for a comparative study of variscite artifacts that would prove helpful in future archaeological research. This paper is an attempt to partially fill this need. This is based on reconnaissance conducted during the Great Salt Lake Project (Russell et al. 1989; Simms et al. 1991) and a few published excavation reports which mention variscite (Allison 2002, 2011; Simms and Heath 1990; Stuart 1980).

Variscite is a mineral that generally forms where massive, phosphate-rich, hydrothermal replacement deposits have altered aluminum-rich rock. It is a semi-precious gemstone ranging in color from pale green to green sometimes trending to bluish green. It is difficult to distinguish from turquoise being similar in color and chemical composition although variscite lacks copper. Turquoise, however, is harder (5–6 on the Mohs Scale) and is a better stone for making jewelry (Chesterman 1978). Visual similarities between turquoise and variscite may be responsible for the under-reporting of variscite in the literature, where it is identified as turquoise (Lupo 1988). The *only* turquoise ornament so far identified in the Great Salt Lake region is a small bead from the Fremont component of a mixed Fremont/Promontory site (Richard Moyle, personal communication 2010).

Sources of variscite in North America appear limited to the Eastern Great Basin and a number have been identified in Utah (Callister 1997; Stokes 1986). Sources include Clay Canyon near Fairfield in Utah County; Amatrice Hill on the east slope of the South Stansbury Mountains in Tooele County; Malthus Point near St. George in Washington County; and two in Box Elder County. Those in Box Elder County include Utahlite Hill on the north end of the Pilot Range near Lucin (utahlite is the official Utah State mineral) and the Hansel Mountain source near Snowville. A source on Promontory Point has been reported (Callister 1998) although I could find no evidence of this source in either my own field reconnaissance or in conversations with local rock hounds. Whenever Promontory is mentioned they always refer to the Snowville source. Local rock hounds also refer to Lucin variscite as utahlite or variquoise and the Snowville source as variscite. Each of these variscite sources has their own distinctive characteristics and can often be identified by visual inspection, although chemical testing is the best way to determine composition and type.

All the sources have been mined historically. To the best of my knowledge, only the utahlite variscite mine near Lucin is still actively mined. Undoubtedly all of these sources were exploited prehistorically, although modern mining has in most cases obscured prehistoric use. Prehistoric use of variscite was first mentioned in 1894 by Don McGuire of Ogden who owned and operated the Clay Canyon mines near Fairfield in Utah County. He noted lithic scatters surrounding the mine and petroglyphs in the area. Joe Pauli, a rock hound and old artifact collector showed me a small Fremont Great Salt Lake Gray bowl filled with raw variscite nuggets that he found with a human skeleton in one of these old prehistoric mine shafts at the Snowville source he was cleaning out for modern use (Joe Pauli, personal communication 1978).

It is likely that variscite being very similar to turquoise and probably indistinguishable to prehistoric people was of heightened importance. Turquoise in the American Southwest and in Mesoamerica has long been associated with rain which symbolizes fertility and prosperity. It has been considered an exotic trade item with a large distribution reaching from the Southwest into Central America. Variscite, with its similarity to turquoise, may have served as an exotic status marker possibly ascribed with magical/spiritual properties (Toll 1987).

Function

How specific artifacts were used is often difficult to determine. It is often assumed that variscite was used solely for personal decoration. It is also assumed it was used only for necklaces, however, it was commonly used by both historic and prehistoric people on bracelets, earrings, bead work, and clothing decoration. As such they commonly served as marks of distinction, prestige and many were assigned special magical or spiritual qualities.

Ornaments can represent investments of considerable time in manufacture and tend to be very limited in quantity compared to other artifact types. Artifact types (Figure 1) identified in this study consists of the following:

- Flakes: Flakes are assumed to be the residue of ornament production. They are usually small in size and resemble tertiary-stage lithic flakes produced by chipping the raw material into a rough shape. Assuming variscite's importance, even flakes and small pieces of raw material may have been saved.
- Beads: Beads are small, usually less than 2mm in size, and circular to oval in shape. They have a drilled hole in or near the center of the object. Included in the bead category are disks. These round, quarter-sized pieces of variscite are ground and polished. Two of the disks have what appears to be the start of a drill hole and may be unfinished ornaments. There is some thought that they may represent gaming pieces.
- Tie-on Beads: Tie-on beads are ground, irregularly-shaped pieces of variscite that have been slightly notched for attachment. In the Great Plains culture area they are known as tie-on Beads (Westfall 2008).
- Pendants: Small- to medium-sized square- or oval-shaped pieces of variscite are ground and polished. At the upper end of the pendant is a drilled hole near the center or side of the ornament.
- Bar: are long, thin, rectangular-shaped pieces of variscite, slightly rounded at the ends and highly polished. Although function is unknown, they may have served as nose plugs for pierced noses.

Production stages of variscite ornament manufacture were probably similar to those of historic Pueblos (Forman 1978).

Stage 1: Involves taking the raw material and flaking or chipping the ornament into a rough shape. Variscite flakes found on archaeological sites are assumed to be indications of this process.

Stage 2: This stage involves grinding the preforms into the desired finished shape.

Stage 3: Involves the drilling of a hole for attachment or slight notching for tie-on beads.

Stage 4: The final step involves smoothing and polishing the ornament for use.

The description of artifact production and types served as a guide for field work. Field work conducted over two field seasons in the Great Salt Lake wetlands recorded over 500 archaeological sites (Russell et al. 1989; Simms et al.1991). The

Figure 1. Variscite and turquoise ornaments (left to right). Top row: variscite tie-on bead, ground disk, ground disk. Middle row: variscite bar (nose piece?), bead, bead, pendant. Bottom row: broken variscite pendant, turquoise bead. Penny for size.

study area reached from Ogden Little Mountain on the south northward approximately 35 miles to Corrine Little Mountain in Box Elder County. It includes the extensive wetland areas of Bear River Bay, Willard Bay and Ogden Bay on the north arm of the Great Salt Lake bounded by the Wasatch uplands (ca. 4,230 ft elevation) to the east. Variscite was occasionally encountered on a few sites (ca. 4 percent of the sites) in the form of small flakes and/or finished ornaments. Variscite was recorded by site number, site type, artifact type, source, and cultural affiliation if known. Variscite source locations were confirmed by knowledgeable rock hounds and a retired Weber State University geology professor (Richard Moyle, personal communication 2010). This data is summarized in Table 1.

Discussion

Although the sample is small, some interesting patterns have emerged. First the two main sources of variscite, as expected, were the Lucin source (ca. 150 miles west of the study area) and the Snowville source (ca. 80 miles to the northwest). These are the two closest variscite sources to the study area. The further Lucin source makes up only 12 percent of the sample with 88 percent coming from the Snowville source. Of the sample of 300 variscite items, 72 percent were flakes produced from the manufacture of ornaments and 28 percent as broken and/or finished ornaments. Based on the patterning of variscite flakes on sites, the center of variscite ornament production appears to be focused in the Corrine/Little Mountain area of Bear River

Table 1. Variscite Use in the Great Salt Lake Region.

Site	Site Type	Flakes	Beads	Tie-On	Pendant	Bar	Source	Cultural Affiliation	Total
Corrine*	HAB	49	20	–	1	–	S-70	Fremont	70
42BO64*	LTC	–	1	–	–	–	S-1	Promontory	1
42BO78*	LTC	–	–	–	1	–	S-1	Promontory	1
42BO121*	LTC	90	25	–	–	–	?	Promontory	115
42SL231*	LTC	–	2	–	–	–	S-2	Promontory Fremont	2
42DV2*	LTC	–	1	–	–	–	?	Promontory Fremont	1
Salt Cr.P	STC	8	–	–	–	–	L-8	Promontory	8
Connor Springs	STC	30	3	1	–	–	L-11, S-23	Promontory	34
42BO3–6	HAB	–	–	–	2	–	L-1, S-1	Fremont	2
42BO63	STC	–	1	–	–	–	S-1	Promontory	1
42BO120	HAB	15	–	1	–	–	L-11, S-5	Fremont	16
42BO128	Rock STC	5	–	–	–	–	S-5	Fremont Promontory Late Prehist	5
42BO135	Rock STC	11	–	–	–	–	S-11	Fremont Promontory	11
42BO143	HAB	3	–	–	–	–	S-3	Fremont	3
42BO1071	LTC	–	7 (2)	1	1	1	L-2, S-8	Fremont Promontory	10
42WB33	LTC	–	1	–	–	–	L-1	Fremont	1
42WB43	HAB		–	–	1	–	S-1	Fremont	1
42WB57	HAB	–	2	–	1	–	S-3	Fremont	3
42WB178	HAB	–	3	–	–	–	S-3	Fremont	3
42WB185	HAB	–	1	–	–	–	S-1	Fremont	1
42WB282	HAB	–	2	1	–	–	S-3	Fremont	3
42WB247	LTC	–	1 (1)	–	–	–	S-2	Promontory	1
42WB285	LTC	–	2 (2)	–	–	–	S-2	Promontory	2
42WB303	HAB	–	3 (2)	–	–	–	S-3	Fremont	3
42WB430	LTC	–	2	–	–	–	S-2	Fremont	2
Totals		211	77 (7)	4	7	1	L-34, S=266	–	300

HAB= Habitation Site with Structures

L= Lucin Source

LTC= Long Term Camp

Rock= Rockshelter/Cave

S= Snowville Source

STC= Short term Camp

( ) = Number of disks included with beads

* = Excavated Site

Bay. The Connor Springs site produced over 30 variscite flakes, three beads (each broken in the attempt to drill them), and one tie-on bead. Approximately 2 miles to the northeast, two rock shelter sites 42BO128 and 42BO135 produced variscite flakes, as did one of the open Salt Creek sites (Salt Cr.-P). These sites produced variscite from both the Lucin and the Snowville sources.

A little further to the east, Lupo (1988) reports variscite flakes and ornaments from the Corrine Mounds site collected by William Stanley Smith. She reports 49 variscite flakes, 11 beads broken during drilling, nine bead blanks (disks?), and one pendant. Lupo also reports a variscite bead from the West Brigham City site. Based on Smith's map of his collecting areas this site is probably part of 42BO120, a series of Fremont habitation mounds stretching at least a mile along Black Slough, a tributary of the Bear River just east of Corrine. My own recording of 42BO120 confirmed this observation with the discovery of variscite flakes and a tie-on bead. To the northeast of 42BO120 a short distance is the Orbit Inn site (42BO121) excavated by Simms and Heath (1990). Simms and Heath's excavations recovered 90 flakes of variscite and 25 finished ornaments. Unfortunately, neither Simms and Heath nor Lupo reports the source location of the variscite.

It appears there was little or no production of variscite ornaments south of the Willard Mounds sites (42BO3–6 and 42BO143). The location of the Willard Mounds site is at a strategic transportation point where Willard Bay of the Great Salt Lake extends eastward almost to the foothills of the Wasatch Mountains thus forcing all north/south traffic to this corridor to avoid the wetlands to the west and the waters of the Great Salt Lake during wet years. This point is also the natural geographical boundary between Bear River Valley to the north and the Weber Valley to the south. Hence the Willard Mounds site may have been a regional trade center. Variscite ornaments but no flakes have been observed south of this site. This suggests that variscite ornaments were being produced in the Corrine /Little Mountain area of Upper Bear River Bay and then traded as finished goods to people living in Weber and Salt Lake Valleys.

This observation parallels the distribution of calcite-tempered ceramics and obsidian in both the Fremont and the Promontory time periods. Geologically the Promontory, Corrine/Little Mountain area have many limestone rock formations and weathered calcite chunks can be readily obtained. Approximately 70–80 percent of ceramics from this area are calcite tempered which suggests this is a possible production source location. Obsidian from Great Salt Lake archaeological sites originate almost exclusively from the Malad source in extreme southeast Idaho, some 85 miles to the north. Out of 75 obsidian artifacts from Fremont and Promontory sites that have been sourced by the USAS Promontory/Tubaduka Chapter (Cornell et al. 1992; Hughes 2002) all but one originates from Malad. The one exception is from the Wild Horse source in the Mineral Mountains. The evidence suggests that variscite ornaments, calcite-tempered ceramics, and obsidian may have been some of the items traded to inhabitants of Weber, Salt Lake, and possibly Utah Valleys. As suggested by Simms (1986) this trade may have been between non-farming Fremont groups (or non-Fremont groups, i.e. Promontory) with Fremont horticulturists. What they received in exchange may have included feldspar/quartz and crushed-rock tempered ceramics, painted ceramics (Fremont only), and *Olivella* shell beads. *Olivella* shell beads are common on sites in the Great Salt Lake wetlands but are rare north of it. Although it is outside the scope of this paper I would concur, as Janetski (2002) suggests most of the trade between areas was in perishable foodstuffs and goods. Could it be that pine nuts from northwest Utah and bison products from the Bear River Valley were traded for agricultural goods (maize) during the Fremont period and other wetland products (i.e. fish, seeds, and roots) during the Promontory period?

Recommendations

The same rigorous study that turquoise has been subject to (Jardine 2007) should be applied to variscite. Therefore I would make the following recommendations for future research:

1. In future archaeological work attention should be taken to observe and quantify variscite ornaments and especially flakes which might suggest local production.
2. Every effort should be made to identify the source location of the variscite. Because of the distinctive appearance of different variscite sources it is possible to visually examine or consult with geologists.
3. Variscite may have the potential to tell us much about territories, movements and trade patterns between various prehistoric groups, especially when used with other cultural items such as obsidian, pottery, and shell beads.
4. Variscite may have the potential to yield insights into the social and/or religious customs and behaviors of prehistoric peoples in northern Utah.
5. Comparisons should be made with other Fremont groups and non-Fremont groups such as the Ancestral Pueblo and other groups who highly valued blue-green stones.

Conclusions

The two main sources of variscite in northern Utah are the Lucin (utahlite or variquoise) source and the Snowville/Hansel Mountains source. In the study area the Lucin source comprises 12 percent of the sample with 88 percent coming from Snowville. Based on the patterning of variscite flakes it appears the center of variscite ornament production is the Corrine/Little Mountain area of Bear River Valley, which were then traded as finished goods. This observation parallels the distribution of calcite-tempered ceramics and obsidian in both the Fremont and Promontory time periods. The evidence suggests variscite ornaments, calcite temper, and obsidian were being traded to people living in the Weber and Salt Lake Valleys who may have traded *Olivella* shell beads and quartz/feldspar-tempered pottery. It is also possible that much of the trade involved perishable items such as maize and buffalo products. It is also proposed that the large Willard Mounds site (42BO3–6) may have served as a regional trading center for the people of Bear River and Weber/Salt Lake Valleys.

Based on the small sample of sites (n = 24), it appears that the heaviest use of variscite occurred during the Fremont period ca. A.D. 400–1300. (11 single occupation and five mixed occupation sites) with a slight decrease during the Promontory period ca. A.D. 1300–1600 (eight single occupation and five mixed). At present, there is little or no evidence of variscite during the Archaic (6000–100 B.C.) or the Protohistoric Period (A.D. 1600–1800). It is apparent that variscite, like turquoise, was highly valued and sought after. Its use may have been as a prestige item and/or an item of religious significance. As seen from this paper, a great deal of research remains to be done on this topic. ■

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Book Reviews

"The Prehistory of Gold Butte: A Virgin River Hinterland, Clark County, Nevada" by Kelly McGuire, William Hildebrandt, Amy Gilreath, Jerome King, and John Berg. University of Utah Anthropological Papers, No 127, University of Utah Press, Salt Lake City. ISBN-13:978-1607813057

Review by Mark Karpinski, Cultural Resource Program Lead, Tetra Tech.

One of the most common complaints about the cultural resource management portion of field archaeology is a lack of scope in individual undertakings which, in turn, limit the potential contribution to the greater archaeological knowledge base. Another is when such scaled endeavors do occur, the data is packed away in grey literature that will likely never be seen or heard from again. The cultural resource management undertaking conducted by Far Western on the 364,116 acre Gold Butte Area of Critical Environmental Concern (ACEC) on behalf of the BLM, Las Vegas Field Office is an exception to both complaints. As someone caught in the repetitive rut of "survey fast, record briefly, report minimally, repeat," reading the results of this work provided much needed relief and even hope that one day I would get to be an archaeologist again.

Gold Butte ACEC is located in southeastern Nevada at the convergence of both the geographically and culturally defined areas of the Great Basin, Mojave Desert, and Colorado Plateau. Additionally, the study area is situated between the Virgin River to the north and the Colorado River to the east. As Far Western details, the region is well situated to provide significant information for such research questions as cultural chronology, land utilization by both hunter-gatherer and agriculturally focused groups, interregional exchange, the Puebloan collapse, and the Numic expansion. Gold Butte has also been long known for its high density of rock art, for which Far Western also presents their encounters and documentation.

As with any project of this scale, the first obstacle is how to effectively collect data that helps characterize the cultural material present in a 364,116-acre area without the time and expense of physically walking the entire acreage. Far Western's solution to the problem was to divide the entirety of Gold Butte area into 25 hectare squares and into five major ecological domains they define within the area. They selected a random inventory sample of 311 of the 25-hectare units and, based on the initial results, an additional 194 nonrandom units for inventory to provide information for a total of 31,196 acres. The inventories recorded 341 sites and 387 isolated finds. From the results, Far Western developed their site typology designed to help refine and inform the subsequent analysis of land use, population density, and resource utilization.

A key part of Far Western's resource goals for the project was to establish a cultural chronology specific to Gold Butte. In addition to using the typical temporally diagnostic artifacts such as projectile points, trade beads, and ceramics, Far Western expands the study to include other chronometric measures in an attempt to further region-specific refinement by conducting obsidian hydration analysis (324 specimens) and radiocarbon sampling (32 assays). Far

Western was able to refine Gold Butte's cultural chronology beyond the standard established cultural chronologies for the major surrounding culture areas. The resulting data from the obsidian hydration analysis proved problematic at times; however, the authors's understanding of such issues like source and effective hydration temperature variation and having multiple other sources of chronometric data allowed for effective use of the hydration results. They also use the frequency of each diagnostic indicator to reconstruct potential land use intensity at given points in time. The information presented in this chapter is critical to their later arguments for Basketmaker through Pueblo land use and subsequent Numic arrival and proliferation at Gold Butte.

The excavation section reviews the results of limited excavations at nine sites within the Gold Butte area. The individual site descriptions summarize all findings at each site with particular focus on defining encountered component(s), the chronological age of defined component(s), and establishing the resource utilization activities that occurred at the site. Although excavations appear "limited" at a total of 26 m^3 for all nine sites, the findings reported by Far Western excite the mind of what information could potentially still be present within the nine sites as well as those not subjected to subsurface excavation. From the data Far Western did recover, they are able to show the changes in resource use through time and, by inference, potential changes in land use intensity and resource focus by groups at specific temporal periods.

For their study of the rock art of Gold Butte, Far Western begins by reviewing the major defined style of the greater region. They then review the results of their findings (379 panels over 42 sites) compared to the defined styles and the frequency of each style occurrence. At the outset it seems to be a recounting of the rock art inventory of the region. However, the rock is confined to outcrops of Aztec sandstone that only makes up seven percent of the overall area, and the formation is concentrated in the north-central portion of the study area. Far Western also concludes that by the frequency the various temporally bound rock art styles, Gold Butte was likely more frequently utilized by both pre- and post-agricultural groups. They also challenge the validity of West Virgin as a separate style of rock art and report no evidence of Fremont influence in the rock art, which corresponds to the similarly sparse material record of a single Fremont ceramic sherd.

From the body of data collected by Far Western, Gold Butte's prehistory is argued to be a dynamic interaction of groups across time and space within these hinterlands and surrounding river valleys. It is an area that saw increased population and utilization from the later Archaic through Pueblo I with subsequent decrease through Pueblo II and III. Resource utilization changed as groups intensified use of riverine bottom lands for agriculture. Far Western's study of the frequency and distribution of Pueblo ceramics also suggests Gold Butte was a critical trade corridor during early periods. After the Pueblo collapse, Numic groups appear in the region and utilization increases in a pattern similar to pre-Pueblo I.

The book is a valuable contribution to the body of archaeological knowledge of western North America. The study covers a large geographic area with a rich archaeological record in a single undertaking using a broad range of archaeological inventory methods and theory. Far Western's efforts provide insights into numerous on-going research questions including: land and resource use through time; trade and regional interaction; rock art styles; and agricultural use of land not suitable for farming. The results of this study are a valuable resource for future researchers studying within Gold Butte and the greater region of southern Nevada, southwestern Utah, and northwestern Arizona. Resource managers and cultural resource archaeologists should use it as an example of applying inventory and limited testing data to answer research questions beyond standard management archaeology. ■