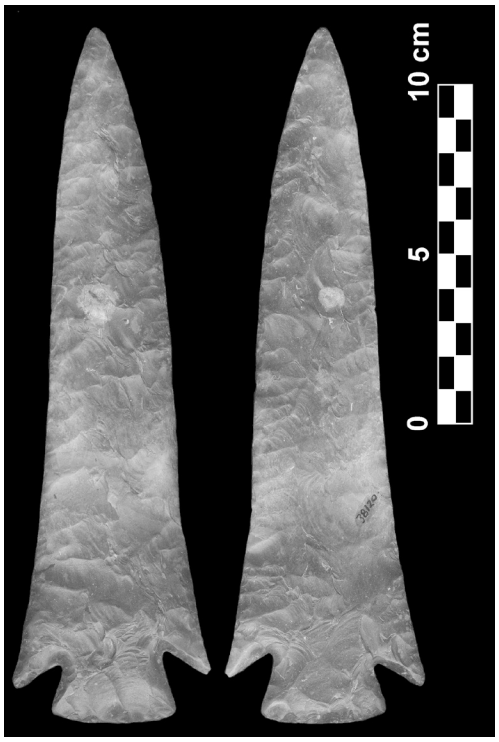
THE WYOMING Archaeologist

VOLUME 63; NUMBER 2; 2019



ISSN: 0043-9665
[THIS ISSUE PUBLISHED
November, 2022]

THE WYOMING **Archaeologist**

WYOMING ARCHAEOLOGICAL SOCIETY, INC.

THE WYOMING ARCHAEOLOGIST is published semi-annually by the Wyoming Archaeological Society, Inc. Address manuscripts and news items for publication to: Dr Danny Walker, Editor, The Wyoming Archaeologist, 1687 Coughlin St, Laramie WY 82072.

INFORMATION FOR CONTRIBUTORS

The Wyoming Archaeologist accepts papers from professional archaeologists, students, and avocational archaeologists. Subjects published in The Wyoming Archaeologist include, but are not limited to, archaeological reports on sites in Wyoming and adjacent areas, descriptive project summaries, preliminary results of significant studies, archaeological method and theory, ethnographic studies, regional history, and book reviews. Submissions by professional archaeologists will be sent for peer review before acceptance.

Authors submitting manuscripts for consideration should follow the style guidelines of the journal *AMERICAN ANTIQUITY* as revised in June 2017 and updated in July 2018. These guidelines can be found at www.SAA.org. Complete instructions for authors were published in *THE WYOMING ARCHAEOLOGIST*, Volume 62(1), 2018, and can also be found on the inside back cover of this issue. Deadline for submission of copy for spring issues is January 1 and for fall issues is July 1. Reports and articles received by the Editor after those dates will be held for a following issue.

The society membership period is from January 1 through December 31. All subscriptions expire with the Fall issue and renewals are due January 1 of each year. Continuing members whose dues are not paid by March 31 of the new year will receive back issues only upon payment of $5.00 per issue. If you have a change of address, please notify the Executive Secretary/Treasurer. Your *WYOMING ARCHAEOLOGIST* will not be forwarded unless payment is received for return and forwarding postage. Back issues in print can be purchased for $5.00 each, plus postage. Back issues out of print are available at $0.25 per page plus postage.

Checks for chapter subscriptions and renewals should be sent to the chapter secretary involved. All other checks, subscriptions, and renewals should be addressed to the Executive Secretary/Treasurer. Correspondence and orders for back issues should be addressed to the Executive Secretary/Treasurer.

A list of chapters and their officers can be found at: http://www.wyomingarchaeology.org/was-chapters.html

Society yearly subscription rates are as follows:
Individual Associate Member - $20.00
Institutional Member - $30.00
Canada and Other Foreign - $34.00

Other memberships may be available. Contact the Executive Secretary/Treasurer for information. Local chapter dues are in addition to state society dues. The Wyoming Archaeological Society is a Nonprofit Organization.

The Wyoming Archaeological Society, Inc. and its local chapters do not discriminate on the basis of age, gender, sexual orientation, gender identity, gender expression, ethnicity, disability, national origin, political affiliation, or religious belief.

Neither the State of Wyoming, the Wyoming Department of State Parks and Cultural Resources, the Office of the Wyoming State Archaeologist, the Wyoming Archaeological Society, Inc, nor their employees or appointed or elected officials can be held responsible for any comment or viewpoint expressed in any issue of *The Wyoming Archaeologist.* The author(s) of each article or issue are totally responsible for the content and views expressed in their paper(s).

On the Cover:

Large ceremonial blades from Garret-Allen site, Carbon County, Wyoming and Gas Hills Area, Fremont County, Wyoming. Eckles, this issue.

THE WYOMING ARCHAEOLOGIST
VOLUME 63(2), FALL 2019

Table of Contents

"Publication of this issue of *The Wyoming Archaeologist* is supported in part by a grant from the Wyoming Cultural Trust Fund, a program of the Department of State Parks and Cultural Resources."

THIS ISSUE PUBLISHED November 2022

WYOMING ARCHAEOLOGICAL SOCIETY MEMORIAL GIFT or CONTRIBUTION FORM

Given by: *Miss, Mrs., Mr., Ms., Dr.* $ _____ *(Amount)*

Name: *Last* _____ *First* _____ *Middle* _____

Address: _____ *City & State* _____ *Zip* _____

Donor phone number *( )* _____

TYPE OF GIFT: ***General Contribution*** *[ ]* ***Specific Contribution*** *[ ]*

In Memory of: _____
Name *City & State*

In Honor of: _____
Name *City & State*

Specify where you would like your money to go (e.g., Mulloy or Frison Scholarship Funds, The Wyoming Archaeologist, ???????)

Please make your check payable to THE WYOMING ARCHAEOLOGICAL SOCIETY
Send to Carolyn Buff, Executive Secretary/Treasurer, 1617 Westridge Terrace, Casper, WY 82604

WYOMING ARCHAEOLOGICAL FOUNDATION MEMORIAL GIFT or CONTRIBUTION FORM

Given By: Miss, Mrs., Mr., Ms., Dr. ***$***_____
Amount

_____
NAME: ***LAST*** ***FIRST*** ***MIDDLE***

_____
ADDRESS: ***CITY & STATE*** ***ZIP***
Donor phone number: _____
Type of Gift: ***General Contribution [ ]*** ***Specific Contribution [ ]***
In Memory of: _____
Name ***City & State***
In Honor of: _____
Name ***City & State***
Please specify where your donation is to be placed.
Jensen/Robson Research Grant _____; Jensen/Robson PhD Travel Award _____;
Hell Gap Research _____; WAF General Operations ____; Other _____.

Please make your check payable to the WYOMING ARCHAEOLOGICAL FOUNDATION and mail to Marsha Peterson, WAF Treasurer, P.O. Box 2168, Laramie, WY, 82073; 307-766-5564.

Any funding for the George C. Frison Institute please contact Dr. Jason Toohey at University of Wyoming Anthropology, Dept. 3431, 1000 E. University Avenue, Laramie, WY 82071; or email jtoohey2@uwyo.edu.

IN MEMORIUM

Edward Jess
1951-2022

Edward William Jess passed away June 18, 2022 at Kingsway Arms Nursing Home in Schenectady after a long illness. He was born July 31, 1951 to Edward and Mayzoe Jess in Schenectady, NY.

From a very early age, Ed's passion was digging and collecting rocks and artifacts and that interest never waned. After graduating from Schalmont High School, he attended the University at Binghamton where he earned his degree in Anthropology, Ed spent his entire career working as an archeologist. His love for the field afforded Ed the opportunity to work in South and Central America early in his career, but the extensive body of work he produced comes from the Western US (mainly Wyoming) involving discovery, archiving and studying Native American sites and artifacts. He owned his own archeological consulting firm centered in Rawlins, Wyoming for many years, later moving to Kemmerer, Wyoming to work for the US Bureau of Land Management, until illness forced his retirement.

To those that knew Ed best, he will be remembered as a fiercely independent, private person who valued close friendships. He was a true free spirit that marched to the beat of his own drum. Ed was also a talented guitarist, collector of music, and a voracious reader.

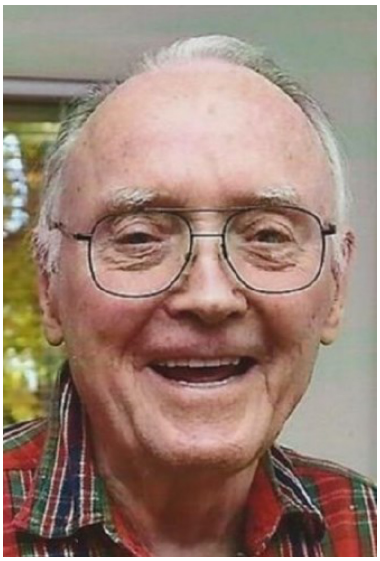
He was predeceased by his parents, his brother Thomas Jess and sister Joanne Jess Perry. Ed is survived by his brothers Steven (Kim) Jess of Charlton, NY, Richard (Danielle) Jess of Charleston, SC and Robert (Nancy) Jess of Saratoga, NY, brother-in-law William Perry, sister-in-law Colleen Jess, several nieces and nephews, cousins and friends.

Remembrances may be shared at bondfuneralhome.com. Memorial donations can be made to City Mission, 425 Hamilton St., Schenectady 12305.

A special Celebration of Life for Ed Jess will be held on Saturday, September 17, at Wolf Hollow Brewing Company, 6882 Amsterdam Road, Glenville from 3-6pm. Relatives and friends are invited to attend.

Arrangements are by the Bond Funeral Home
1614 Guilderland Avenue Schenectady.
https://www.bondfuneralhome.com/memorials/edward-jess/4958511/obituary.php

Stuart Conner
1925-2022



Stuart Conner, loving husband, father, brother, Montana history advocate and expert in American rock art, died at age 97 on March 15, 2022.

He was born in Chicago and grew up in Livingston before moving to Billings, where he graduated from Senior High in 1942. He was a ranger in Yellowstone Park for several summers. A Marine in World War II, Stu graduated from the University of Montana Law School in 1949, spent four years with the FBI and then practiced law in Billings until his retirement in 1986.

Stuart became interested in archaeology, his life's passion, in the late '50s. He was instrumental in the creation of the Montana Archaeology Society, the acquisition of Pictograph Caves as a State Park, and was President of the Montana Historical Society.

The many awards he received in his lifetime included an Honorary Doctorate of Letters from Montana State University, the Crabtree Award from the Society for American Archaeology, the Wellmann Award from the American Rock Art Research Association, the Montana State Historic Preservation Award for Achievement in Archaeology, and the Carroll Award from the Yellowstone Historic Preservation Board.

Stuart is predeceased by his sister, Patricia Morledge; and his former wife, Betty Lu Conner. He is survived by his wife, Susan McDaniel; his daughters, Laurie Wertman (Jim), Cindy Merriam (Steve) and Robin Lester (Jim); as well as many grandchildren and great-grandchildren.

Memorials may be made to the Montana Historical Society, PO Box 201201, Helena, MT 59620. There will be a celebration of Stu's life at Rocky Mountain College's Prescott Hall on Saturday, May 7, from 3 to 5 p.m. Friends and family, please join us in giving the Old Warrior a proper send off!

Condolences may be made at www.michelottisawyers.com.

DEEP SAND: EXCAVATION OF 48LN4114, A STRATIFIED EARLY ARCHAIC CAMP ALONG THE HAMS FORK RIVER

by
Garrett D. Williams

ABSTRACT

This paper presents the results of Metcalf Archaeological Consultants, Inc.'s (Metcalf) data recovery efforts on site 48LN4114 during the Ruby Pipeline Project. Located on land managed by the BLM–Kemmerer Field Office in the Green River Basin of southwest Wyoming, site 48LN4114 yielded evidence of multiple occupations from the Early Archaic Great Divide phase to the Historic period. Excavations were conducted in 2011 following a cultural discovery during pipeline trench inspection. Thirty-two m^2 of excavation documented at least three stratified Early Archaic Great Divide phase and Opal phase occupations spanning about one millennium from ca. 7300 BP to ca. 6300 BP. Located in an alluvial fan or colluvial apron setting between surrounding ridges, all cultural materials were found in deeply buried aeolian sediments capped by around two m of mixed sheetwash and slopewash sediments. Three radiocarbon estimations were acquired from hearth charcoal: 7310±40 BP, 6700±40 BP, and 6290±40 BP. The most recent dated occupation (Opal phase) exhibited the greatest quantity of cultural materials and seems to be the most intensely used occupation. Twelve small hearths were excavated, and nearly 15,000 artifacts collected. The excavations revealed a camp along the Hams Fork River repeatedly visited by Archaic period foragers during the warm and dry mid-Holocene thermal maximum. Excavations also revealed a depositional sequence lending additional support to prevailing climatic theories in this part of Wyoming.

SITE DESCRIPTION

At an elevation of 6,760 ft, previously recorded and National Register-eligible site 48LN4114 is nestled among low ridges extending south toward the Hams Fork River from a large east-west trending ridge system (Figure 1). The site is located on the north side of the Hams Fork River near the community of Opal in southwest Wyoming. The Hams Fork River originates in the Bridger-Teton National Forest and is part of the Green River drainage system. Site 48LN4114 showed surficial artifacts and features widely dispersed over about 13 acres of rolling terrain. Its setting among the undulating ridges provides for a variety of depositional contexts, and buried cultural materials are found at uneven depths across the broad site. Wind-blown aeolian deposits are located on the leeward side of ridges in the western part of the site, as well as in low sheltered areas in the eastern part of the site. Large expanses of deflation with regolith and sandstone bedrock are evident along exposed ridges. In contrast, alluvial fan and colluvial apron slopewash deposits are present in low areas between the ridges, along with ephemeral drainage channels. The varied topography of the site allowed artifacts and features to be exposed on the ground surface, as well as preserved in deeply buried contexts. Diagnostic Late Prehistoric period artifacts and historic era debris were documented on the surface.

Vegetation, dominated by a sagebrush steppe community which includes sagebrush, rabbitbrush, greasewood, and various grasses and forbs, is typical of the area and the prevailing semi-arid climate. A riparian vegetation community is located along the Hams Fork River, which in present-day, includes cottonwood and willow trees. Much of the area surrounding the Hams Fork River is currently cultivated. Prehistorically, the meandering course of the river would have provided suitable settings for marshes along abandoned oxbows and other low-lying locales.

Figure 1: Site overview facing south toward the Hams Fork River. Excavation block is located near center of disturbed pipeline corridor.

Another notable aspect of the natural environment near site 48LN4114 is the presence of lag cobbles of various chert and quartzite materials exposed on the eroded surface of the Pleistocene ridges surrounding the site. The site is located within the broad confines of the Blacks Fork Secondary Lithic Procurement Archaeological Landscape (Blacks Fork Lithic Landscape) (Hoefer 1992). Various unaltered quartzite and chert lag cobbles of potential toolstone associated with the lithic landscape were observed in abundance in close proximity to the site.

EXCAVATIONS

Excavations at 48LN4114 resulted from a discovery in the open pipeline trench during the construction phase of the Ruby Pipeline (Williams et al. 2013). Charcoal staining was observed close to two m below the bladed surface (bbs) within a thick layer of fine reddish brown sand deposits. This buried aeolian unit underlies thick layers of mixed rocky alluvial and colluvial erosional deposits. The reddish color of the wind-deposited sand unit was a potential indicator of antiquity. The potential for significant, and notably aged, cultural deposits was hinted at by proximity to and apparent stratigraphic similarities with the nearby Vegan site (48LN1880), an Early Archaic period camp located in a similar setting less than 0.5 km to the east/southeast. Excavations at the Vegan site in 1989 revealed evidence of multiple components buried in aeolian sediments capped by coarse alluvial fill (McKern and Creasman 1991).

Thirty-two m^2 were excavated between about 150 and 250 cmbbs at site 48LN4114 in one largely contiguous block bisected by the 2.0 to 2.5 m wide pipeline trench (Figure 2). Excavations identified and excavated twelve features. Chipped stone artifacts recovered include projectile points, bifaces, flake tools, cores, tested raw material, and several thousand pieces of debitage, all from deeply buried Early Archaic period aeolian deposits. Although chipped stone artifacts dominate the assemblage and lithic reduction of locally acquired materials seems to be the only activity undertaken with intensity, a small number of manos, hammer stones, and manuports were also collected. Finally, a small

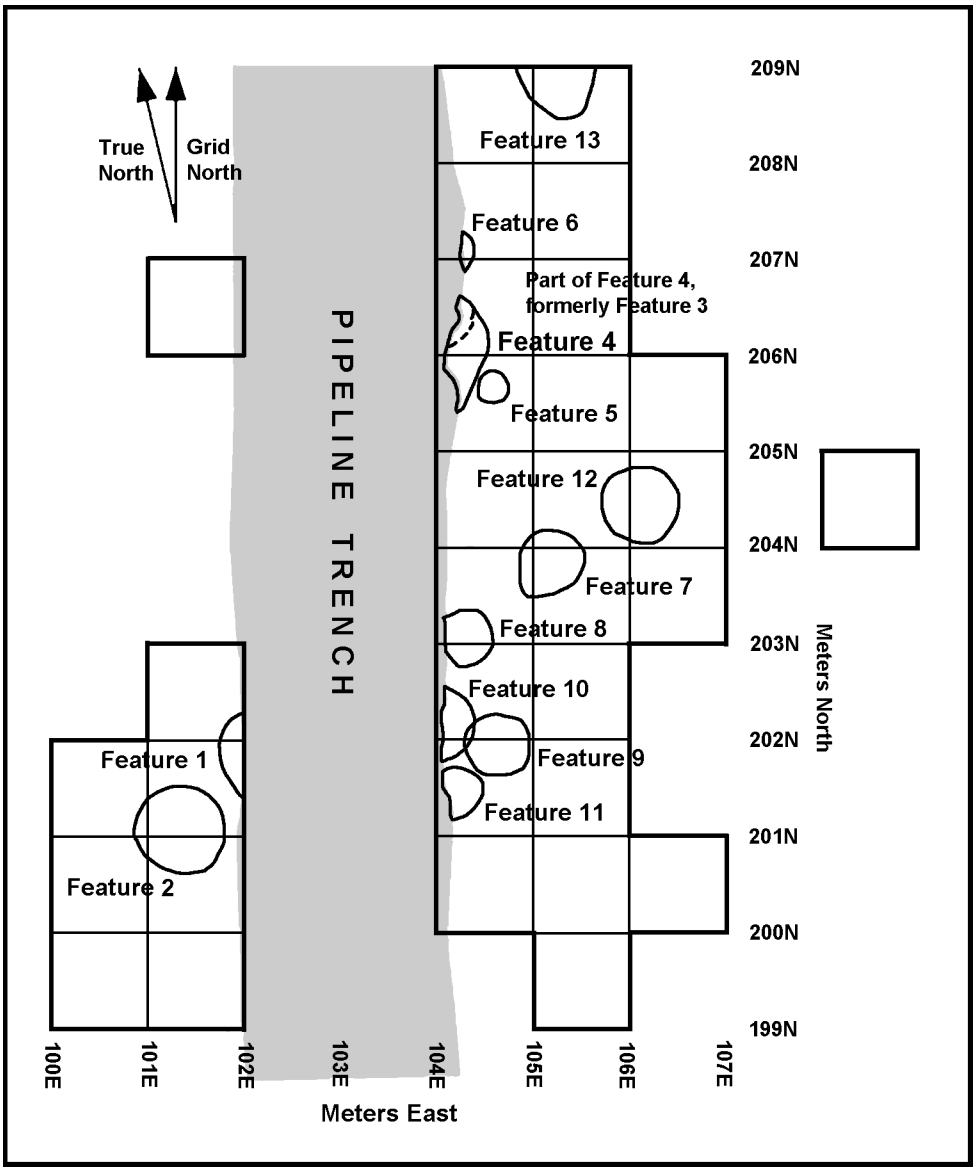


Figure 2: Excavation grid map.

collection of faunal remains and unmodified bivalve shell fragments was also recovered. Heat-altered or fire-cracked rocks (FCR) were documented, but they were not abundant given the amount of excavation. This paper is a summary of the detailed results of data recovery presented in the report prepared for Ruby Pipeline LLC (Williams 2015).

STRATA

Western GeoArch Research (WGR) documented several Late Quaternary strata, consisting of around two m of pebbly, intermittent stream alluvium and alluvial fan deposits overlying nearly two m of relatively fine aeolian sand (Figure 3) (Mayer et al. 2015).

Below the overlying rocky sediments, excavations were guided by the identification of four primary strata in the targeted cultural level about 1.5 to 2.0 m below surface. A representative field profile is depicted in Figure 4; note these strata are independent of WGR's profile and not all strata were identified across the excavation block. Stratum I, at the top of the backhoe-stripped profile about 1.5 mbbs, consisted of the various intermixing bands and pockets of mixed alluvial and colluvial slope-wash sediments. Holocene in age, these deposits capped the underlying cultural components. Gravels within Stratum I were largely comprised of local

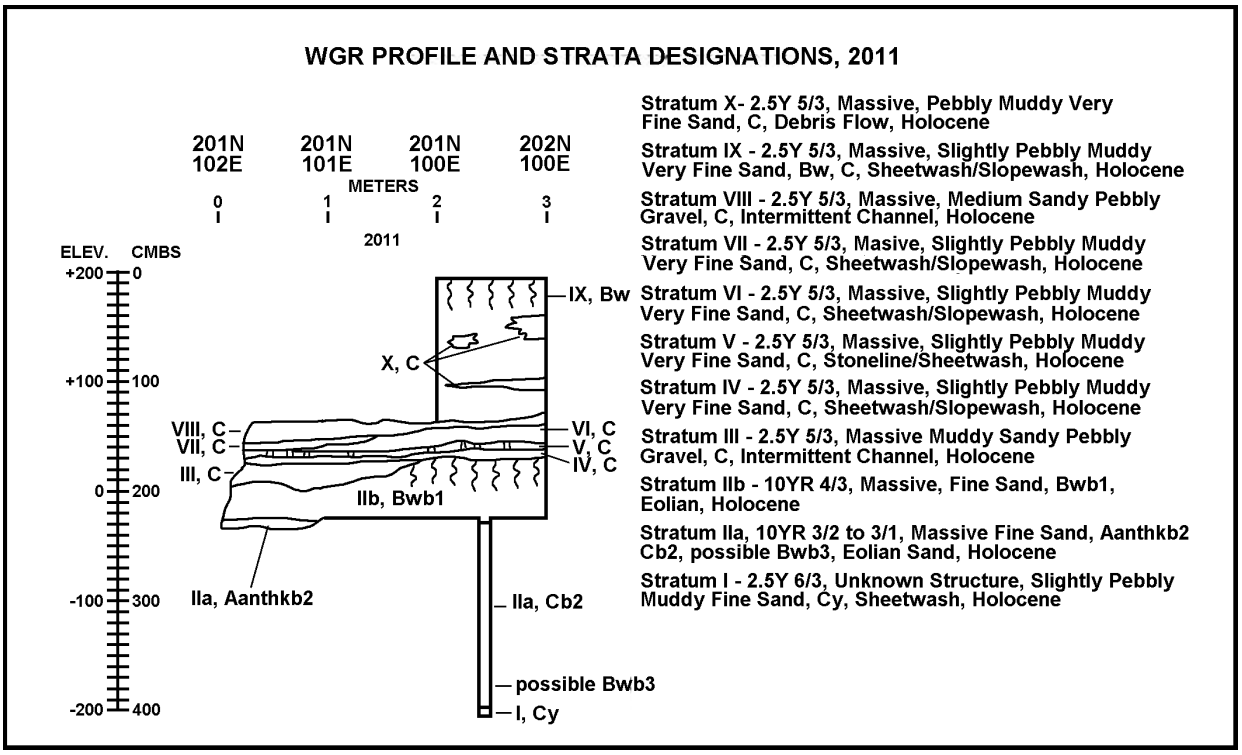


Figure 3: Western GeoArch Research stratigraphic profile, southwest side of data recovery block

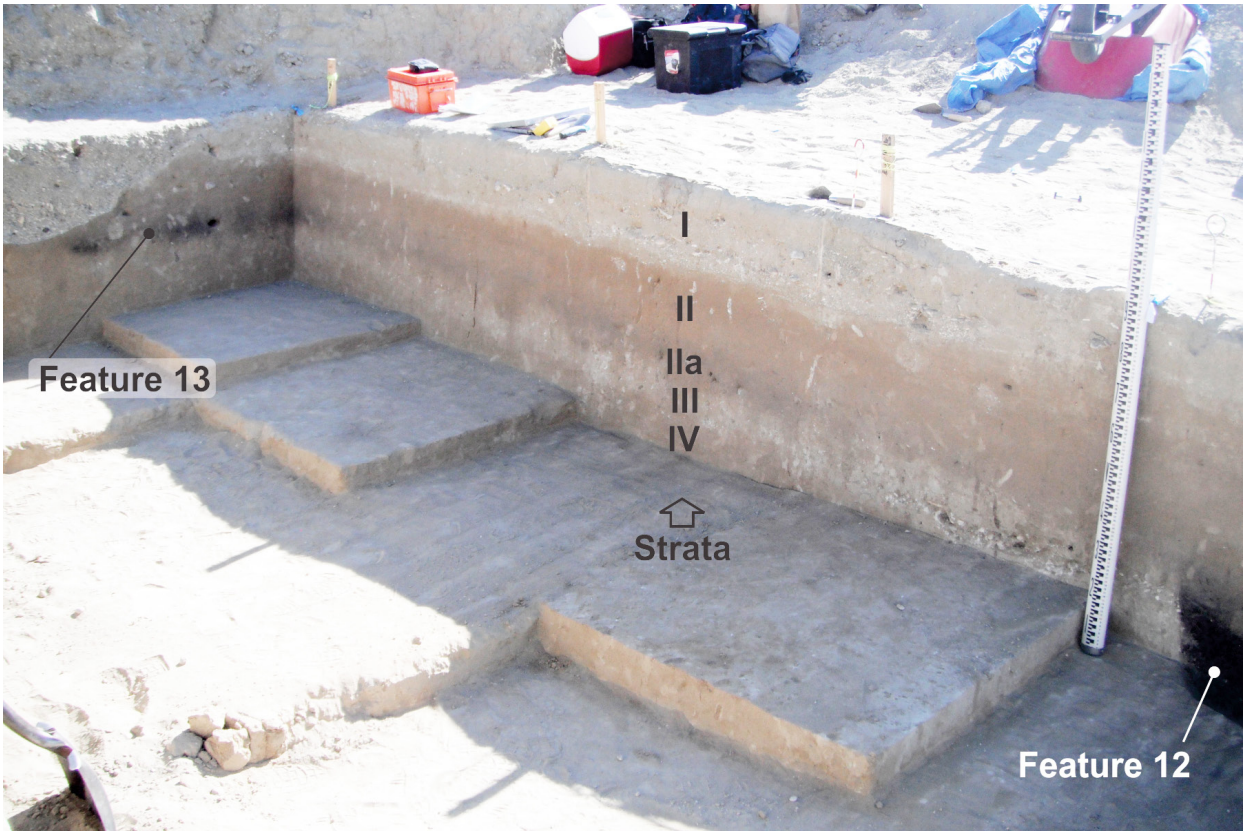


Figure 4: Representative field profile with labeled Metcalf strata: view northeast of units 205–208N, 106E.

angular shales. This stratum was readily identifiable and typically exhibited sharp boundaries with the underlying aeolian deposits. Within the broader Stratum I, a large and easily traceable alluvial event apparently scoured out the underlying sand and deposited a layer of gravels in a northeast to southwest trajectory across the top of the excavation block (visible at the far left side of Figure 4), trending across units on both sides of the trench. This alluvial event was evidently of fairly high intensity, although the gravels within it may not have traveled far as they were not particularly rounded.

Stratum II consisted of a 30 to 50 cm thick layer of aeolian, reddish-brown, upward-fining, sandy clay loam with few to no underlaying gravels, and was often cut into by the alluvium of Stratum I. Most artifacts and features across the site were located within this stratum. Also within this stratum was a distinctive band of dark-gray charcoal staining (Substratum IIa), largely connecting the features in the north portion of the block on the east side of the trench. Substratum IIa was dated to the Opal Phase, with a ca. 6300 BP radiocarbon date. Excavations in the northeastern part of the block were guided by this somewhat easily traceable, dark anthropogenic staining.

Stratum III consisted of another apparently mixed slopewash sediment layer, or small debris flow, interbedded within thick aeolian sediments. It underlay the cultural staining of with Substratum IIa and is characterized as a light-brown band of silty clay with variable amounts of small, angular, chalky gravels and rounded quartzite cobbles. It was most prominent in the southeastern side of the block, and it is noteworthy the clay was not observed within excavation levels on the west side of the trench where Bill Eckerle of WGR profiled and conducted an auger test. A feature radiocarbon dated to ca. 7300 BP was excavated into these gravels, suggesting the gravels were deposited slightly before then.

Stratum IV was markedly similar to Stratum II and consisted of a thick layer of aeolian, reddish-brown sandy loam with few gravels. It underlay the gravelly, light-brown, silty clay sediments of Stratum III in areas on the east side of the trench where the stratum was present and identifiable. In areas where Stratum III was not present, such as the west side of the trench, Stratum IV blended in with, and was largely indistinguishable from, Stratum II. Stratum IV was essentially culturally sterile and continued below the floor of the excavation units. Two shovel tests placed on the northern and southern ends of the block were excavated an additional 1.2 to 1.4 m below the base of excavations (roughly 3.5 mbs) to test for deeply buried deposits. Both were culturally sterile and largely revealed a continuation of similar sediments.

FEATURES

Twelve small features were identified during excavations (Table 1); nearly all are classified as simple basin hearths. Feature 3 was incorporated into the diffuse boundary of Feature 4. Features 9 and 10 overlapped; they were essentially a double hearth. With one exception, the features appeared generally similar. Feature 12 was nearly twice as deep as the next deepest feature and was distinctive in its definition, quantity of artifacts (400+ flakes), and notably its quantity, density, and diversity of charcoal.

CHRONOLOGY

Three dated features represent the three main cultural levels (Table 2). A charcoal sample from Feature 9 was radiocarbon dated to 7310±40 BP, which falls near the middle of the Great Divide phase of the Early Archaic period (Thompson and Pastor 1995). Feature 9 was located within a distinct hearth cluster on the east side of the trench. A charcoal sample from Feature 1 on the west side of the trench was radiocarbon dated to 6700±40 BP, which placed the occupation in the latter part of the Great Divide phase of the Early Archaic period. Feature 1 was located almost directly across the trench from Feature 9 at about the same depth; however, Feature 9 was associated with a distinctly more gravelly layer. Feature 12, a notably large and well-defined hearth located toward the east edge of the block, was stratigraphically associated with a band of distinct cultural staining in units toward the northern end of the block on the east side of the trench. A radiocarbon date of 6290±40 BP was based on charcoal from Feature 12 which falls near the beginning of the Opal phase of the Early Archaic period. Although all dated components are Early Archaic in age, their two sigma calibrated age ranges do not exhibit any overlap signifying a potential for contemporaneity.

Diagnostic artifacts are limited to three

Table 1. Provenience and metric measurements of features.

F#	AU	FEATURE TYPE	GRID UNITS	TOP DEPTH (cmbd)	TOP DEPTH (cmbbs)**	DIMENSIONS (cm) N–S	E–W	Depth	OXIDATION?	ARTIFACTS?
1	South-west (2)	Hearth, round-bottomed	N201-202 E101	279	179	87	22*	15	No	Debitage
2		Hearth, round-bottomed	N200–201 E100–101	290	190	90	92	12	No	FCR, debitage, burned bone
3/4	North (3)	Hearth, round-bottomed	N205–206 E104	250	150	120	50*	20	No	FCR, debitage, burned bone
5		Amorphous stain	N205 E104	250	150	34	33	3	No	Debitage
6		Hearth, round-bottomed	N206–207 E104	243	143	40	10*	16	No	Debitage, burned bone
7		Hearth, round-bottomed	N203–204 E104–105	267	167	70	67	10	No	Debitage
12		Hearth, round-bottomed	N204 E105–106	267	167	78	80	38	Yes	FCR, 400+ debitage, 3 flake tools
13		Other basin feature	N208 E104–105	225	125	54	60	11	No	Debitage, flake tool, burned bone
8	Lower (5)	Hearth, round-bottomed	N202–203 E104	288	188	60	47*	12	No	Debitage, burned bone
9		Hearth, round-bottomed	N201–202 E104	290	190	65	65	15	No	FCR, debitage, burned bone
10		Hearth, round-bottomed	N201–202 E104	292	192	80	40*	14	Yes	FCR, debitage, burned bone
11		Hearth, round-bottomed	N201 E104	293	193	55	40*	10	No	Debitage, burned bone

* = measurement truncated by pipeline trench.
** = approximate depth below bladed surface.

Northern Side-notched projectile points (Figure 5), which typically appear in contexts ranging from about 7200 to 4400 BP (Holmer 1986:104). Two were found in association with the Opal phase component, and the third was recovered from an undated context which may also date to this phase. Five additional projectile point fragments undiagnostic of type were recovered, although all appear stylistically consistent with the Archaic period.

ANALYTICAL UNITS

To facilitate cultural component description and comparison, six individual analytical units (AUs) were defined by a combination of excavation block and stratigraphic location (Figure 6). Three primary AUs represent the three radiocarbon-dated components. These include the Lower AU (AU5), associated with the deepest and oldest dated cultural materials found in the earliest Great Divide phase component; the Southwest AU (AU2) includes the later Great Divide phase component on the west side of the trench; and the North AU (AU3) associated with the Opal phase component. It is important to note no single AU is assumed with certainty to represent a discrete use episode; it may be some or all AUs represent a fusion of relatively closely spaced uses of the locale.

Table 2: Radiocarbon Ages

F#	AU	SAMPLE TYPE	^{14}C AGE BP	∂^{13}C	CALIBRATED AGE RANGES BP (2-SIGMA)	RELATIVE PROBABILITIES FOR AGE RANGES	MEAN OF CALIB. AGE RANGES (CAL BP)	BETA ANALYTIC LAB NO.: BETA-
12	3	Greasewood charcoal	6290 ± 40	-24.5 o/oo	7157–7316	1.00	7237	315987
1	2	Sage charcoal	6700 ± 40	-22.0 o/oo	7490–7624	.97	7557	300962
9	5	Sage charcoal	7310 ± 40	-24.1 o/oo	8020–8185	1.00	8103	315986

Note: All dates are AMS. All calibrations were done using CALIB 6.0.2 with IntCal09 calibration curve and presented as years before present (1950) (http://radiocarbon.pa.qub.ac.uk/calib/calib.html). Charcoal identified by Kathy Puseman, PaleoResearch Institute, Golden, Colorado.

RESULTS

LOWER AU (AU5)

The Lower AU (AU5) captures the deepest 20 to 30 cm of 12 contiguous units in the southeastern corner of the data recovery area (Figure 7). It stratigraphically underlies the North and Middle AUs and is located across the pipeline trench from the Southwest AU. A radiocarbon date of 7310±40 BP derived from Feature 9 charcoal is considered a solid date for the component. The radiocarbon age places the occupation near the middle of the Great Divide phase of the Early Archaic period, with the Lower AU being the oldest component identified at site 48LN4114. No temporally diagnostic artifacts were found in this component. Artifacts associated with the Lower AU include two bifaces; two flake tools; one core; 346 pieces of debitage; one mano; 20 (3.6 g) faunal remains; one piece of unmodified bivalve shell; and 2.42 kg of heat-altered stone.

The Lower AU was also identified by its stratigraphic association with a stark sediment change to increased silty clay sediments and mixed gravels, in contrast to the otherwise ubiquitous aeolian sands associated with the other components. It appears the Lower AU occupation was located on top of the heaviest gravels, and features were excavated into the rocky sediments, indicating they were constructed after an episode of apparently substantial debris flow. The broad stained area above the features also exhibited a higher quantity of mixed gravels than the surrounding aeolians sands, which hints at the possibility of a subsequent minor alluvial event as well. Further, several pieces of FCR and a few larger flakes were documented during excavation as lying on their edges, i.e., not lying horizontally, as would be expected. A possible explanation for this orientation could be low-intensity alluvial "washing" of the area, which could also account for the increase in small gravels in the midst of the cultural horizon.

Figure 5: Northern Side-notched projectile points.

The Lower AU includes a cluster of four hearths (Features 8, 9, 10, 11), all of which were similar in location, depth, and morphology. They appear to have been used within a narrow time horizon. Features 9 and 10 overlapped, and the fill in the overlap appeared continuous with no indication of one feature having been constructed before the other. A morphologically similar double hearth (Feature 11) was also found in the Early Archaic component at site 48LN1185 (McDonald 1993:97). All features exhibited sagebrush charcoal and contained both burned and unburned faunal remains. Significantly less FCR was located in the features than outside the features, which suggests hearth cleanout and reuse may have occurred.

No charred seeds were found, and no indications of subsistence were detected in the macrofloral

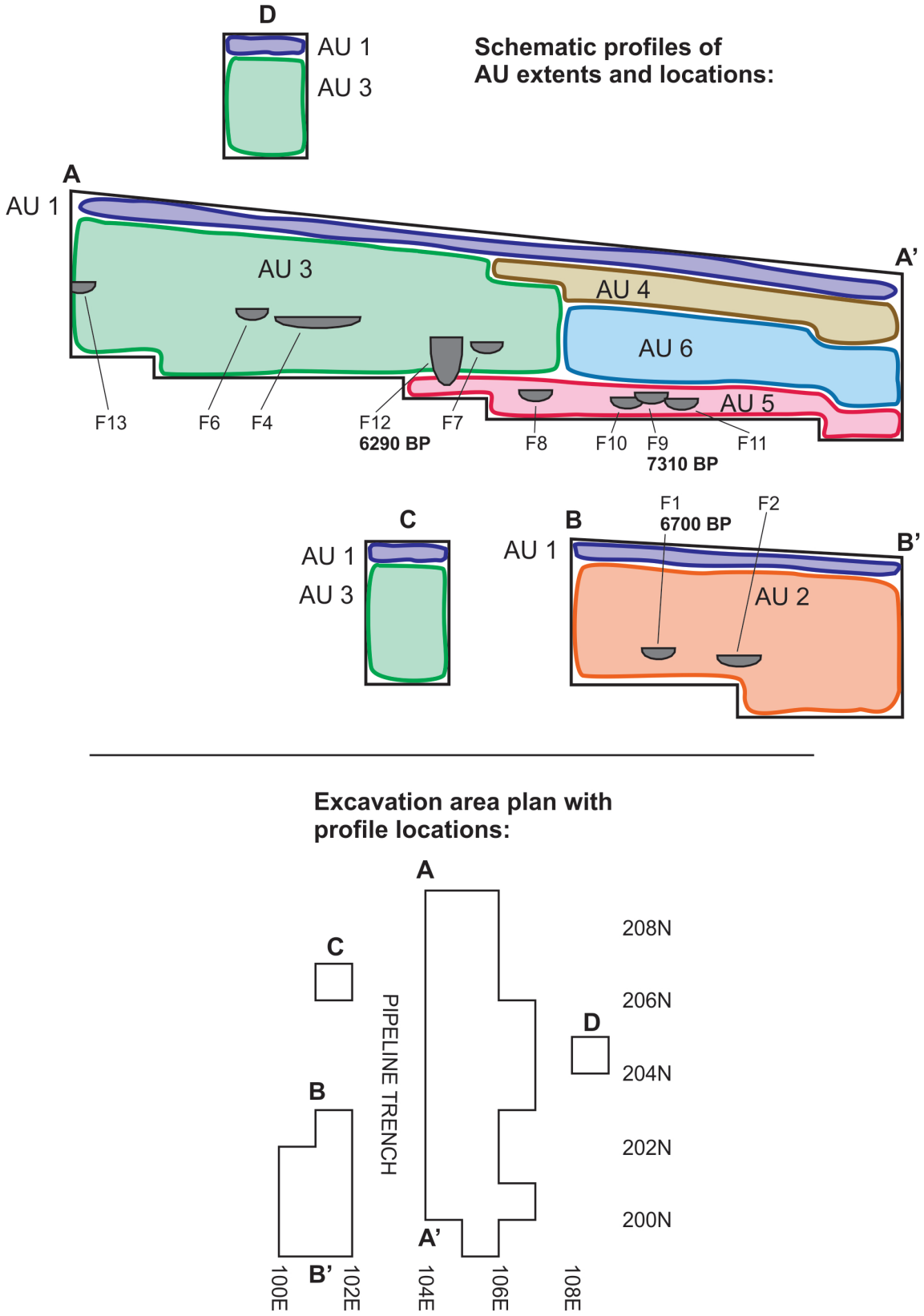


Figure 6: Schematic depiction of analytical units.

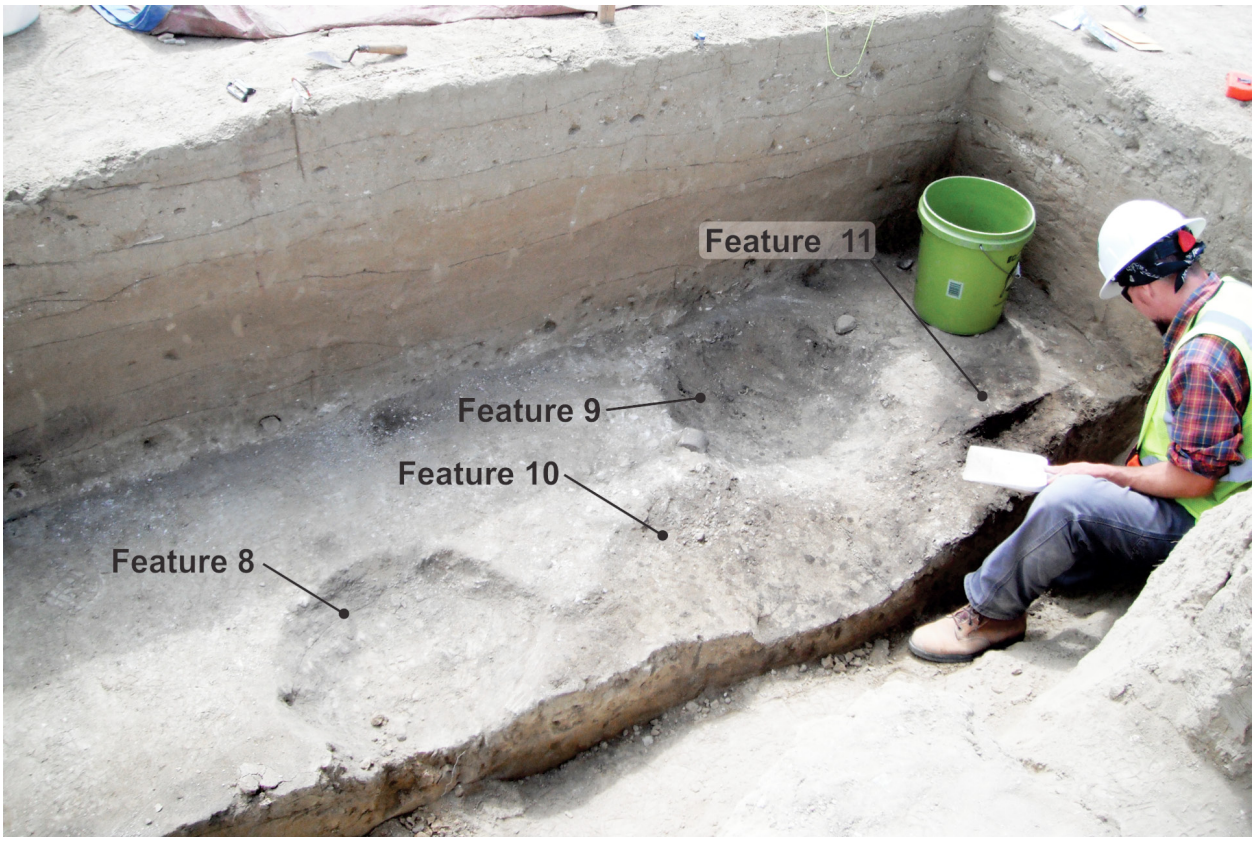


Figure 7: View facing southeast of Lower AU excavation in progress. Note gravels in association with Features 8 through 11.

analysis of flotation samples (Bach 2015). Like the other lipid samples from this site, a FCR sample did not reveal identifiable fatty acids; however, the sample contained lipid biomarkers/triacylglycerols suggesting a plant and animal combination (Malainey and Figol 2015).

Consistent with the rest of the site, chipped stone debitage was the most common artifact type, and quartzite materials comprised most of the assemblage. Both quartzite and cryptocrystalline materials were reduced to a similar degree. The number of size grade (SG) 1-3 debitage, among both quartzite and cryptocrystalline materials, is nearly equal to the number of SG4 debitage, which is generally unexpected. In a typical assemblage, regardless of reduction technology, SG4 flakes are predictably more numerous (Ahler 1989). The lower proportion of smaller flakes could be an indication of erosional "washing" of lighter materials, but this is conjecture. It could also be a reflection of coarse- or lower-quality raw material not conducive to further reduction, a sampling anomaly, or simply a lack of emphasis on the later stages of toolmaking.

The two bifaces include a late-stage knife fragment and an early-stage tool margin found in adjoining units to the south and southeast of the feature cluster. The knife fragment, along with a sediment control sample, was submitted for protein residue analysis. Residue was matched to rabbit proteins (Yohe and Gibbons 2015). Two utilized flakes classified as general scraping tools were found in the same two excavation units and levels as the two bifaces.

A single quartzite mano was found about 30 cm south of Feature 11 near several of the chipped stone tools. The mano is complete and uniform, and was manufactured through grinding and pecking. It further showed heavy grinding as use wear on two facets. The mano does not appear to be burned; however, it also showed a distinct reddish stain along one margin. While not conclusively identified, the stain may be pigment, possibly red ocher.

The mano, along with a sediment control sample, was submitted for pollen and starch analysis. The results indicated both samples were dominated by *Artemisia* (sagebrush) pollen, which is not unexpected. Cheno-am pollen was subdominant and also

present on both samples. In addition, *Pinus, Juniperus, Quercus*, and *Picea* pollen were located in one or both samples, which, taken together, indicates a sparse woodland once surrounded site 48LN4114. The analysis indicated *Typha* (cattail) was processed and probably ground using the mano. Cattails are perennial plants found in marshy habitats such as ponds, sloughs, or along streams, and were close to site 48LN4114 because of the proximity of the Hams Fork River. Various parts of cattail plants can be used throughout the year to provide a valuable source of nutrients. Shoots, flower stalks, root stalks, flowers, seeds, and pollen can all be consumed. In addition to use in subsistence, cattail plants can also be used for a variety of utilitarian purposes, including down, leaves, and stems for medicine, padding, and woven mats (Cummings et al. 2015).

While only 20 (3.6 g) individual faunal remains were recovered, a variety of species were present, and several specimens were burned and found within or next to features. Jackrabbit (*Lepus*)remains are dominant, and subsistence use of jackrabbit can be inferred. The presence of rabbit proteins on a knife fragment is an additional indicator of rabbit processing. Other less prevalent faunal remains include medium- and large-sized mammal (deer/pronghorn-sized), small bird, and small lizard; however, their use in subsistence is uncertain.

Although the number of artifacts in the Lower AU is fairly meager, the artifacts are somewhat diverse in type as well as located within a distinct cluster. Dark charcoal staining was fairly widespread and connected all of the features, and the bifaces, flake tools, mano, and most of the debitage, faunal remains, and FCR were located in a fairly discrete area near the southern edge of the feature cluster, including the contiguous units to the south and southeast. The clustering of cultural materials suggests the locale functioned as a hearth-centered locus of activity, ostensibly for a variety of tasks. Activities included rabbit processing, as indicated by faunal remains and a late-stage knife fragment with rabbit proteins, and cattail processing, as indicated by palynological analysis. Although no fatty acids were identified from the FCR sample, peak ratios of triacylglycerols indicated a plant and animal combination, which is in accord with the subsistence evidence.

The Lower AU represents a short-term field camp occupied near the middle of the Great Divide phase of the Early Archaic period. The camp appears to have been used after an episode of apparently high-intensity debris flow which left a swath of tan-colored silty clay with intermittent patches of dense gravels interbedded within the thick aeolian layer. There are suggestions remains of the camp may also have been affected by a subsequent, minor alluvial episode. Like the other components, the Lower AU was occupied during the mid-Holocene thermal maximum. This time period in southwest Wyoming consisted of a long-lasting interval exhibiting generally warmer and dryer than average conditions, although the debris flow is suggestive of at least a localized alluvial event before ca. 7300 BP.

SOUTHWEST AU (AU2)

The Southwest AU captures a fairly sparse amount of cultural materials buried in aeolian sand in seven contiguous units in the southwest corner of the data recovery area (Figure 8). Although artifacts were vertically separated within the sand, most were found about 20 to 30 cm overlying Features 1 and 2. A radiometric date of 6700±40 BP derived from Feature 1 is considered a solid date for this AU and places the occupation in the latter part of the Great Divide phase of the Early Archaic period. The date from Feature 1 is close to the midpoint between the dates derived from Feature 12 in the North AU (ca. 6300 BP) and Feature 9 in the Lower AU (ca. 7300 BP). No diagnostic artifacts were discovered. Artifacts include one flake tool; 432 pieces of debitage; one mano last used as a heating stone in a hearth; three (2.08 g) unmodified faunal remains; one fragment of unmodified bivalve shell; and four pieces (0.91 kg) of heat-altered stone.

The eastern side of this small block of units abuts the pipeline trench disturbance and is bordered elsewhere by unexcavated sediment. Features within the Southwest AU are located at nearly the same depth as features in the Lower AU, which is 2.0 to 2.5 m to the east-northeast across the pipeline trench. However, clear stratigraphic differences are apparent between the two components.

Two similar hearths were discovered about 50 cm apart. Feature 1 was originally identified during open trench inspection as a discrete charcoal stain bisected by the pipeline trench. Excavation revealed the hearth to be a uniform, well-defined, circular

Figure 8: Overview southwest of Southwest AU initial test unit excavation in progress. Feature 2 is under bucket. Note nearly 2 m of overlying alluvial sediments.

basin which dipped slightly to the south. Feature 2 was located about 50 cm southwest of Feature 1 and was slightly deeper, which is probably a reflection of a sloping ground surface accounting for the southward slope of Feature 1. Evidence suggests Features 1 and 2 were contemporaneous. Both features exhibited a broad and shallow form, which is generally typical of the nondescript hearths of the Great Divide phase (Thompson and Pastor 1995). Both features contained charcoal, and excavation of Feature 2 revealed a small amount of burned bone and FCR. In fact, all FCR detected in the Southwest AU was located either on top of or next to Feature 2.

Macrofloral analysis of the light fraction from flotation revealed sagebrush charcoal was present in both features; however, no seeds—charred or uncharred—were found which could provide indications of subsistence (Bach 2015). A FCR sample from Feature 2 was submitted for lipid analysis. While fatty acids were not identifiable, the sample contained lipid biomarkers/triacylglycerols showing the presence of both plant and animal products, possibly including plant seed oil (Malainey and Figol 2015).

Artifacts were dominated by chipped stone debitage, and it is noteworthy, and unique among components in the excavations, that cryptocrystalline materials were prevalent, accounting for 57% of the assemblage. As both quartzite and cryptocrystalline materials are found nearby as lag cobbles, it may suggest people more commonly selected cryptocrystalline rather than quartzite for toolmaking purposes during this occupation. The chipped stone data clearly indicate cryptocrystalline materials were reduced to a greater degree (i.e., they comprise a greater proportion of the smaller flakes) than quartzite materials. Sixty-one percent of cryptocrystalline flakes are SG4, as opposed to 34% of quartzite flakes. It is possibly an anomaly resulting from the smaller sample size, but it also could be a reflection of lower-quality quartzite material. Obsidian, which was scarcely represented in the assemblage, was sourced to Phillips Pass/ Green River gravels (Hughes 2015). Obsidian can be found in local gravel occurrences near the Green River northeast of the site, and those gravels are

suspected to be the source of the obsidian given their proximity to the site.

The single flake tool found near Feature 2 consists of a retouched cryptocrystalline scraper. It was resharpened and showed light use wear and scalar flake scars. The fragmentary flake tool may have broken during use, resharpening, or possibly as a result of burning.

The single non-chipped stone artifact in the Southwest AU consists of a lightly prepared ortho-quartzite mano. The mano had light pecking but did not appear to have been used for plant processing. It was burned, and its location near Feature 2 suggests it was last used as a heating stone.

Among the sparse assemblage of generally small fragments of faunal remains, one piece was identified as *Lepus* sp. (jackrabbit), and two others were categorized as small (rabbit-sized) and medium mammal (deer/pronghorn-sized). Because the faunal remains were generally clustered close to the floor of the block near Feature 2, and several were burned, suggests a cultural affiliation despite the small number of fragments present. The meager faunal assemblage provides little indication of subsistence, however, aside from a hint of the economic use of rabbit or possibly deer/pronghorn.

The Southwest AU component showed characteristics of a short-term field camp, as defined by Binford (1980). Activities revealed by the cultural remains are limited to chipped stone manufacturing and maintenance, primarily utilizing cryptocrystalline raw materials. The meager collection of faunal materials provides the only suggestions of subsistence within the Southwest AU. The Southwest AU occupation probably represents a campsite used for limited short-term foraging, and the earlier Great Divide phase occupation (Lower AU) probably left a visible imprint on the landscape which attracted later groups. In addition, the inhabitants may have re-used lithic materials or other items left behind from the earlier encampment.

NORTH AU (AU3)

The North AU defines the well-identified component situated on the northeast side of the block. It consists of portions of 15 units in the main block north of the 203N line on the east side of the trench plus two isolated units, and it includes Features 3/4, 5, 6, 7, 12, and 13. The North AU is associated with a 6290±40 BP radiocarbon date derived from Feature 12, which places it near the beginning of the Opal phase of the Early Archaic period (Thompson and Pastor 1995). Two diagnostic Northern Side-notched projectile points add further credence to the age of the occupation. Toward its southern edge, the AU stratigraphically underlies the Upper AU, an undated later component, and stratigraphically overlies the Lower AU, an earlier component.

A fairly narrow range of time of occupation of this component is posited based on distinct charcoal staining connecting the top of all features in this AU; although it is quite possible and likely multiple use episodes are present. The North AU cultural component seems to be the most intensively used occupation defined during data recovery. Excavations yielded the most artifacts and features, the most visible cultural staining, the most diverse collection of artifacts, and, presumably, the longest occupation span or the most repeated occupations of the locale. Artifacts associated with the North AU include 13 bifaces; 23 flake tools (including one spokeshave); four cores; one piece of tested chert; 9,342 pieces of debitage; three possible hammer stones; four manuports (some possibly minimally utilized); 25 (5.08 g) unmodified faunal remains; two fragments of unmodified bivalve shell; and 6.24 kg of heat-altered stone.

Six hearths are associated with this AU, although Feature 5 may be cleanout from Feature 3/4. Although the exact function of Feature 12 is not known, it stood apart from all other features in its size, definition, amount and diversity of charcoal, and quantity of artifacts (Figure 9). More than 400 pieces of debitage, 84% of which are quartzite, from Feature 12 are evidence of nearby reduction or retooling of quartzite. Debitage found in Feature 12 is nearly 80% SG4 or smaller, which may suggest lithic debris was knapped directly into the hearth. The presence of three broken flake tools may suggest debris was also discarded into Feature 12.

FCR in the North AU was not particularly abundant given the presence of six hearths and the large quantity of artifacts. Twenty-six large (>5 cm) pieces weighed 5,140 g, and 97 small (<5 cm) pieces weighed 1,100 g. Only seven pieces of FCR, weighing 490 g, were documented in features, indicating significantly more pieces were scattered outside features. In general, the greater mass of FCR outside

Figure 9: Excavation block overview facing southeast toward the Hams Fork River; Feature 12 is visible in profile.

rather than inside hearths suggests hearth cleanout and reuse may have occurred. Although not concentrated, most of the FCR was documented in the southern portion of the AU, in the general vicinity of Features 7 and 12. While fatty acids from two FCR samples submitted for lipid analysis were not sufficient for identification, each sample indicated the presence of both plant and animal products, including plant seed oil (Malainey and Figol 2015).

Cultural materials in the North AU were dominated by chipped stone debitage, which was present in fairly high densities across the block. Over 99% of the debitage assemblage is comprised of quartzite or cryptocrystalline material, with more quartzite than cryptocrystalline (62.6 vs. 36.9%). It is likely most of lithic materials were acquired locally, as noted previously. It is doubtful quartzite materials were preferred but rather material availability probably favored quartzite. The remaining 0.5% of debitage is comprised of obsidian, quartz, and silicified sediment. Obsidian is present in small amounts and generally small pieces, which suggests limited resharpening of tools. Obsidian flakes were sourced to Malad, Idaho, and Phillips Pass/Green River gravels (Hughes 2015). The Malad determination is noteworthy as it is the only sample from this site not sourced to Phillips Pass/Green River gravels.

Debitage appears most concentrated within and between the Feature 4, 5, and 6 cluster and Features 7 and 12. A little over one m separates Features 7 and 12 from the Feature 4, 5, and 6 cluster. Spatially distinct knapping episodes or activity areas were not apparent, aside from a slightly increased proportion of quartzite flakes near Feature 12 coinciding with a slightly decreased frequency of quartzite flakes in the three units containing Features 4, 5, and 6.

The 13 bifaces include five with evidence of hafting (probable projectile points) and eight lacking a hafting element. Hafted bifaces include the two previously mentioned Northern Side-notched projectile points, one of which is complete and showed resharpening, apparently from secondary use as a knife. Hafted, but non-diagnostic, bifaces include a small base and medial fragment and two small indeterminate base fragments. The remaining eight bifaces include three knife fragments, one fragment of a cutting tool, two scraper fragments, one indeterminate fragment, and a complete early stage blank manufactured from gray quartzite.

Flake tools in the North AU consist of three

retouched and 20 utilized flakes; all are unpatterned. Six flake tools exhibit indications of resharpening after use or reworking after fracture. Based on edge angles, most (n=15) are classified as scraping tools, while seven are classified as cutting tools. One is a spokeshave; it was retouched and had light use wear. The dominant material type for North AU flake tools is split between cryptocrystalline and quartzite materials, with ten of each. The remaining flake tools include two of obsidian and one of silicified sediment.

While quartzite comprises a considerably higher percentage of the debitage than other material in the North AU, it is notable most bifacial tools (10 of 13) and nearly half of the flake tools are cryptocrystalline. A proportionally greater share of larger flakes (SG1–3) are quartzite, and a proportionally greater share of smaller flakes (SG4) are cryptocrystalline. These data may suggest a trend of quartzite core reduction for the production of flake tools, which could result in larger flakes than biface reduction. It may also suggest a trend of utilizing cryptocrystalline materials more often for bifacial reduction and later stages of toolmaking, which could produce a greater quantity of smaller flakes than core reduction. In general, toolmaking probably occurred along a continuum in which more specialized tools required a higher quality material. Since cryptocrystalline materials generally produce a sharper edge for cutting tasks, it is probable cryptocrystalline materials were favored for late-stage bifacial production. Quartzite materials may have been favored for scraping tools. However, the data also indicate each material type was used to produce both expedient flake tools and late-stage bifaces.

The greater ratio of flake tools to bifacial tools (23 vs. 13) may suggest a longer duration of occupation, as expedient flake tools may have been crafted in response to immediate needs for project-specific tools. A greater ratio of bifaces often implies greater mobility or shorter duration occupations, as more curated bifaces are used for general functions rather than flake tools (Kelly and Todd 1988). The number of flake tools may also be a reflection of the abundant flaking material found near the site.

Non-chipped stone artifacts in the North AU are sparse in comparison to chipped stone artifacts. They are limited to three possible lightly used hammer stones and five manuports, including one small unmodified fossil fragment. The manuports were clearly imported given their location in the otherwise fine aeolian sediments.

Subsistence information from the North AU is meager. No charred seeds were located in flotation samples from any of the hearths, and no fatty acids were identifiable from any hearth FCR samples. Protein residue analysis of a biface returned negative results as well. Economic use of animals may be inferred from a small quantity of burned faunal materials, of which rabbit is most common.

Charcoal from Feature 12 was identified as sagebrush, hopsage, cottonwood, and greasewood, indicating those plant varieties were present nearby at the time of occupation.

The Opal phase radiometric date derived from Feature 12 suggests this component of comparatively longer duration or greater intensity occurred, like the other Early Archaic period components, during the warm and dry mid-Holocene thermal maximum. The massive accumulation of sand deposits is also indicative of ongoing warm and dry conditions.

MIDDLE AU (AU6)

The Middle AU includes a 30-cm thick layer of aeolian sediments between better-defined components above and below it in eight units in the southeastern corner of the block. Because of a lack of features, the Middle AU could not be dated but stratigraphically overlies the ca. 7300 BP Lower AU and underlies the undated Upper AU, which itself overlies the ca. 6300 BP North AU. The ca. 6300 BP date derived from the North AU may provide an equivalent or approximate date for the Middle AU as well. The lone diagnostic artifact from the Middle AU, a Northern Side-notched projectile point base, gives further credibility to suppositions connecting the North and Middle AUs. Artifacts recovered from the Middle AU include seven bifaces; 3,968 pieces of debitage; four faunal remains (0.9 g); and 500 g of dispersed FCR.

Although nearly 4,000 artifacts were found in the Middle AU, they exhibit little diversity. Artifacts are dominated by chipped stone debitage, primarily smaller sizes of quartzite and cryptocrystalline flakes. As in the North AU, over 99% of the debitage assemblage is comprised of quartzite or cryptocrystalline materials. The remaining <1% is comprised of obsidian, quartz, and silicified sediment. Two

obsidian flakes were sourced to Phillips Pass/Green River gravels (Hughes 2015).

In addition to the Northern Side-notched point base, bifaces include two other hafted non-diagnostic bifaces: a large cryptocrystalline corner-notched projectile point fragment and a side-notched projectile point fragment manufactured from quartzite. The four unhafted bifaces include a knife fragment, a scraper fragment, a cutting tool fragment, and an indeterminate fragment. Five of the bifaces were manufactured from gray quartzite, and the other two were crafted from cryptocrystalline materials. All are classified as finished and unusable, and were probably discarded because of breakage or functional or material flaws created during use or retooling.

Three of the four faunal remains unidentified to species or size are not sufficient to infer cultural usage or subsistence; however, a rabbit-sized bone is in accord with faunal materials recovered from the rest of the excavations. Beyond the meager faunal materials, there is no subsistence information in the Middle AU.

Activities revealed by the cultural remains in the Middle AU are limited to chipped stone manufacturing and maintenance. A comparison of the ratio of debitage count to mass suggests a greater quantity of smaller and lighter flakes compared to the rest of the AUs. Because of the lack of features, defined activity areas, and cores or tested raw material, and presence of only broken tools, it is speculated the locale captured by the Middle AU served as a disposal or refuse area.

To summarize, the Middle AU by itself provides little data of significance and notably lacks evidence of chronology, subsistence, or a range of activities. However, if the idea of the Middle AU being temporally associated with the North AU is accurate, then a more meaningful analysis may be possible. Together, the North and Middle AUs contain nearly 90% of the lithic debitage from the excavation as a whole. Similarities between the chipped stone artifacts in each AU are evident, notably a nearly identical distribution of raw material types and a great quantity of lithic debris. They differ somewhat in the Middle AU exhibiting a slightly greater percentage of smaller flakes than the North AU. It is possible some of the lithic debitage and broken tools in the Middle AU were not primarily deposited there but rather disposed of during site cleaning of the adjacent North AU hearth-centered activity areas or some combination thereof. Alternatively, the Middle AU could represent knapping episodes separate from the hearth areas in the North AU or relate to unexcavated activity areas farther to the south.

UPPER AU (AU4)

The Upper AU captures the top 20 to 30 cm of eleven contiguous units in the southeastern corner of the block. It overlies both the Middle and North AUs and underlies the slopewash and alluvial lenses at the top of the profile. Its lower boundary with the Middle and North AUs was not clearly defined. While no intact features were present, the Upper AU is marked by an elevated FCR count in association with charcoal flecking, chipped stone tools, and debitage. The Upper AU is not dated, and no diagnostic artifacts were recovered. However, it is stratigraphically above the ca. 6300 BP radiocarbon date derived from Feature 12 in the North AU, and it is presumed to date to the middle or latter part of the Opal phase. Artifacts recovered in the Upper AU include five bifaces, two flake tools, 649 pieces of chipped stone debitage, one piece (.06 g) of bone, one piece of unmodified bivalve shell, and 1.49 kg of heat-altered stone.

This seemingly transitory cultural manifestation was most pronounced within a narrow depth range in a small number of units bordering the pipeline trench disturbance, and it appears much of this component was destroyed by trenching. Given the presence of somewhat concentrated FCR and charcoal flecking, it is presumed a hearth had been present nearby but was not preserved, or, most likely, it was destroyed by the pipeline trench.

Consistent with debitage from other cultural levels, over 99% of Upper AU debitage is comprised of quartzite or cryptocrystallines, with quartzite counts higher than cryptocrystalline materials. Only three flakes of other materials—one obsidian and two quartz—were discovered. All size grades of flakes are present in the assemblage; however, larger flakes are best represented by quartzite. Cryptocrystalline materials exhibit a greater percentage of SG4 flakes than does quartzite, albeit still an unexpectedly low proportion. The overall proportion of SG4 to SG1-3 flakes in this AU is conspicuously low at 32.5%, which is the lowest in the excavations. Reasons for

this marked difference from a more typical distribution may include any of the following: only preliminary stages of lithic reduction occurred here; raw material was of poor quality and not conducive to further reduction; erosional disturbance at the top of the profile may have washed away smaller artifacts; or some combination thereof.

The five bifaces include three non-diagnostic projectile point fragments: a quartzite large side-notched medial and base fragment; a cryptocrystalline small base fragment; and a cryptocrystalline slightly concave lanceolate base fragment. The remaining two bifaces include a knife fragment and an early-stage fragment of a possible scraping tool. All Upper AU bifaces are classified as finished and unusable, suggesting they may have broken during use or retooling. It is notable four were manufactured from cryptocrystalline materials rather than quartzite, as quartzite is more common in the debitage assemblage.

The two flake tools consist of one cryptocrystalline retouched flake and one quartzite utilized flake. Both are classified as scraping tools because of steep edge angles, and both are considered unusable from breakage.

Faunal remains in the Upper AU are limited to 0.06 g of small and unidentifiable fragments from a single level; they probably represent a lone piece of bone or bone fragment. No inferences regarding subsistence may be gleaned because of the paucity of faunal remains in the Upper AU. Lacking further data, few interpretations may be made regarding site activities aside from the ostensibly casual reduction of local raw materials, limited resharpening of tools, and unspecified cutting and scraping activities.

The Upper AU component seems to have functioned as a short-term camp probably occupied during the middle to latter part of the Opal phase. The Upper AU component was seemingly transitory, and the prehistoric inhabitants were likely drawn to the area by the placement of the site and the availability of the resources. Cultural materials were encased in sediments indicative of warm, dry, and windy conditions conducive to aeolian erosion and deposition. However, a stark sediment change to deposition indicative of more mesic conditions was visible in the profile just above this undated occupation.

INTERPRETATIONS

Excavations at site 48LN4114 were highly productive and have contributed additions to our knowledge of southwest Wyoming Early Archaic period sites, a scarcity in regional data recovery work (U.S. Department of Interior 2004). Significant contributions to the regional data set have been made through radiocarbon estimations and their stratigraphic locations in the noteworthy geomorphological sequence defined on the site. Further, the results of data recovery provided comparative data on geomorphology/paleoenvironment, subsistence, settlement patterns, chipped stone technology, hearth morphology, and site function.

GEOMORPHOLOGY AND PALEOENVIRONMENT

Paleoenvironmental studies conducted along this pipeline project, as well as other regional projects, have accumulated a substantial data set from a variety of avenues of research, including fossil woodrat middens, lake sediments, and peat bog pollen sequences. The results further solidify indications the 1,000 year span of occupation documented at this site occurred during generally warm and dry conditions. The three dated Early Archaic period components fall within the early Middle Holocene and coincide with the mid-Holocene thermal maximum/Altithermal climatic period, which is marked by a long period of generally warmer temperatures and dry, windy conditions (Thompson and Pastor 1995; Mayer et al. 2015). The dry conditions were conducive to aeolian erosion and deposition, and they resulted in the massive sand accumulation documented at site 48LN4114. Sandstone-capped ridges surround the data recovery block, and, along with Hams Fork River sediments, provided ample sources of sand. A minor episode of debris flow with variably heavy gravels (Stratum III in Figure 4) was interbedded within the thick aeolian deposit in a small number of units on the east side of the trench.

A weak mesic trend, dating to the late Middle Holocene, gradually intensified in the Late Archaic period in southwest Wyoming (Mayer et al. 2015). The slopewash and sheetwash deposits noted at the top of the profile, as well as a massive debris flow crossing the top of the excavation block (also visible at the far left side of Figure 4), likely correspond to the changing climatic conditions. Although cultural

materials were located only toward the top of the thick aeolian deposit, a broader geomorphological sequence was captured. Further, in an auger test, a hint of a stable horizon in aeolian sediments was noted considerably deeper than the oldest cultural component, which suggests the potential for discovery of additional aged cultural deposits.

SUBSISTENCE

As xeric climatic conditions continued, an increase of aeolian sediment availability occurred concurrent with a probable trend in the replacement of grassland and sagebrush steppe habitat with saltbush desert habitats (Thompson and Pastor 1995). Coincident with habitat change, large herd animals such as bison decreased in population in the region. Faunal materials recovered from this site, albeit meager, confirm smaller mammals were most often targeted, as is typical of most sites of this period (Thompson and Pastor 1995). Because most of the faunal remains were charred and found in or next to hearths suggests of economic use. Rabbit protein was detected on a knife fragment from the earliest Great Divide phase component, and faunal remains consistent with rabbit were found in each dated component. Rabbits were likely used both for meat and skins.

The specific identification of cattail pollen on a mano in the oldest Great Divide phase component is notable. Cattail plants have the ability to provide important nutrients throughout the year, and they only grow in marshy habitats such as along the Hams Fork River. Although this is the only direct evidence of what types of floral remains may have been used in subsistence, it is probable cattail and other riparian plants were used for subsistence, as well as utilitarian purposes, by foraging groups at this site throughout the Archaic period.

SETTLEMENT PATTERNS

Site 48LN4114 is located on the north side of the Hams Fork River floodplain. Because a preponderance of evidence indicates the site was occupied in generally dry and warm conditions, the importance of the river and its riparian resources cannot be overstated and is assumed to be the single greatest factor in site selection. Prehistorically, the meandering course of the river would have provided suitable settings for marshes along abandoned oxbows and other low-lying locales. The Hams Fork River is a locally significant drainage which would have provided a set of resources not available for a considerable distance, namely water, bivalves, a diversity of trees and shrubs, and aquatic plants, in addition to animals attracted by those same resources. The Hams Fork River valley may also have served as a convenient travel corridor.

Excavation results at 48LN4114 are comparable and consistent with the results obtained from the adjacent Vegan site, which was also excavated as a pipeline discovery along the Hams Fork River (McKern and Creasman 1991). The stratigraphic profile revealed at site 48LN4114 is similar to the Vegan site, namely Archaic period cultural deposits deeply buried in aeolian sand under lenses of gray sandy clay and gravels. Components I and II at the Vegan site, both Early Archaic in age, similarly exhibited only sparse, heavily fragmented faunal remains comprised mostly of small, rabbit-sized animals. Also similar to site 48LN4114, Components I and II revealed only a small quantity of ground stone artifacts.

Given the harsh environmental conditions at the time of occupation, the use of locales near rivers may have been a near necessity. Differing from site 48LN4114, a Late Archaic component was identified in excavations at the Vegan site; however, occupation intensity was heavily weighted to the Early Archaic time period. The authors postulated a less intense use of the site during the Late Archaic was in response to ameliorating climatic conditions. In other words, people were able to increase the use of interior areas further away from major waterways and too marginal during the preceding climatic interval. Data uncovered at site 48LN4114 further support this theory given the abundant evidence of repeated Early Archaic period activity amidst ongoing aeolian deposition in this camp along the Hams Fork River.

In addition to the river, other natural or environmental factors are considered significant in the placement of the site. These factors include the ubiquitous lag cobbles of quartzite and cryptocrystalline materials associated with the Blacks Fork Lithic Landscape exposed on the surrounding Pleistocene ridges. Although perhaps not the best toolstone quality, they nonetheless would have provided a convenient and reliable lithic source.

CHIPPED STONE TECHNOLOGY

Quartzite debitage counts were considerably higher than cryptocrystalline counts, probably a reflection of greater material availability as opposed to material preference, although quartzite materials are less prone to breakage during certain tasks. It has been posited Early Archaic period groups in the Green River Basin typically used a greater quantity of quartzite materials in comparison to later groups (Clayton 1999). A trend of decreasing use of quartzite materials through time was documented at sites 48LN1185 (McDonald 1993) and 48LN373 (Wheeler et al. 1986), also multicomponent sites in the Green River Basin.

In general, the assemblage contains a greater percentage of large quartzite than large cryptocrystalline flakes and a greater percentage of small cryptocrystalline over small quartzite flakes. In addition, cryptocrystalline materials exhibit significantly more cortical flakes, particularly in smaller size grades, in contrast to quartzite materials. Taken together with the general dearth of larger SG1 or 2 cryptocrystalline flakes in the assemblage, it seems mostly small cobbles of cryptocrystalline materials were being reduced on-site, which is likely a reflection of the availability of generally smaller-sized cobbles in the immediate area.

While quartzite is the dominant material type in the debitage assemblage, it is notable bifacial tools were more commonly crafted from cryptocrystalline materials by a ratio of 17 to 10. Flake tools exhibit a more balanced proportion, with quartzite slightly more common. Although tool proportions vary within individual AUs, the excavation-wide totals form a general trend suggesting a preference for cryptocrystalline materials for biface production, and, to a lesser extent, quartzite materials for expedient flake tools.

Obsidian was present in small amounts in eachk component, except for the earliest Great Divide phase occupation (Lower AU). One sample from the Opal phase North AU was sourced to Malad in southeastern Idaho, while the remaining four were sourced to Phillips Pass/Green River gravels. Given the proximity of the Green River northeast of this site, and some flakes exhibited cortex, it is likely this obsidian was collected locally from Green River pebbles, as opposed to Phillips Pass.

No diagnostic projectile points were found in either Great Divide phase component; however, Northern Side-notched specimens were found in the Opal phase components. Possible stemmed points were also found during excavations at site 48LN4114. Excavations at the Trappers Point site (48SU1006) along the Green River north of this site revealed several stemmed points within the highly variable projectile point assemblage. Their presence in the Early Archaic period artifact assemblage is further evidence for "… stemmed and corner-notched point types may have a much greater antiquity in southwest Wyoming than is generally acknowledged" (Francis and Widman 1999:153).

HEARTH MORPHOLOGY

Features were, for the most part, simple basin hearths with little FCR. Such nondescript hearths are typical of the Great Divide phase. Some investigators have suggested larger, lined, or rock-filled hearths are more typically found in the Opal phase (Thompson and Pastor 1995). Feature 12 was radiocarbon-dated to the Opal phase, and although not lined or rock-filled, it was notably large and distinct. It further exhibited the greatest quantity and diversity of charcoal, including charcoal identified as sagebrush, cottonwood, hopsage, and greasewood. Feature 12 was the lone feature in which charcoal other than sagebrush was identified. Based on analysis of flotation samples, it is estimated Feature 12 contained over 200 g of charcoal, which is nearly 20 times more than other hearths in the block. Such a large quantity of charcoal with relatively little associated FCR may suggest it was originally designed to produce a lot of smoke. Large pieces of charcoal were common, and these may have resulted from incomplete combustion of woody materials. Features with similar attributes have been described as hide-smoking pits (Wheeler et al 1986:183). At the Vegan site, similar to 48LN4114, nondescript hearths were found in Component I (Great Divide phase); however, both a rock-filled and a slab-lined hearth were found in Component II (Opal phase) (McKern and Creasman 1991).

SITE FUNCTION

Cultural materials and site functions inferred at 48LN4114 appear largely typical of Early Archaic forager field camps found throughout the Wyoming Basin. Site activities revealed through excavations

are primarily concerned with lithic procurement and reduction, as well as limited fauna and plant procurement and processing. Documented occupations seem typical of short-term field camps with limited activity areas, as defined by Binford (1980). Differences in cultural dynamics between temporal components were not large or obvious in these excavations—a characteristic generally posited for the Archaic period as a whole in southwest Wyoming (Thompson and Pastor 1995). It is presumed people were visiting the locale for similar activities and resource extraction purposes throughout the 1,000 years documented in these excavations. The significantly greater quantity of artifacts and generalized cultural staining associated with the Opal phase components, rather than the preceding Great Divide phase, is ostensibly a reflection of longer-term occupations or evidence of a greater number of seasonal reoccupations.

Site 48LN4114 seemed to provide an advantageous locale for short-term encampments by foraging groups during generally xeric climatic conditions in the Early Archaic period. Although not explored during these investigations, this site also preserves evidence of features and artifacts dating to the Late Prehistoric period, which is a further indication of the appealing location of this site in a somewhat sheltered setting along the Hams Fork River. The initial Great Divide phase occupation was most likely short-term but it probably left a physical imprint on the landscape which subsequent foraging groups recognized and then used for the attractive combination of resources available at this location.

ACKNOWLEDGEMENTS

The funding for this project was provided by the Ruby Pipeline, LLC. Special thanks should be given to archaeologist Lynn Harrell of the Kemmerer BLM and geoarchaeologist William Eckerle of WGR for their advice and recommendations before and during the project. Several outside analysts provided useful information derived from a variety of artifact and sample testing programs after excavation. In addition, a host of Metcalf Archaeology employees participated in the multi-year project: special thanks are given to Anne McKibbin and Pat O'Brien who produced most of the maps and graphics; Jennie Lee and Jenny Stahl who conducted the processing, analysis, and curation of the artifacts; finally, Principal Investigator Kelly Pool who provided expertise and guidance during the operation.

REFERENCES CITED

Ahler, Stanley A.
1989 Mass Analysis of Flaking Debris: Studying the Forest Rather than the Tree. In Alternative Approaches to Lithic Analysis, edited by Donald O. Henry and George H. Odell, pp. 85–118. A*rchaeological Papers of the American Anthropological Association* No. 1. American Anthropological Association, Arlington, Virginia.

Bach, Daniel R.
2015 Macrofloral Analysis of Flotation Samples. In Ruby Pipeline Project: Final Report of Excavations, Lincoln County, Wyoming, Volume 1: Project Background and Overview, Methods, and Specialist Reports, edited by Kelly J. Pool, Nicole Sauvageau, Amy Nelson, and Naomi Rintoul, pp. 197-238. Metcalf Archaeological Consultants, Inc., Eagle, Colorado. Prepared for Ruby Pipeline, LLC. On file at Wyoming Cultural Records Office, Laramie.

Binford, Lewis R.
1980 Willow Smoke and Dogs Tails: Hunter–Gatherer Settlement Systems and Archaeological Site Formation. *American Antiquity* 45(1):1-20.

Clayton, Carmen
1999 Lithic Raw Material Utilization. In *The Trappers Point Site (48SU1006): Early Archaic Adaptations in the Upper Green River Basin, Wyoming,* edited by Mark Miller, Paul Sanders, and Julie Francis, pp. 91-138. Cultural Resource Series 1. Office of the Wyoming State Archaeologist, Laramie.

Cummings, Linda Scott, R. A. Varney, and Kathryn Puseman
2015 Pollen, Starch, and Charcoal Analysis for Sites 48LN1301, 48LN3997, and 48LN4114. In Ruby Pipeline Project: Final Report of Excavations, Lincoln County, Wyoming, Volume 1: Project Background and Overview, Methods,

and Specialist Reports, edited by Kelly J. Pool, Nicole Sauvageau, Amy Nelson, and Naomi Rintoul, pp. 177-196. Metcalf Archaeological Consultants, Inc., Eagle, Colorado. Prepared for Ruby Pipeline, LLC. On file at Wyoming Cultural Records Office, Laramie.

Francis, Julie E., and Yvette Widman
1999 Variability in the Archaic: Projectile Points from Trappers Point. In *The Trappers Point Site (48SU1006): Early Archaic Adaptations in the Upper Green River Basin, Wyoming*, edited by Mark Miller, Paul Sanders, and Julie Francis, pp. 139-170. Cultural Resource Series 1. Office of the Wyoming State Archaeologist, Laramie.

Hoefer, Ted, III
1992 Intermountain Antiquities Computer System (IMACS) Site Form for Site 48LN2469, 48SW9241, 48UT1582, Blacks Fork Secondary Lithic Procurement Archaeological Landscape. Archaeological Services of Western Wyoming College. Electronic document, Wyoming Cultural Records Office WYCRIS database, http://wyoshpo.state.wy.us/, accessed October 10, 2012.

Holmer, Richard N.
1986 Common Projectile Points of the Intermountain West. In *Anthropology of the Desert West, Essays in Honor of Jesses D. Jennings,* edited by Carol J. Condie and Don D. Fowler, pp. 89-115. University of Utah Anthropological Papers No. 110. University of Utah, Salt Lake City.

Hughes, Richard E.
2015 Obsidian Sourcing. In Ruby Pipeline Project: Final Report of Excavations, Lincoln County, Wyoming, Volume 1: Project Background and Overview, Methods, and Specialist Reports, edited by Kelly J. Pool, Nicole Sauvageau, Amy Nelson, and Naomi Rintoul, pp. 133-142. Metcalf Archaeological Consultants, Inc., Eagle, Colorado. Prepared for Ruby Pipeline, LLC. On file at Wyoming Cultural Records Office, Laramie.

Kelly, Robert L., and Lawrence Todd
1988 Coming into the Country: Early Paleoindian Hunting and Mobility. A*merican Antiquity* 53(2):231-244.

McDonald, Elizabeth Kae (editor)
1993 Archaeological Excavations at 48LN1185. Archaeological Energy Consulting, Inc. and Metcalf Archaeological Consultants, Inc. Prepared for Presidio Oil Company, Englewood, Colorado, and Northwest Pipeline Company, Salt Lake City, Utah. On file at Wyoming Cultural Records Office, Laramie.

McKern, Scott T., and Steven D. Creasman
1991 *Salvage Excavations at the Vegan Site, 48LN1880, in the Green River Basin,* Wyoming. Cultural Resource Management Report No. 58. Archaeological Services of Western Wyoming College. Prepared for Colorado Interstate Gas Company, Colorado Springs, Colorado. On file at Wyoming Cultural Records Office, Laramie.

Malainey, Mary, and Timothy Figol
2015 Analysis of Lipid Residues Extracted from FCR. In Ruby Pipeline Project: Final Report of Excavations, Lincoln County, Wyoming, Volume 1: Project Background and Overview, Methods, and Specialist Reports, edited by Kelly J. Pool, Nicole Sauvageau, Amy Nelson, and Naomi Rintoul, pp. 143-158. Metcalf Archaeological Consultants, Inc., Eagle, Colorado. Prepared for Ruby Pipeline, LLC. On file at Wyoming Cultural Records Office, Laramie.

Mayer, James, William Eckerle, Doug Kolb, Orion Rogers, and Sasha Taddie
2015 Geoarchaeological Studies. In Ruby Pipeline Project: Final Report of Excavations, Lincoln County, Wyoming, Volume 1: Project Background and Overview, Methods, and Specialist Reports, edited by Kelly J. Pool, Nicole Sauvageau, Amy Nelson, and Naomi Rintoul, pp. 39-128. Metcalf Archaeo-

logical Consultants, Inc., Eagle, Colorado. Prepared for Ruby Pipeline, LLC. On file at Wyoming Cultural Records Office, Laramie.

Thompson, Kevin W., and Jana V. Pastor
1995 *People of the Sage: 10,000 Years of Occupation in Southwestern Wyoming.* Cultural Resource Management Report No. 67. Archaeological Services of Western Wyoming College, Rock Springs.

U.S. Department of the Interior
2004 *Cultural Resources Class I Regional Overview for the BLM Kemmerer Planning Area, Wyoming.* Bureau of Land Management Kemmerer Field Office, Kemmerer, Wyoming.

Wheeler, Charles W., Gail S. Firebaugh, Wm. Lane Shields, and Elisa K. Wade
1986 5500 Years on the Great Plains–Great Basin Frontier: An Excavation of Sites in Section 14. Western Cultural Resource Management, Inc. Prepared for Exxon Company, Midland, Texas. On file at Wyoming Cultural Records Office, Laramie.

Williams, Garrett (editor)
2015 Ruby Pipeline Project: Final Report of Excavations, Lincoln County, Wyoming, Volume 4: Site 48LN4114. Metcalf Archaeological Consultants, Eagle, Colorado. Prepared for Ruby Pipeline, LLC. On file at the Wyoming Cultural Records Office, Laramie.

Williams, Garrett, Naomi Rintoul, Kelly J. Pool, and Gail Lincoln
2013 Ruby Pipeline Project: Final Report of ROW Monitoring and Open Trench Inspection and Summary of Data Recovery on the Wyoming Segment, Lincoln and Uinta Counties, Wyoming. Metcalf Archaeological Consultants, Eagle, Colorado. Prepared for Ruby Pipeline, LLC. On file at the Wyoming Cultural Records Office, Laramie.

Yohe, Robert M., II, and Summer Gibbons
2015 Protein Residue Analysis. In Ruby Pipeline Project: Final Report of Excavations, Lincoln County, Wyoming, Volume 1: Project Background and Overview, Methods, and Specialist Reports, edited by Kelly J. Pool, Nicole Sauvageau, Amy Nelson, and Naomi Rintoul, pp. 159-164. Metcalf Archaeological Consultants, Inc., Eagle, Colorado. Prepared for Ruby Pipeline, LLC. On file at Wyoming Cultural Records Office, Laramie.

Garrett D. Williams
Metcalf Archaeological Consultants, Inc.
3094 I-70 Business Loop, Suite B,
Grand Junction, CO 81504

ATYPICAL STONE ARTIFACTS FROM THE GARRETT ALLEN (ELK MOUNTAIN) SITE, 48CR301

by
David G. Eckles

The Garrett Allen (Elk Mountain) archaeological site (48CR301) is located in southeastern Carbon County, Wyoming at the northern end of the Medicine Bow Mountains and southern edge of the Hanna-Carbon Basin. It is within a homoclinal valley near the perennial Quealy Spring which forms an ephemeral drainage flowing north-northwest. Archaeological deposits are present just south, southwest and southeast of the spring. These deposits are about 10-12 feet above the spring, but their total depth is unknown.

Excavations were conducted by members of the Wyoming Archaeological Society with assistance from the Office of the Wyoming State Archaeologist and University of Wyoming Anthropology Department beginning in late 1968 and continued each year through 1980. Additional work was conducted by the State Archaeologist office in 2014. Units were established on a north-south, east-west grid. Most units were 5x5 feet blocks with some as large as 10x5 and 10x10 feet. Most units were excavated to 12 inches below ground surface with some units reaching 60 inches or more below ground surface. The depth sequence and radiocarbon dating are addressed by Eckles (2013).

Recent research on the Garrett Allen site has discussed the excavation history, projectile points and chronology of the site (Eckles 2013), chipped stone raw materials and obsidian sourcing (Eckles and Guinard 2015), chipped stone projectile points (Eckles and Miller 2019), and research potential of the collection (Clauter 2013). Data on these topics have indicated support for the idea the site represents a series of special place gatherings over about 3,100 years of prehistoric occupation. Analysis of stone artifact types not often found in Wyoming prehistoric sites is presented here. Included are rarely encountered chipped stone artifacts, ground stone atlatl weights, a steatite pipe bowl fragment, a probable stone pendant, quartz crystals, modified sandstone artifacts, minerals, fossils, and a variety of pebble manuports. The raw materials represented by these stone artifacts were brought into the site, most from considerable distances.

CORNER TANG BIFACES

Two corner tang bifaces (Figure 1) were found in the southwestern portion of the site grid in 1980. They were found nearly side-by-side at the edge of a hearth exposed during the University of Wyoming archaeological field school excavations (George Frison and Mark Miller, personal communication, 2016). Based on the existing excavation forms, it appears the unit in which they were found was referred

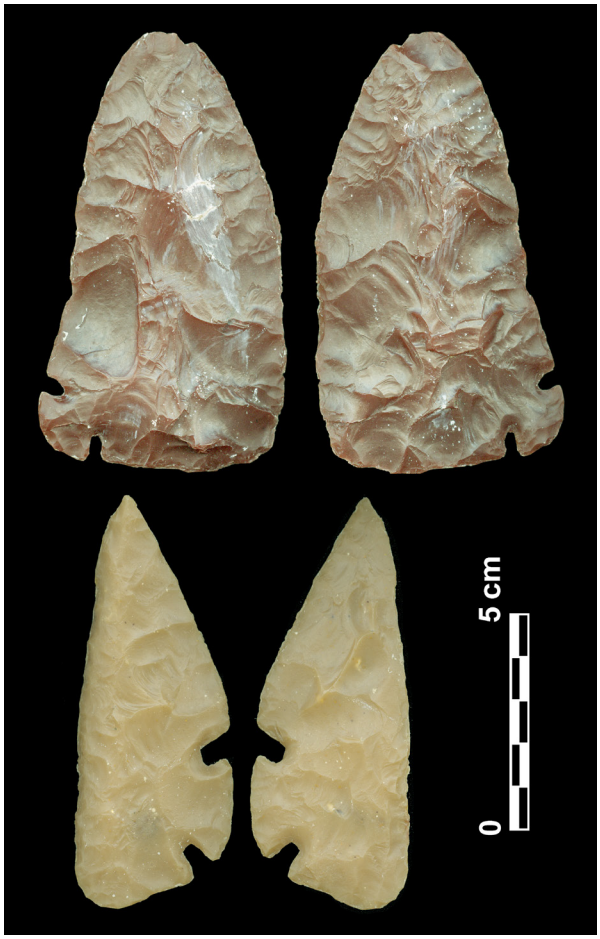


Figure 1: Corner Tang Bifaces (casts) from 48CR301.

to as "Craig's Test," a five-by-five foot unit which was part of a series of similar-sized units established along a backhoe trench excavated to test the depth of deposits, establish an area from which to set up block units, and reveal cultural and geologic (soils) stratigraphy. The two bifaces and a hearth (among other artifacts) were found at a depth of 20 inches below ground surface within this unit. A charcoal sample from the hearth in this excavation unit was found in the collection and submitted for dating on March 15, 2016. It returned a date of 814+/-18 radiocarbon years before present (D-AMS 015960).

The two corner-tang artifacts are both made of dendritic agate, similar to the kind found in east-central Wyoming. One appears to have been recently finished and unused, while the other had been extensively retouched along its working edge and reduced in size. The latter exhibits a relatively steep edge angle of 57 degrees from retouch, forming a beveled edge. It appears it had been resharpened to the point of exhaustion as a usable tool. Both artifacts were discussed by Frison (1991:113) and Kornfeld et al. (2010:57).

RESEARCH AND DATING ON CORNER TANG BIFACES

Kraft (1993) presents a synthesis of research on these highly stylized artifacts. Much of this synthesis is based on pioneering work done by Patterson (1936; 1937) which relied on surface finds of corner tang artifacts. The greatest numbers were found in Texas, with Wyoming and Nebraska having the next highest surface counts. Corner tangs have been found in relatively small numbers in South Dakota, Montana, Colorado, Kansas, Oklahoma, New Mexico, Iowa, Wisconsin, Illinois, Missouri and Arkansas (Fischel 1938; Patterson 1936).

Few such artifacts have been found in dated context. Kraft (1993:41-42) indicates a date range from about 2300 to 700 years B.P. based on corner tang artifacts found in dated contexts in Texas, Colorado, and Kansas. Obsidian hydration of a corner tang biface found on the surface near Bozeman, Montana suggested a date from about 2900 to 2500 years B.P. (Davis 1975). A recent report of a corner tang biface in dated context from a site near Amarillo, Texas indicates a date range of 2540-2240 years B.P. (Quigg 2011:4). A corner tang artifact was recovered from the Glenwood Locality in southwestern Iowa and dated from about 650-800 years before present (Perry 1996). Although not directly dated, a corner-tang biface was found in east-central Wyoming (Converse County) on the site surface near a surface hearth dated to 1145+/-100 years B.P. (Greiser et al. 1982:5-68). In sum, corner tang artifacts appear to date from the early Late Archaic to middle Late Prehistoric periods.

LARGE NOTCHED BIFACE

A large corner notched biface was collected in the mid-1970s from the surface close to the Garrett Allen site (Figure 2). Its location has been identified to a sandstone outcrop on Halleck Ridge just northwest of the spring and excavated deposits (Mark Miller and George Frison, personal communication, 2016). As Frison (1991:355) has stated:

> "… A large notched biface was reported to have been found on the surface in southern Wyoming and its authenticity was questioned. However, part of a large *Busycon* sp. shell was found a year or so later by a different person in the same location and it is now believed the two items were from a human burial that had eroded out nearby. Both items are diagnostic of materials from the lower Mississippi Valley that somehow found their way onto the Plains …"

Dr. Emmett Evanoff of the University of Colorado identified this shell fragment (Figure 3) in 1983 as *Busycon contrarium*, the lightening whelk, a common marine shell along the Gulf Coast states. This shell artifact and the large biface are illustrated in Frison (1991:355-356) and Kornfeld et al. (2010:445-446).

In addition to the probable location of these two artifacts, one human occipital bone is cataloged in the Garrett Allen site collection, although it is missing from the collection. There is no provenience information on the catalog card. Conversations with individuals who participated in the site excavations revealed there was a general consensus human remains had been found in the area of the sandstone outcrop just northwest of the site. Unfortunately, we do not know what these remains are or where they might be located if they were collected.

The area of the sandstone outcrop was examined in September of 2013 and in August of 2014 by staff

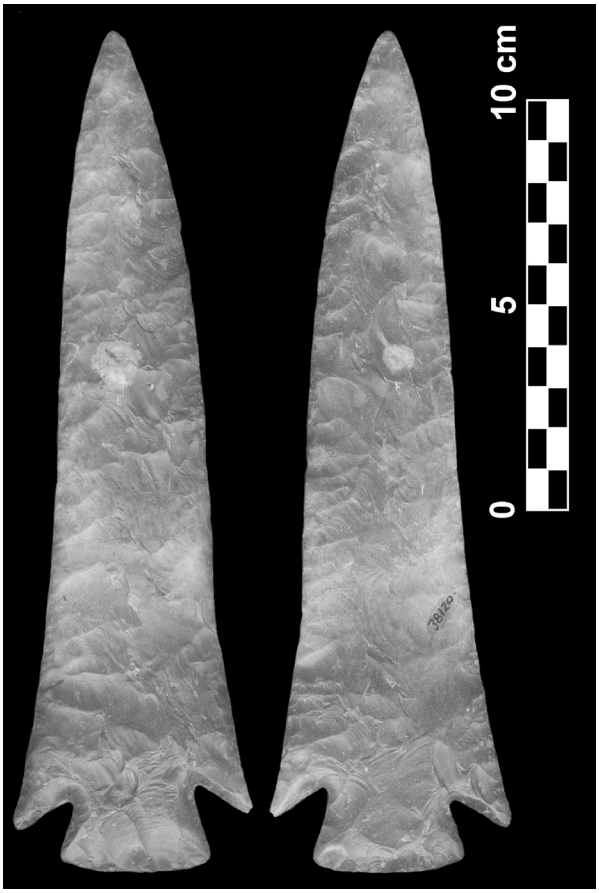


Figure 2: Large notched biface, 48CR301.

from the Office of the Wyoming State Archaeologist and Wyoming SHPO, as well as students from the University of Wyoming. No artifacts or bones were located in or near this outcrop at these times. If a burial was present in this area and the biface and shell artifacts were associated with the burial, it would appear all evidence of the burial has vanished.

Given the surface nature of the find, a question has arisen regarding the biface's authenticity: is it a prehistoric artifact or a modern reproduction? Opinions differ on the matter. The following is a compilation of information about the biface and a brief analysis of its possible identity.

The piece is long and relatively thin with deep corner notches, expanded convex base and slightly recurvate blades. While finely made, the basal portion is asymmetrical with the length from the haft portion to base differing significantly (Table 1). The barbs are also of somewhat different sizes. About one-third of the lower blade area and the barbs shown signs of smoothing as if ground to dull the edges. The flaking pattern is generally collateral,

Figure 3: Busycon shell recovered from near 48CR301.

but flakes scars vary in terms of total size and orientation. In some portions of the blade, the flaking pattern is nearly random. There appears to be minor attrition (post-manufacture breakage) on the blade edges and one barb.

The biface is made from a medium to dark gray and black mottled chert with one rounded sandstone inclusion in the blade section. A lighter gray color appears at the distal end and near the center of the below the sandstone inclusion. This is clearly not a Wyoming raw material type. It is also different from any known raw lithic materials found in the Northern Plains and Northern Rocky Mountains. Suggestions have been made regarding the raw material type include Cobden chert from southern Illinois or Dongola/Wyandotte chert from southern

Table 1: Large Corner-notched Biface, Metrics.

PORTION	MILLIMETERS
Total length	202.3
Maximum width (from barbs)	58.8
Thickness	7.1-9.3
Haft width	29.9
Lengths from haft width to base	14.4
	17.6
Maximum base width	37.3

Indiana (Dr. Ernie Boszhardt, personal communication, 2013) and Georgetown flint from Texas (W. Blackwell, personal communication, 2013). It does not appear to be from an Ohio source (Dr. Mark Seeman, personal communication, 2013). A review of Midwestern lithic raw materials in DeRegnaucourt and Georgiady (1998) suggests some resemblance to the Cobden/Dongola/Wyandotte materials. Illustrations of Texas cherts found on the internet only somewhat resemble the Garrett Allen specimen. It is unlike specimens of Edwards Plateau chert from central Texas of which a few samples are present at the University of Wyoming Anthropology Department.

A few people who have examined the artifact have likened it to the modern large biface reproductions called "gray ghosts."

> "…They were named for and made from gray Edwards chert from Texas …The first ones were produced in Bryon Rinehart's 'flint spear' factory in the 1940s. 'Gray ghosts' are large modern-made flint spears that were made during the 40s, 50s, 60s and early 70s …Each one is a little different and unique …" (Bostrom 2013:1).

Another web posting describes how Rinehart made his artifacts.

> Bryan (sic) Reinhardt had developed a method of mass producing large flint spear points, none of which is under nine inches long … with the use of a rock saw and complex level flaker (fulcrum and lever). Rienhardt (sic) quarried tons of gray Edward's Plateau chert … Once he had the slabs cut and trimmed he would heat treat the material … For the actual flint knapping stages, Bryan (sic) removed the first stage of conchoidal flakes (which) was done with an elaborate jig set up. The jig was an elaborate set of holes and pins that allowed Bryan (sic) to apply fulcrum and level pressure at any angle and from any direction to any size or shaped piece of flint. The edging was done with micro-lever and shearing techniques. This gave the early Gray Ghosts their characteristic steep margin double bevels . . ." (Harwood 2005:2-3).

A more thorough summary of the Rinehart/Gray Ghost phenomenon was presented by Whittaker (2004:50-53). All of the internet information appears in this article, including the devices used to "flake" the pieces. While Rinehart may have been inspired by the prehistoric artifacts from the Spiro Mound in Oklahoma, his points were not intended to be replicas of genuine artifacts. He seemed to be interested in making shapes according to his own preferences (Whittaker 2004:52).

These modern bifaces are no longer being produced by Mr. Rinehart as he passed away in 1982 (Bostrom 2013:1). Other flint knappers have continued to make the bifaces similar to "gray ghosts" after Rinehart's passing, possibly up to the present time (Whittaker 2004:53).

A cursory examination of illustrations of gray ghosts appearing on several websites and in Whittaker (2004:51) shows a wide variety of sizes and basal and blade attributes. Rinehart's "gray ghosts" are flawlessly made, completely symmetrical in all attributes and generally thin to moderate thickness. Final flaking along the blade edges shows flakes of nearly similar sizes and orientations. The flaking pattern can be nearly parallel oblique, horizontal to the vertical plane of the blade or at a low angle to the vertical plane of the blade. Steep double bevels along the blade edges are present on many of the illustrations shown on various websites and in Whittaker (2004:51).

Arguments in opposition to the possibility the Garrett Allen site notched biface is a gray ghost include the following. First, its basal configuration is quite asymmetrical. Second, there are no obvious indications of modern manufacture such as residue from metal implements or the type of crushing which can occur while chipping with, for example, pliers or a metal punch. Third, the flaking pattern on the biface blade is by no means repetitive; flakes are of multiple sizes and orientations. Furthermore, no steep angled double bevel is evident, in fact no beveling is observed. Examination of the specimen under 20x magnification revealed what appear to be small sediment grains in a few of the interstices of hinge fractured flakes, suggesting the artifact had at some point been in contact with sediment. With the limited information available, there do not appear to be any of Rinehart's gray ghosts similar to the Garrett Allen specimen. Other large modern

bifaces illustrated in Whittaker (2004) are also quite dissimilar to the Garrett Allen side notched biface.

This large biface is clearly not a typical High Plains or Rocky Mountain prehistoric type. The stone raw material is not from a Wyoming or nearby source. Are there any similar large notched bifaces in other parts of North America, or even Wyoming? Perhaps. In 1971, The Fremont County Chapter of the Wyoming Archaeological Society reported on two large exotic blades found in central Wyoming (Fremont County Chapter, WAS 1971:13-15). They were reported to have been made from the same or similar "dark brownish gray chalcedony," and were both ten inches long. No further information is available on either piece, including present location.

Zeimens and Walker (1977) describe a third similar biface (Figure 4) found in the Gas Hills area of eastern Fremont County:

> "One other artifact from this area is worthy of special mention. It is a large bifacially flaked blade, probably a ceremonial knife or spearpoint. The material it is made from is not found locally …The artifact resembles similar specimens recovered from Hopewell sites in the Ohio River Valley …Only three similar specimens are known from Wyoming. One almost exactly like the Gas Hills blade came from Elk Mountain about 100 miles south and east of the Gas Hills. Another came from the South Pass area 70 miles to the west and one from Douglas 125 miles due east …None have been found in a definable context, and nothing definite can be said about their origin. It is possible that they represent some contact between this area and the Hopewellian in the East" (Zeimens and Walker 1977:20-21).

Figure 4: Large biface from the Gas Hills Area, Fremont County, Wyoming.

Like the two blades described in 1971, the present location of this blade is unknown, but based on photographs taken in 1976, the material of the Gas Hills blade appears to be the same, or fairly close to the same, as the Elk Mountain blade. These three other reported occurrences of large ceremonial type blades lend credence to the idea of the Elk Mountain blade being prehistoric and not a modern replica and further shows the probability of long-range trade networks in the region.

A search of the literature (by no means exhaustive) discussing large (probably ceremonial) bifaces points to one particular type known from southwestern and west-central Illinois, northern, central and southwestern Missouri, northwestern Arkansas and northeastern Oklahoma. This is the Etley point which has been found in burials and other contexts. Etley points have been dated from about 4150 to 2550 radiocarbon years before present (O'Brien and Wood 1998:145; Ray n.d.:2).

There is considerable variation among Etley points in terms of metrics, and especially in its notching and basal attributes and configuration of the barbs (see e.g. Banks 2005; O'Brien and Wood 1998; Ray et al. 2009; Roper 1978). Most of the examples illustrated in the literature are not particularly similar (except in length) to the Garrett Allen large biface, but there are two examples of Etley points which are somewhat similar. One is from north-central Missouri reported in Chapman (1975:246) and the other is reported in Holmes (1902:118-119 and Plate XI). The Holmes (1902)

specimen shows the slightly recurvate blade, asymmetrical expanded convex base and deep corner notches, but its barbs are longer and the blade appears to be wider than the Garrett Allen site biface. The Chapman (1975) example shows a similar flaking pattern, asymmetrical base and barbs which are more similar to the Garrett Allen specimen.

The large notched biface reported by Holmes (1902) is particularly interesting because it was found while dredging a spring in extreme northeastern Oklahoma. This Etley point was found along with other large bifaces and the bones of bison, deer, wolf, birds, mammoth and mastodon. The remains from the spring obviously include a long time range and the materials were not found in dateable contexts. Holmes considered the stone artifacts and possibly some of the faunal remains were ritually deposited in the spring over prehistoric time.

There are other long notched bifaces in the literature from burial sites and mounds in the Mississippi River system, lower Missouri River valley and in the larger region east of the Mississippi River dating from the Middle to Late Archaic, Woodland and Mississippian prehistoric periods. A few have a vague resemblance to the Garrett Allen site specimen. For example, there is a long notched biface from the Coral Snake Mound in northwestern Louisiana dating to 1650-1750 years B.P. It has deep corner notches, prominent barbs and a slightly expanded, but straight base. The blades are not recurvate (McClurkan et al. 1980).

It must be admitted two or three examples of a stylized artifact which resemble another one is a fairly thin argument for identification of the Garrett Allen biface to a type. The comparison to Etley is suggestive but far from definitive. The raw material is clearly exotic, but from which source is unknown. It does not appear to be a "gray ghost" but it could be a modern reproduction made by someone other than Bryon Rinehart. The arguments presented here point toward the biface, and the three other Wyoming exotic blades, as being prehistoric artifacts, but lacking a dated context, it is difficult to conclude much about them.

STEATITE ARTIFACT

One small fragment of a possible steatite pipe bowl (Figure 5) was found at four inches below surface in the southwestern portion of the site grid. It is likely contemporaneous with the late Late Prehistoric Shoshone Knife, side-notched, tri-notched and unnotched arrow points recovered from about 0-12 inches below surface in many parts of the site (see Eckles 2013). Adams (1992:35-47) has identified sources of steatite and quarry locations in the Teton and Gros Ventre Mountains of northwestern Wyoming, Wind River Range of west-central Wyoming, Owl Creek and Bighorn Mountains of north-central Wyoming and possibly the Seminoe Mountains and the Carbon County portion of the North Plate River drainage of south-central Wyoming.

Figure 5: Steatite artifact, 48CR301.

ATLATL WEIGHTS

Four atlatl weights were recovered from the site (Figure 6; Table 2). All are made of green-black to jet black, dense igneous or metamorphic rocks. Three of the four exhibit smoothing and striations on the formed facets along the long axis of each artifact.

Amphibolite is a dark green to green-black metamorphic rock commonly found in dikes (Miller 1971:19-21). Amphibolite dikes are commonly found in the Laramide mountain ranges of Wyoming, especially in the Cheyenne Belt (a tectonic suture zone) crossing the southern Laramie Range, northern Medicine Bow Mountains and Sierra Madre Range of southeastern Wyoming (Grambling and Tewksbury 1989:1; Hoffman 1989:460-461). Dark green amphibolite schist is also found in the Seminoe Mountains (Lovering 1929:222). Other sources include the Casper Mountain area where amphibolites occurs in dikes, lenses and pods up to 500 meters long and 10+ meters wide (Gable et al. 1988). Amphibolite deposits are also found in the Granite Mountains of central Wyoming (Peterman 1978) and the Wind River Range (Shepard 1985), among others.

Basalt rocks in Wyoming are most commonly found in the Yellowstone-Absaroka field located in northwestern Wyoming. This is the largest volcanic field in Wyoming and is considered to be the source

Figure 6: Atlatl weights, 48CR301.

of most of the volcanic debris in the state. Basalt rocks are found in late Eocene, early Oligocene, Miocene, and early Pliocene deposits in this field (Houston 1964:16).

Basalt outcrops are known from the western edges of North Park, Colorado, in the area of Rabbit Ears Pass and Elk Mountain. Grouse Mountain Basalt overlies Troublesome formation rocks and Rabbit Ears volcanics (Bolyard and Sonnenberg 1997:165-166). Luedtke and Smith (1978) show Late Cenozoic volcanic dikes and flows containing basalt rocks on the western side of North Park, Colorado, north and northwest of Steamboat Springs, up to and just over the Wyoming border in southwestern Carbon County. There are additional basalt dikes and flows south of Steamboat Springs and into Middle Park and central Colorado (Izett 1966:42).

West of North Park, basalt rocks are found in the Elkhead Mountain Volcanic Field which extends from Cedar Mountain near Craig, Colorado north to Battle Mountain, an extinct volcano located in extreme southwestern Carbon County, Wyoming (Carey 1955:44).

Closer to the Garrett Allen site in the Saratoga Valley between Walcott and Saratoga, cross-bedded conglomerates of the Browns Park Formation contain rounded clasts of Precambrian rocks, including basalt, rhyolite, andesite, and other extrusives. These conglomerates were transported from the Rabbit Ears and Never Summer volcanic fields in northern Colorado during Miocene times (Montagne 1991:25). Basalt dikes are also found along the Cheyenne Belt in southeastern Wyoming (Houston and Marlatt 1997).

POSSIBLE PENDANT

A small fragment of a modified stone was found at 5 inches below surface. This artifact has one smoothed surface with a series of nearly parallel abrasion marks (Figure 7). Both ends of the specimen have been incised, creating a narrow groove, possibly for the attachment of a cord. It has been (purposefully?) broken and exhibits two cleavage surfaces, both of which have weak conchoidal fracture marks. The rock is a dark red to dark brown color and is highly magnetic.

The stone is a variety of baked shale, common in the Powder River Basin of Wyoming and Montana. Many coal bed outcrops in the basin have burned and the heat from coal fires has baked and fused

Table 2: Atlatl Weights, Provenience and Rock Type.

ROCK TYPE	UNIT	DEPTH	LENGTH	MAX. THICK.	MODIFICATION	COUNT	FIGURE
Amphibolitic basalt	N/A	N/A	71.1	22.9	4 facets with parallel striations, perpendicular incisions on 3 sides at center	1	6b
Igneous dike basalt	0-10N 30-35W	12”	61.1	19.8	4 facets with faint parallel striations	1	6c
Amphibolite dike	N/A	32”	65.9	23.9	5 facets with parallel striations	1	6a
Igneous basalt family	N-S Trench 12S	48”	53.4	17.2	Faint smoothing on two sides, no striations	1	6d

Figure 7: Grooved baked shale artifact.

the overlying clastic rocks into clinkers (Miller 1979:38). When such rocks are heated, they generally turn a shade of red or brown and become more magnetic (Miller 1979:27). The rock is partially silicified and has conchoidal fractures, common characteristics of baked shale (Wayne Sutherland, personal communication, June 3, 2014).

QUARTZ PYRAMIDAL CRYSTALS AND CRYSTALLINE QUARTZ

A discussion of quartz artifacts from the site were previously discussed by Eckles and Guinard (2015) who described 467 quartz artifacts recovered from all depth increments. This includes a large number of flakes and a relatively small number of chipped quartz tools. There are eight modified (flaked) pyramidal crystals, seven unmodified pyramidal crystals (Figure 8a), and three unmodified stream pebbles in the assemblage.

Of the modified pyramidal crystals, one found at 18 inches below surface (Figure 8c) is irregularly oval in shape with the thickest end flaked, exhibiting four flake scars on one side and two on the other. This has formed a 62º angle working edge which shows crushing from use. The opposite (narrower) end has one flake scar and possible polish. Perhaps this crystal was inserted into a bone or antler socket to facilitate its use as a tool.

Figure 8: Quartz pyramidal crystals.

The other seven crystals show one to at most two flakes removed from the apex of the crystal (example shown in Figure 6b). Three small clear quartz flakes retaining one of the crystal facets were also recovered. None of the pyramidal crystals or flakes show any evidence of use wear or further flaking. It would appear the modification of these crystals was for purposes other than producing a functional tool or flake for functional use.

Most of the quartz recovered includes irregular pieces from milky white or vein quartz. These pieces do not appear to be suitable for making functional stone tools, and none show any evidence of use wear.

For the most part, quartz artifacts are present in small numbers more or less evenly distributed across the site in all depth increments. A closer examination of the context of quartz artifacts reveals some units with greater densities, possibly concentration areas (Table 3). While we do not know precisely where these items were found within the units (which include 1, 5, 10 and 25 square foot areas), the data (Table 3) do suggest perhaps in these units at the depths indicated, more concentrated knapping/other use of quartz occurred. Most of these units contain both quartz cores and debitage, and two also contain pyramidal crystals. Three out of the five pyramidal crystals have one or more flakes removed from the apex of the crystal. None of the flakes indicated in the table include any of the flakes removed from the apex of a pyramidal crystal.

Clearly, some of the reduction of quartz raw materials was to produce functional stone tools, given the presence of 23 such tools in the collection. As discussed by Eckles and Guinard (2015), most of the quartz debitage consists of irregular chunks of milk (vein) quartz which do not appear to be useful for use as tools. With one exception, the flaked pyramidal crystals and flakes derived from these crystals show no edge wear. It appears the purpose of reducing many of the quartz cores and the flaking of pyramidal crystals was not to produce functional stone tools.

While large in numbers, the quartz artifact assemblage from the Garrett Allen is not the largest in the state. Site 48NA182 in central Wyoming contains 529 quartz artifacts from a dated component (2610+/-50 B.P.) which also produced Pelican Lake corner-notched dart points. Several dozen other quartz artifacts were recovered from other

Table 3: Possible Concentration Areas of Quartz Artifacts, 48CR301

UNIT	DEPTH IN INCHES	TOTAL SQ. FT.	CORE	PYRAMIDAL CRYSTAL	FLAKES NISP	TOTAL	NUMBER OF ARTIFACTS PER SQ. FT.
10N 35W	8	1	1		5	6	6.0
17N 70-80W	12	10	1		18	19	1.9
E-W Tr. 32W	30	5			18	18	3.4
N-S Tr. N. End	44	25		2 (both flaked)	53	55	2.2
E-W Tr. 45E	48	5	1		13	14	2.8
E-W Tr. E. End	48	25	2	3 (one flaked)	44	49	2.0

components (Goss and Slensker 2002:74). Another site in southeastern Wyoming, 48LA304, contains over 200 quartz artifacts (Reher and Frison 1991). Most of the other sites where quartz artifacts were recovered (Table 4) have relatively few such artifacts compared to the Garret Allen, 48NA182 and 48LA304 sites.

MODIFIED SANDSTONE PEBBLE AND INCISED SANDSTONE SLAB

One small dark brown irregularly shaped sandstone pebble contains a probable bore hole on one side. It appears a natural hole in the rock has been enlarged by drilling or scraping around the edges of the hole which has and made it somewhat wider and deeper. This bore hole reaches about half way through the pebble.

A portion of a rectangular, thin sandstone slab exhibits faint and narrow grooves as well as probable incisions. On one side there are two faint and shallow grooves. On the other side are faint V-shaped incisions resembling a tree. It is possible this specimen was used in a similar fashion as the sandstone shaft abraders although the possible grooves are extremely shallow suggesting it was not extensively used as such, or the grooves represent something else. The tree-like pattern could be the result of random incisions made for an unknown purpose, or perhaps this is an example of portable art.

SMALL STONE MANUPORTS

Several unmodified pebbles and other rock fragments were transported into the site. Some are sedimentary rock pieces, but most are relatively small stream rounded pebbles and wind polished flat pebbles of igneous and metamorphic origin. These are, for the most part, unmodified (or minimally modified) rocks and pebbles exhibit bold colors, including red, white, yellow, purple, black and brown.

Table 4: Selected Wyoming and Colorado Sites with Quartz Artifacts

SITE	LOCATION	PREHISTORIC PERIOD	QUARTZ ARTIFACTS	REFERENCE
48NA202	Central Wyoming	Protohistoric	1 tool	Reher and Frison (1991:388)
48NA326	Central Wyoming	Late Prehistoric	5 flakes	Randall (1963)
48LA302	SE Wyoming	Late Prehistoric	1 projectile point and flakes	Reher (1971:40); Reher and Frison 1991:388)
48AB1	SE Wyoming	Late Prehistoric	10 flakes	Waitkus (2013:7.2)
5WL101	NE Colorado	Late Prehistoric	1 crystal	Steege (1967)
48LN317	SW Wyoming	Late Prehistoric	7 quartz stream cobbles	McGuire (1977)
48LA304	SE Wyoming	Late Prehistoric to late Late Archaic	200+ flakes, 8 tools, 2 unmodified stream pebbles	Reher and Frison (1991:387)
48NA182	Central Wyoming	early Late Archaic	529 quartz artifacts from dated component	Goss and Slensker (2002)
48NA1950	Central Wyoming	Late Archaic	4 crystals	Klemperer (1988)
48WA1	North-central Wyoming	Late Archaic	10 modified crystals	Frison (1965:85-86)
48WA302	North-central Wyoming	Late Archaic	12 modified crystals	Frison (1968:264)
48AB2128	SE Wyoming	Middle Archaic	21 flakes	Ambrose (2009)
48CK7	NE Wyoming	Middle Archaic	5+ flakes	Reher and Frison (1991:388)

SOFT ROCK SPECIMENS

Several rounded to irregularly shaped rocks of sedimentary origin were recovered from various depth increments (Table 5). Red, yellow and brown unconsolidated sandstones are present as well as three white chalk specimens. The parent rock is soft, light, unconsolidated and the grains easily detach. All but the red specimens show rounding of the surfaces which might lead to an inference they were modified in some way for some purpose. Clear evidence of use wear, however, is not apparent. The red sandstone fragments are heavier and more consolidated, but no use wear is apparent. It is possible these are fragments from broken metates, or served some other purpose. Source areas for the soft sandstone manuports are unknown.

The first reference to chalk deposits in Wyoming is found in Hayden (1872:123) who reported on the "Chalk Cliff" in the Laramie Basin, part of the Cretaceous age Niobrara formation. Chalk from this formation has also been reported north of Rock River (Mears et al. 1986:8), Centennial Valley west of Laramie (Atherton 1971:11), the northwestern portion of Shirley Basin (Massington 1996:33-36), and central Wyoming (Pirrson 1915:885).

HARD ROCK PEBBLES

A rather large number of small to medium unmodified stream-rounded igneous and metamorphic pebbles were recovered from most depth increments (Table 6). Twenty-seven items of metaquartzites, orthoquartzites, chert, petrified woods, granites and basalt exhibiting a variety of colors are in the collection with provenience data. Sizes range from 2.0 to 8.5 cm (maximum lengths). Both round to oval and irregular shapes are present (Figure 9). There are another 34 of these pebbles listed in the catalog cards, but are missing from the collection.

These rocks are presumed to be manuports. As far as has been observed, there are no stream worn pebbles or cobbles on or near the site. The gravel layer depicted in one excavation profile (see Eckles 2013:32) at roughly 30-36 inches below surface appears to correspond to a gravel layer noted in the field in 2014. The gravel in this deposit consists of angular sandstone fragments deposited by colluvial action (Casey Dukeman, personal communication, 2014).

Most of the petrified wood pebbles also are unmodified. One of the petrified wood specimens (depth of 48 in) is highly polished with all four of the lateral edges exhibiting noticeable smoothing and rounding. In addition, a single flake was removed

Table 5. Soft Rock Manuports by Depth (inches)

ROCK MATERIAL	TYPE	0-6	7-12	13-18	19-24	43-48
White sandstone	Irregular fragments	1	--	--	2	--
Red sandstone (unburned)	Irregular fragments	1	--	3	--	1
Yellow sandstone	Oval fragments	1	2	--	--	--
Brown sandstone	Rounded fragments	--	--	1	1	--
White chalk	Rounded fragments	--	--	1	2	--

Table 6: Hard Rock Stream Pebbles by Depth (inches)

ROCK MATERIAL	TYPE	7-12	13-18	19-24	25-30	31-36	43-48
Brown metaquartzite	Pebble	--	--	1	--	2	--
Red metaquartzite	Pebble	--	--	--	--	1	--
Gray metaquartzite	Pebble	--	--	--	--	2	--
Yellow metaquartzite	Pebble	--	--	--	1	--	--
Brown orthoquartzite	Pebble	1	--	--	--	--	--
Gray chert, split pebble	Pebble	1	--	--	--	--	--
Gray chert, irregular	Pebble	1	--	--	--	--	--
Red granite	Pebble	--	1	--	--	2	--
Tan granite	Pebble	--	--	--	--	1	--
Purple granite, irregular	Pebble	--	--	--	--	1	--
Black basalt, irregular	Pebble	--	--	1	--	--	--
Petrified wood, irregular	Pebble	--	2	--	--	6	2
Petrified wood, highly polished	Pebble	--	--	--	--	--	1

Figure 9: Examples of unmodified stream worn pebbles and soft rock sandstone specimen (petrified wood upper left; chert middle left; sandstone lower left. All others are granite).

from the dorsal surface of the pebble. One small gray chert pebble was split and the impact scar is visible.

WIND POLISHED PEBBLES

The collection contains 18 small flaked pebbles made on relatively flat, dark brown and gray opaque to moderately translucent cherts and chalcedonies. They retain a wind polished cortex which is almost certainly desert varnish. Most of the modified pebbles are shaped in the form of small triangular bifaces (see Eckles and Guinard 2015). Raw materials are likely from the Eocene age formations of the southwestern and south-central Wyoming basins. An additional eleven unmodified, flat wind polished pebbles were recovered at various depths (Table 7); they were probably intended for reduction into tools, but were left at the site unmodified.

MINERALS SPECULAR HEMATITE AND EARTHY HEMATITE

One specimen of specular hematite and three small fragments of earthy hematite were recovered from the site. The specular hematite specimen is a dark reddish black, irregularly shaped piece measuring 2.3 by 1.8 cm found on the surface of the site. Specular hematite has been found in the Sunrise mining area of east-central Wyoming (Hausel 2005:87; Tankersly et al. 1995). Wayne Sutherland of the Wyoming Geological Survey examined this piece and concluded is probably from the Sunrise Mining Area near Guernsey, Wyoming.

Three small irregular fragments of earthy hematite (red ochre) were recovered at various depths (Table 8). Earthy hematite is also found in the Sunrise area. There is a prehistoric red ochre quarry called the Powers II site dating to Paleoindian times (Frison et al. 2018; Kornfeld et al. 2010:251; Pelton et al. 2022, Tankersly et al. 1995). In the Rawlins Uplift of south-central Wyoming, there are the historic Rawlins paint mines which contain powdery hematite, siliceous nodules, and lenticular hematite masses (Lovering 1929:209-214). The earthy hematite fragments from the Garrett Allen site could have been transported from either source area, or perhaps from another relatively distant location.

MAGNETITE WITH HEMATITE ANGULAR FRAGMENT

The single specimen from the site was found at 6 inches below surface. It is black to dark reddish black and is highly magnetic. Magnetite is one of the most common iron minerals, and can be found in igneous, metamorphic and sedimentary rocks. Much of the magnetite in Wyoming is found in banded iron formations. Sources include the South Pass Area, Copper Mountain and the Seminoe Mountains (Hausel 1982:78). Black magnetite is reported by Lovering (1929:222) from the Seminoe Mountains. South of the Bradley Peak area "…hematite is a late mineral and is largely an oxidation product of earlier

Table 7: Unmodified Wind Polished Pebbles by Depth (inches)

ROCK MATERIAL	TYPE	0-6	7-12	13-18	19-24	43-48
Brown chert	WP pebble	1	1	1	1	--
Brown fossiliferous chert	WP pebble	1	--	1	1	1
Gray chalcedony	WP pebble	1	--	1	1	--

Table 8: Minerals by depth (inches)

ROCK MATERIAL	TYPE	0-6	7-12	13-18	25-30	31-36	43-48
Earthy hematite, dark red	Fragment	1	--	1	--	1	--
Specular hematite, red-black	Rounded piece	1	--	--	--	--	--
Magnetite with hematite, black	Irregular fragment	1	--	--	--	--	--
Concretionary iron, wind polished. Dark greenish brown with yellow streaks	Irregularly shaped	3	1	1	1	--	1
Concretionary iron, red-black	Rounded piece	1	--	--	--	--	--
Concretionary iron, red-black, fossil bone cast	Fragment	--	1	--	--	--	--

magnetite . . .” (Lovering 1929:222). In the Casper Mountain area, magnetite appears to be common and locally is intergrown with or rimmed by hematite (Gable et al. 1988:12). Magnetite can oxidize into hematite and vice versa. The specimen from the site appears to be in a state of transformation into one or the other.

CONCRETIONARY IRON (INCLUDING FOSSIL CAST)

Concretionary iron, including concretions formed around fossils, is common in Upper Cretaceous and Lower Tertiary sedimentary rocks of Mesaverde Group (Gill et al. 1970). Several of these pieces are wind polished and are probably derived from interior basins such as the Hanna/Carbon Basin after having been eroded from geological strata and exposed to weathering. Given the Garrett Allen site is nearly surrounded by strata of the Mesaverde Group, fragments of concretionary iron have likely eroded into and become incorporated into the archaeological deposits. Some of these rocks, especially those not wind polished, may not be cultural items.

The wind polished concretionary iron pebbles are likely manuports and exhibit a dull greenish brown color superimposed on a tan/yellow background of the parent sandstone. Most appear to be unmodified in any way. However, one of these specimens found at a depth of 6 inches (Figure 10, left) appears to be highly polished as if from rubbing in the hands or fingers.

MAMMALIAN FOSSILS

Three fossil mandible fragments (Figure 11b-d), one of which retained well preserved teeth, were found at the site. All were recovered from the ground surface. They are identified as belonging to the Order Condylarthra, small to medium sized ungulates from the Paleocene to Eocene eras (Kelli Trujillo, Uinta Paleontological Associates, personal communication, May 5, 2014). In Wyoming, condylarth fossils can be found in the Hanna formation, which outcrops to the east and northeast of the site at the eastern edge of the Hanna/Carbon Basin.

Also recovered from the surface are a probable fossil turtle carapace fragment (Figure 11a), and a fossil carpal and phalanx (Figure 11e-f) appearing to be from a medium sized ungulate, similar to condylarth taxa from the Paleocene to Eocene Hanna formation (see Secord 1998). The condylarths of the Order Condylarthra are described as ungulates of a primitive character (Romer 1966), which appear ancestral to several ungulate orders such as the Artiodactyla (modern deer, pronghorn, bison, etc.), Perissodactyla (horses, rhinoceroses, tapirs), Proboscidea (elephants), Cetacea (whales, dolphins, etc.) and others (Rose 2006). Fossil turtles have also been found in the Hanna formation (Bowen 1918:231).

Figure 10: Wind polished concretionary iron (specimen on left is highly polished, perhaps from purposeful rubbing).

Figure 11: Fossil bone fragments.

A small amount of the original matrix still adheres to these fossils. It consists of white unconsolidated fine-grained sandstone. A nearly identical white sandstone irregularly shaped rock containing what appear to be fossil bone fragments was also recovered from the surface of the site.

The Mesa Verde Group of rocks surrounding the Garrett Allen site is of marine origin and contains only marine fossils (Bowen 1918). The mammalian fossils collected from the site were brought in by human agency from other locations, possibly from Hanna formation outcrops in the Hanna/Carbon Basin area.

A single fragment of fossilized bone was found at a depth of 8-12 inches below surface in one of the units excavated by Hayter (1981) for his soils analysis. It is considerably eroded, but retains some of the cortical bone and spongy interior. It appears to be a fragment of long bone of a medium to large sized animal but there are insufficient characteristics to determine if it is mammalian, reptilian, or other animal type. This fossil also appears to be a manuport. It is unclear if it has been modified, but there may be some smoothing/abrasion on its ends.

FOSSIL WOOD

One gray-blue mudstone fragment of possible fossil wood was found at 24 inches below surface. This is possibly from mudstone facies containing peat-like deposits within the sequence of Mesaverde group of marine sedimentary rocks, including the Allen Ridge, Pine Ridge Sandstone and Almond formations (Dereume 2010:66). The Pine Ridge sandstone nearly surrounds the site (Hayter 1981). The fossil wood fragment may, therefore, be locally derived from the sedimentary rocks surrounding the site.

One angular specimen of poor grade subbituminous coal which is almost certainly a fragment of fossil wood was found at 44 inches below surface. Bituminous and subbituminous coal deposits are present in the Paleocene age portions of the Ferris and Hanna formations in the Hanna and Carbon basins (Dobbin et al. 1929; Flores et al. 1999). These deposits are relatively close to the site, although coal deposits are found throughout Wyoming.

DISCUSSION

As with the chipped stone raw materials (Eckles and Guinard 2015), the rock specimens presented here could have been derived from several sources both relatively near and considerably distant from the Garrett Allen site. A few of the items discussed above were likely tools of various kinds (e.g. the corner tang bifaces, atlatl weights, some of the quartz artifacts), or possible decorative items (baked shale pendant, bored sandstone rock, incised sandstone slab). The soft sedimentary rocks and hematites could have been acquired to produce colorings for paints or other purposes.

The presence of what appears to be an unusually large number of quartz artifacts, quite a few small unmodified rounded and irregularly shaped stream pebbles, irregularly shaped petrified wood and concretionary iron rocks, minerals, fossils, and the large notched biface and conch shell (assuming their association with a burial) could be argued to be associated with ritual activities. Data on certain small stones and fossils compiled from ethnographic studies of Plains and Rocky Mountain groups is presented (Table 9). Many of these groups prepared ritual bundles of various kinds which often included the kinds of stones found at the Garrett Allen site. An archaeological example of a possible shaman's

Table 9: Selected Plains and Rocky Mountain Ethnographic Data on Ritual Use of Rocks and Fossils.

GROUP	MEDICINE OR OTHER BUNDLE	OTHER*	ROCK/FOSSIL TYPE	REFERENCE
Arapaho	X	X	Quartz	Gill (1983)
			Irregular pebbles	Kroeber (1983:440-443)
Kiowa	X		Quartz	McAllister (1965)
	X		Rocks (unspecified)	Hanson (1980:203)
Crow	X		Irregularly shaped rocks and fossils,	Hanson (1980:203); Wildschut (1975)
	X		Round stream cobble	Wildschut (1975)
Cheyenne	X		Quartz	Grinnell (1926:179)
	X		Rocks (unspecified)	Hanson (1980:203)
		X	Minerals and quartz	Albers (2003:941-943)
Shoshone		X	Fossil shells	Shimkin (1947)
Blackfoot	X		Ammonites and baculites	Wissler (1912:243)
Nez Perce		X	Irregularly shaped rocks in bold colors	Spinden (1908:260)
Piegan	X	X	Fossil shell, coral, ammonites, baculites;	Curtis (1911:60); Mayor (2005)
			Minerals	Mayor (2005:291)
Teton Sioux	X		Round stream cobble	Densmore (1992:206)
(Lakota)		X	and quartz rocks	
			Minerals and quartz	Albers (2003:941-942)
Gros Ventre	X		Rocks (unspecified)	Hanson (1980:203)
Mandan/Hidatsa	X		Fossil cephalopod, Baculites	Pepper and Wilson (1908:304); Wood (1971)
Arikara	X		Rocks (unspecified)	Hanson (1980:203)
Plains Cree	X		Rocks (unspecified)	Hanson (1980:203)
Pawnee	X		Smooth rocks	Linton (1923)

*Other uses include personal spiritual items, decorative items, and other ritual use not associated with bundles.

bundle from northeastern Utah dated to 400-600 years before present contained small stones and red ochre among a variety of floral and faunal remains (Gough 2002:4).

Quartz has been referenced often and widely in the New World as both a source for tool stone and for ritual use. As Whitley et al. (1999:221) have stated, "… quartz, the most common mineral on earth, is almost universally associated with shamans…" Throughout the Americas, shamans carried prismatic quartz crystals (Miller 1983:81). Perhaps the most extensive research on quartz artifacts is from California archaeological sites dating from about 6500-1500 years before present (Gibbon 1998:697). Elasser (1961:41) discusses quartz crystals as well as minerals and oddly shaped pebbles found in California, Nevada and Utah sites thought to be evidence of shamanism. There are also ethnographic accounts of the ritual use of quartz in the California literature (e.g. Hohenthal 1950; Hopkins et al. 2012; Levi 1978; Miller 1983; Sapir 1908, Whitley et al. 1999). Compared to the California evidence, little has been written about quartz use among Plains or Rocky Mountains prehistoric groups.

Reher and Frison (1991) summarized the data on quartz artifacts from Wyoming sites and discussed the use of quartz as tools and ritual items. They mention the few Plains ethnographic sources and detail the numbers of quartz artifacts in the Wyoming sites. Clearly, quartz was sought out by prehistoric Wyoming groups and throughout the Americas for both ritual use and tool manufacture.

References to the use of minerals in prehistory has often been in regard to the extraction and use of hematite. Both earthy hematite (red ochre) and specular hematite have been found in Wyoming Paleoindian sites which include probable residential locations, caches and burials (Stafford 1990; Stafford et al. 2003) and one site from which the mineral was mined (Tankersly et al. 1995; Frison et al. 2018; Pelton et al 2022). Several Wyoming and adjacent states Paleoindian sites contained various amounts of the mineral which has been associated with possible ritual (Stafford 1990:9). Its use in later periods was apparently not as extensive as in the Paleoindian period and is often associated with burials (Stafford 1990:11). Stafford (1990:12-18) presents an extended discussion of the ritual uses

of hematite both ethnographically and archaeologically. It possible the Garrett Allen site specimens of earthy hematite, specular hematite, and possibly magnetite with hematite were brought into the site for ritual purposes.

Small stones of both rounded and irregular shapes, fossils, minerals, concretions and other chipped stone artifacts (e. g. projectile points) have been mentioned in some ethnographic studies. They were collected and kept in personal and group bundles or pouches, possessing spiritual qualities attractive to the individual or group.

> …the attention to and esteem of fossil bones would appear to be behavior comparable to that involved in the placing of various unusual and mysterious objects such as crinoids and other fossils, concretions, petrified wood, and other such items in medicine bundles. The practice has, of course, been recorded for many tribes, and for some archaeological cultures the placing of such objects in burials has been noted … (Jones 1942:163).

Nearly all of the fossils collected by the groups listed (Table 9) are invertebrates. The use of vertebrate fossils is not as well represented in the literature although Mayor (2005) discusses a small number of mammalian taxa collected for medicinal and ritual use. The Garrett Allen site fossils include only vertebrate specimens and fossil wood.

An artifact cache containing large flakes and large minimally chipped tools was discussed in Eckles and Guinard (2015). Source areas of the lithic raw materials include southwestern and east-central Wyoming. This cache may have been created with the idea of returning to the site to retrieve high quality raw materials for processing at a later time. Given its location near the site's spring, it could have been intended as a ritual offering. Claassen (2015:168-169) details the possibilities some stone tool caches, especially those placed in rocky outcrops, elevated places and springs, were most likely ritual offerings.

The exotic ceremonial biface and marine shell suggest exchange far from Wyoming.

The presence of quartz crystals, small rounded and irregularly shaped stones, fossils, concretions, unmodified petrified wood rocks, minerals, etc. at the Garrett Allen site is suggestive of their use in ritual activities. The numbers of these artifacts, especially quartz, is further suggestive of more than the "usual" amount of ritual activities could have been carried out at the site. This could have to do with the number of participants gathered at the site, or because the site was by itself a location of special ritual significance.

Likely source locations for the rock specimens discussed here include the areas near the Garrett Allen site such as the Saratoga Valley, Hanna/Carbon Basin, North Platte River drainage, and Medicine Bow Mountains. At greater distances from the site, likely sources for specific rocks include the Powder River Basin, Laramie Basin, south-central and southwestern Wyoming basins, central, southeastern and north-central Wyoming mountain ranges, and the Hartville Uplift of east-central Wyoming. The diversity of source areas represented by the rocks discussed here mirror those of the chipped stone raw materials (Eckles and Guinard 2015). There is a high diversity of stone raw materials which entered the site from several directions, many relatively near and some from quite far away. These data support the idea the site represented a special place gathering for interaction, exchange and ritual activity.

ACKNOWLEDGMENTS

Many thanks to Jody Clauter and Mark Lane of the University of Wyoming Archaeological Repository who were of great assistance with the 48CR301 collections and associated field and lab documents. Jody also contacted colleagues in Ohio and Wisconsin regarding the large notched biface. Kelly Trujillo of the University of the Wyoming Geology Museum (currently with Uinta Paleontological Associates) identified the mammalian fossil remains. Wayne Sutherland of the Wyoming State Geological Survey identified the rock types of the mineral specimens, atlatl weights, baked shale pendant, concretionary iron specimens, and wind polished (desert varnished) rocks. Richard Adams of the University of Wyoming Anthropology Department examined the steatite artifact and suggested its function and possible source areas. George Frison and Mark Miller provided their recollections of the context of the

two corner tang bifaces and large notched biface. Thanks to John Laughlin of the Wyoming SHPO for directing the author to references on the "gray ghost" phenomenon. Funding for one radiocarbon date was provided by the Office of the Wyoming State Archaeologist.

REFERENCES CITED

Adams, Richard
1992 *Pipes and Bowls: Steatite Artifacts from Wyoming and the Region.* Unpublished Master's thesis, Department of Anthropology, University of Wyoming.

Albers, Patricia C.
2003 The Home of the Bison: An Ethnographic and Ethnohistorical Study of Traditional Cultural Affiliations to Wind Cave National Park. Submitted by the Department of Indian Studies University of Minnesota to United States National Park Service. Electronic document, http://www.nps.gov/wica/learn/historyculture/the-home-of-the-bison.htm, accessed June 20, 2015.

Ambrose, Clifton V.
2009 Site form for 48AB2128. Submitted by United States Forest Service, Laramie Ranger District. On file at SHPO Cultural Records, Laramie.

Atherton, Charles C.
1971 *Planktonic Foraminiferal Biostratigraphy of the Niobrara Formation, Centennial Valley, Albany County, Wyoming.* Unpublished Master's Thesis, Department of Geology, University of Wyoming.

Banks, Alan
2005 Some Information on the Etley. *Central States Archaeological Journal* 152(2):90-98.

Bolyard, Dudley W. and Stephen A. Sonnenberg
1997 *Geologic History of the Colorado Front Range: 1997 RMS-AAPG Field Trip #7.* The Rocky Mountain Association of Geologists, Denver.

Bostrom, Peter A.
2013 Gray Ghosts by Bryan Reinhardt. Electronic document, http://www.lithiccastinglab.com/gallery-pages/ghostreinhardtgrayghostslrg.htm, accessed June 1, 2015.

Bowen, C. F.
1918 *Stratigraphy of the Hanna Basin, Wyoming.* United States Geological Survey Professional Paper 108-L. United State Geological Survey, Washington, D.C.

Carey, Byrl D.
1955 The Elkhead Mountains Volcanic Field, Northwestern Colorado. In, *Guidebook to the Geology of Northwest Colorado*, pp. 44-46. Rocky Mountain Association of Geologists, Denver.

Chapman, Carl C.
1975 *The Archaeology of Missouri.* University of Missouri Press, Columbia.

Claassen, Cheryl
2015 *Beliefs and Rituals in Archaic Eastern North America: An Interpretive Guide*. The University of Alabama Press, Tuscaloosa.

Clauter, Jody A.
2013 The Problems and Potentials of Using Older Collections: A Preliminary Assessment of the Elk Mountain (48CR301) Ceramics. Paper presented at the 71st Annual Meeting of the Plains Anthropological Conference, Loveland, Colorado.

Curtis, Edward S.
1911 *The North American Indians, Being a Series of Volumes Picturing and Describing the Indians of the United States and Alaska, Volume 6: Piegan, Cheyenne, Arapaho.* Plimpton Press, Norwood, Massachusetts.

Davis, Leslie B.
2075 A Hydration Dated Obsidian Corner-Tang Knife, East Gallatin Valley, Montana. *Archaeology in Montana* 13(3):121-135.

Densmore, Frances
1992 *Teton Sioux Music and Culture.* University of Nebraska Press, Lincoln. Reprint of work first published in the *Bulletin 61 of the Bureau of American Ethnology* (1918)

DeRegnaucourt, Tony and Jeff Georgiady
1998 *Prehistoric Chert Types of the Midwest.* Occasional Monographs Series of the Upper Miami Valley Archaeological Research Museum, No. 7.

Dereume, Jeffry M.
2010 *Sequence Stratigraphic Distribution of Coal-Bearing Rocks from the Mesaverde Group in the Easternmost Atlantic Rim of the Washakie Basin, Wyoming.* Unpublished Master's Thesis, Department of Geosciences, Colorado State University.

Dobbin, C. E., C. F. Bowen, and H. W. Hoots
1929 *Geology and Coal and Oil Resources of the Hanna and Carbon Basins, Carbon County, Wyoming.* United States Geological Survey Professional Bulletin 804. United States Geological Survey, Washington, D.C.

Eckles, David G.
2013 An Introduction to the Excavations at the Garrett Allen Site, 48CR301. *The Wyoming Archaeologist* 57(1):27-39.

Eckles, David G. and Adam Guinard
2015 Chipped Stone Raw Materials from the Garrett Allen (Elk Mountain) Site, 48CR301. *The Wyoming Archaeologist* 59(2):13-43.

Eckles, David G. and Mark E. Miller
2019 Projectile Points from the Garrett Allen (Elk Mountain) Site, 48CR301. *The Wyoming Archaeologist* 63(1):22-43..

Elsasser, A. B.
1961 Archaeological Evidence of Shamanism in California and Nevada. *Kroeber Anthropological Papers* 24:38-48.

Fischel, Hans E.
1938 A Note on Corner-Tang Artifacts. *American Antiquity* 4:152-154.

Flores, R. M., V. V. Cavoroc, and L. R. Bader
1999 *Ferris and Hanna Coal in the Hanna and Carbon Basins, Wyoming: A Synthesis.* In United States Geological Survey Professional Paper 1625-A. United States Geological Survey, Washington, D.C.

Fremont County Chapter, WAS
1971 When Margaret Hineman Found Her Artifact. *The Woming Archaeolgist* 14(3):13-15.

Frison, George C.
1965 Spring Creek Cave, Wyoming. *American Antiquity* 31:81-94.
1968 Daugherty Cave, Wyoming. *Plains Anthropologist* 13:253-295.
1991 *Prehistoric Hunters of the High Plains, Second Edition.* Academic Press, San Diego.

Frison, George C. George M. Zeimens, Spencer P. Pelton, Danny N. Walker, Dennis J. Stanford, and Marcel Kornfeld
2018 Further Insights into Paleoindian Use of the Powars II Red Ocher Quarry (48PL330), Wyoming. *American Antiquity* 83(3):485-504.

Gable, Dolores J., Arthur E. Burford, and Robert G. Corbett
1988 *The Precambrian Geology of Casper Mountain, Natrona County, Wyoming.* United States Geological Survey Professional Paper 1460. United States Geological Survey, Washington, D.C.

Gibbon, Guy
1998 *Archaeology of Prehistoric Native America: An Encyclopedia.* Garland Publishing, Inc. New York.

Gill, Sam D.
1983 *Native American Traditions: Sources and Interpretations.* Wadsworth, Belmont.

Gill, J. R., E. A. Merewether, and W. A. Cobban
1970 *Stratigraphy and Nomenclature of Some Upper Cretaceous and Lower Tertiary Rocks in South-Central Wyoming.* United States Geological Survey Professional Paper 667. United State Geological Survey, Washington, D.C.

Goss, John G. and Brent Slensker
2002 Results of the Evaluative Testing of Sites 48NA182 and 48NA199, Naval Petroleum Reserve #3, Natrona County, W*yoming.* Report by Dust Devil Archaeology, prepared for U. S. Department of Energy. On file at SHPO Cultural Records, Laramie, Wyoming.

Gough, Galal R.
2002 The Shaman's Medicine Bag, Bundle and Pouch in Native American Rock Art. *Utah Rock Art* 22:1-10.

Grambling, Jeffry A. and Barbara A. Tewksbury
1989 *Proterozoic Geology of the Southern Rocky Mountains.* The Geological Society of America Special Report No. 235.

Grieser, Sally T., John S. Stevens, Alan L. Stanfill, Heidi Plochman, T. Weber Greiser, and Susan Vetter.
1982 Eastern Powder River Basin Prehistory: Archaeological Investigations at the Antelope Mine. Report by Historical Research Associates for Nerco, Inc. On file at the Office of the Wyoming State Archaeologist, University of Wyoming, Laramie.

Grinnell, George B.
1923 *The Cheyenne Indians: Their History and Ways of Life, Volume II.* Yale University Press, New Haven.

Hanson, Jeffry R.
1980 Structure and Complexity of Medicine Bundle Systems of Selected Plains Tribes. *Plains Anthropologist* 25:199-216.

Harwood, Ray
2005 Patterned Flake Points—Flake Over Grinding. Electronic document, https://groups.yahoo.com/neo/groups/flintknappingdigest/conversations/messages/324, accessed June 8, 2015.

Hausel, W. Dan
1982 *Ore Deposits of Wyoming.* Wyoming State Geological Survey Preliminary Report No. 19.
1994 *Economic Geology of the Seminoe Mountains Mining District, Carbon County, Wyoming.* Wyoming State Geological Survey Report of Investigations No. 50.
2005 *Minerals and Rocks of Wyoming: A Guide for Collectors, Prospectors, and Rock Hounds.* Wyoming State Geological Bulletin Report No. 72.

Hayden, F. V.
1872 *Preliminary Report of the United States Geological Survey of Portions of Contiguous Territories (Being a Second Annual Report of Progress).* Government Printing Office, Washington.

Hayter, Michael A.
1981 *Soils of the Garrett Allen (Elk Mountain) Archeological Site, Carbon County, Wyoming*. Unpublished Master's Thesis, Department of Geography, University of Wyoming.

Hoffman, Paul F.
1989 Precambrian Geology and Tectonic History of North America. In, *Geology of North America: An Overview,* edited by Albert W. Bally and Allison R. Palmer, pp. 447-512. The Geological Society of America.

Hohenthal, W. D.
1960 Southern Diegueno Use and Knowledge of Lithic Materials. *Kroeber Anthropological Papers* 2:9-16.

Holmes, W. H
1902 Flint Implements and Fossil Remains from a Sulphur Spring at Afton, Indian Territory. *American Anthropologist* 4(1):108-129.

Hopkins, Jerry L., Gerrit L. Fenenga, Alan P. Garfinkel, Samantha Riding-Red-Horse, and Donna Miranda-Begay
2012 Further Reflections on California Rain-Making Shamanism: "The Other Half" of Tubantulabal Shaman's Rain-Making Bundle. *Journal of California and Great Basin Anthropology* 32(2):127-140.

Houston, R. S.
1964 Non-Paleontological Methods of Correlation of Rocks of Tertiary Age in Wyoming: Part III- The Petrographic Calendar. *Contributions to Geology, University of Wyoming* 3(1): 15-26.

Houston, Robert S. and Gordon Marlatt
1997 *Proterozoic Geology of the Granite Village Area, Albany and Laramie Counties, Wyoming, Compared with that of the Sierra Madre and Medicine Bow Mountains of Southeastern Wyoming.* United States Geological Survey Bulletin 2159. United States Geological Survey, Washington, D.C.

Izett, Glen A.
1966 *Tertiary Extrusive Volcanic Rocks in Middle Park, Grand County.* United States Geological Survey Professional Paper 550-B. United State Geological Survey, Washington, D.C.

Jones, Volney H.
1942 Fossil Bones as Medicine. *American Anthropologist* 44(1):162-164.

Klemperer, Paul
1988 Site form for 48NA1950. Submitted by Pronghorn Anthropological Associates. On file at SHPO Cultural Records, Laramie.

Kornfeld, Marcel, George C. Frison and Mary Lou Larson
2010 *Prehistoric Hunter-Gatherers of the High Plains and Rockies, Third Edition.* Left Coast Press, Walnut Creek, California.

Kraft, Kenneth C.
1993 *Corner-Tang Artifacts of the Plains.* Unpublished Master's Thesis, Department of Anthropology, Texas Tech University.

Kroeber, Alfred L.
1983 *The Arapaho.* University of Nebraska Press, Lincoln. Reprint of works first published in the *Bulletin of the American Museum of Natural History* (1902, 1904, 1907)

Levi, Jerome M.
1978 *Wii'ipay*: The Living Rocks—Ethnographic Notes on Crystal Magic Among Some California Yumans. *The California Journal of Anthropology* 5(1):42-52.

Linton, Ralph
1923 Purification of the Sacred Bundles, a Ceremony of the Pawnee. *Field Museum of Natural History Department of Anthropology,* Leaflet No. 7:1-11.

Lovering T. S.
1929 *The Rawlins, Shirley, and Seminoe Iron-Ore Deposits, Carbon County, Wyoming.* United States Geological Survey Bulletin 811d. United States Geological Survey, Washington, D.C.

Luedke, Robert G. and Robert L. Smith
1978 *Map Showing Distribution, Composition, and Age of Late Cenozoic Volcanic Centers in Colorado, Utah, and Southwestern Wyoming*. United States Geological Survey, Miscellaneous Investigations Series Map 1-1091-B.

McAllister, J. Gilbert
1965 The Four Quartz Rocks Medicine Bundle of the Kiowa-Apache. *Ethnology* 4(2):210-224.

McClurkan, Burney B., Edward B. Jelks, and Harald P. Jensen
1980 Jonas Short and Coral Snake Mounds: A Comparison. *Louisiana Archaeology* 6:173-206.

McGuire, David J.
1977 Skull Point: A Preliminary Report of 48LN317. *The Wyoming Archaeologist* 20(3):4-33.

Massington, James J.
1996 *Stratigraphy, Foraminiferal Micropaleontology, and Paleoenvironment of the Upper Cretaceous Niobrara Formation in Natrona County, Wyoming.* Unpublished Master's Thesis, Department of Geology, University of Wyoming.

Mayor, Adrienne
2005 *Fossil Legends of the First Americans.* Princeton University Press, Princeton.

Mears, Brainerd, William P. Eckerle, Douglas R. Gilmer, Timothy L. Gubbels, Gary A. Huckleberry, Hollis J. Marriot, Kenneth J. Schmidt, and Lyndon A. Yose
1986 *A Geologic Tour of Wyoming from Laramie to Lander, Jackson to Rock Springs.* Wyoming State Geological Survey, Public Information Circular No. 27.

Miller, Carter H.
1979 *Seismic, Magnetic, and Geotechnical Properties of a Landslide and Clinker Deposits, Powder River Basin, Wyoming and Montana.* Wyoming State Geological Survey, Open File Report 79-952.

Miller, Jay
1983 Basin Religion and Theology: A Comparative Study. *Journal of California and Great Basin Anthropology* 5(1 and 2):66-86.

Miller, William R.
1971 *Geology of the Indian Hills Area, Carbon County, Wyoming, with Particular Reference to the Evolution of Mafic Dikes.* Unpublished Master's Thesis, Department of Geology, University of Wyoming.

Montagne, John
1991 Cenozoic History of the Saratoga Valley, Wyoming and Colorado. *Contributions to Geology, University of Wyoming* 29(1):13-70.

O'Brien, Michael J. and W. Raymond Wood
1998 *The Prehistory of Missouri.* University of Missouri Press, Columbia.

Patterson, J. T.
1936 The Corner-Tang Flint Artifacts of Texas. *The University of Texas Bulletin* No. 3618 and *Anthropological Papers* 1(4).
1937 Supplementary Notes on Corner-Tang Flint Artifacts of Texas. *The University of Texas Bulletin* No. 3734 and *Anthropological Papers* 1(5).

Pelton, Spencer R., Lorena Becerra-Valdivia, Alexander Craib, Sarah Allaun, Chase Mahan, Charles Koenig, Erin Kelley, George Aeimens and George C. Frison
2022 In Situ Evidence for Paleoindian Hematite Quarrying at the Powars II site (48PL330), Wyoming. *Proceedings of the National Academy of Science* 119(20): e2201005119.

Pepper, George H. and Gilbert L. Wilson
1908 An Hidatsa Shrine and the Beliefs Respecting It. *Memoirs of the American Anthropological Association* 2(4):277-328.

Perry, Michael J.
1996 The Household Economy of a Prehistoric Horticultural Homestead from the Glenwood culture of the Great Plains. The Office of the State Archaeologist, University of Iowa. Electronic document, http.archaeology.uiowa.edu/glenwood, accessed April 4, 2015.

Peterman, Zell E. and R. A. Hildreth
1978 *Reconnaissance Geology and Geochronology of the Precambrian of the Granite Mountains, Wyoming.* United States Geological Survey Professional Paper 1055. United State Geological Survey, Washington, D.C.

Pirsson, Louis V.
1915 *A Textbook of Geology.* John Wiley and Sons, New York.

Quigg, J. Michael
2011 Landis Property Excavations Yield Insights into Late Archaic and Protohistoric Camps on Southern High Plains. *Pasttimes, Newsletter of the Panhandle Archeological Society* 31(3):3-7.

Randall, Arthur G.
1963 Correlation of Lee Site Artifact Rock Type with Quarry Sites, Wyoming. *The Wyoming Archaeologist* 6(1):3-11.

Ray, Jack H.
n.d. To the Point: Etley. Electronic document, associations.missouristate.edu/mas/linked…/Etley.pdf, accessed May 25, 2015.

Ray, Jack H., Neal H. Lopinot, and Edwin R. Hajic
2009 Archaic Prehistory of the Western Ozarks of Southwest Missouri. In, *Archaic Societies: Diversity and Complexity across the Midcontinent,* edited by Thomas E. Emerson, Dale L. McElrath, and Andrew Fortier, pp. 155-190. State University of New York Press, Albany.

Reher, Charles A.
1971 *A Survey of Ceramic Sites in Southeastern Wyoming.* Unpublished Master's Thesis, Department of Anthropology, University of Wyoming.

Reher, Charles A. and George C. Frison
1991 Rarity, Clarity, Symmetry: Quartz Crystal Utilization in Hunter-Gatherer Stone Tool Assemblages. In, *Raw Material Economies among Prehistoric Hunter-Gatherers,* edited by Anta Montet-White and Steven Holen, pp. 375-397. University of Kansas Publications in Anthropology No. 19. Lawrence.

Romer, Alfred S.
1966 *Vertebrate Paleontology*. University of Chicago Press, Chicago.

Roper, Donna C.
1978 The Airport Site: A Multicomponent in the Sangamon River Drainage. *Illinois State Museum Research Series Papers in Anthropology No. 4*.

Rose, Kenneth D.
2006 *The Beginning of the Age of Mammals*. The Johns Hopkins University Press, Baltimore.

Sapir, Edward
1908 Stones Among the Yana. *American Journal of Folklore* 21(80):42.

Secord, Ross
1998 Paleocene Mammalian Biostratigraphy of the Carbon Basin, Southeastern Wyoming, and Age Constraints of Local Phases of Tectonism. *Papers in the Earth and Atmospheric Sciences* No. 170. University of Nebraska, Lincoln.

Shepard, Philip D.
1985 *The Geology of an Amphibolite Dike: Wind River Range, Wyoming.* Unpublished Bachelor's Honor Thesis, Department of Geology, Whiteman College.

Shimkin, D. B.
1947 Wind River Shoshone Ethnogeography. *Anthropological Records* 5(4). University of California Press, Berkeley.

Spinden, Herbert J.
1908 The Nez Perce Indians. *Memoirs of the American Anthropological Association* 2(3):165-274.

Stafford, Michael D.
1990 *The Powers II Site (48PL330): A Paleoindian Red Ochre Mine in Eastern Wyoming.* Unpublished Master's Thesis, Department of Anthropology, University of Wyoming.

Stafford, Michael, George C. Frison, Dennis Stanford, and George M. Zeimens
2003 Digging for the Color of Life: Paleoindian Red Ochre Mining at the Powers II Site, Platte County, Wyoming. *Geoarchaeology* 18(1):71-90.

Steege, Louis C.
1967 Happy Hollow Rockshelter. *The Wyoming Archaeologist* 10(3):11-23.

Tankersley, Kenneth B, Kevin O. Tankersley, Nelson R. Shaffer, Mare D. Hess, John S. Benz, F. Rudolf Turner, Michael D. Stafford, George M. Zeimens, and George C. Frison
1995 They Have A Rock that Bleeds: Sunrise Red Ochre and Its Early Paleoindian Occurrence at the Hell Gap Site, Wyoming. *Plains Anthropologist* 40:185-194.

Waitkus, Brian R.
2013 The China Wall Site (48AB1) Albany County, Wyoming, Volume I. Report prepared by Office of the Wyoming State Archaeologist for the Wyoming Department of Transportation. On file at SHPO Cultural Records, Laramie.

Whitley, David S., Donald I. Dorn, Joseph M. Simon, Robert Rechtman, and Tamara K. Whitley
1999 Sally's Rockshelter and the Archaeology of the Vision Quest. *Cambridge Archaeological Quarterly* 9(2):221-247.

Whittaker, John C.
2004 *American Flintknappers: Stone Age Art in the Age of Computers*. University of Texas Press, Austin.

Wildschut, William
1975 Crow Indian Medicine Bundles. *Contributions from the Museum of the American Indian Heye Foundation,* J. C. Ewers, ed. Vol 17.

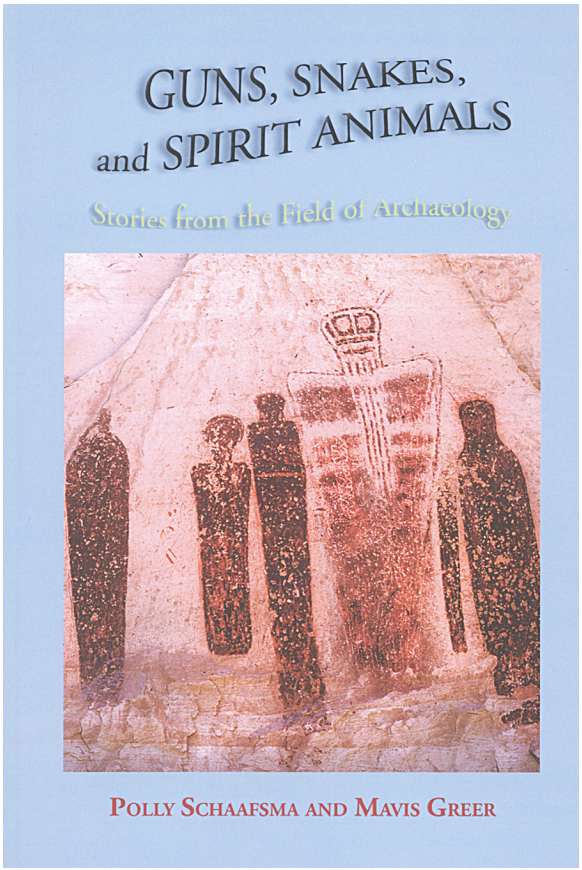
Wissler, Clark
1912 Ceremonial Bundles of the Blackfoot Indians. *Anthropological Papers of the American Museum of Natural History* 7(2):69-298

Wood, W. Raymond
1971 A Protohistoric Mandan or Hidatsa Bundle. *Archaeology in Montana* 12:1-7.

Zeimens, George M. and Danny N. Walker
1977 An Inventory of Archeological Resources in the Gas Hills Uranium Mining District. *The Wyoming Archaeologist* 20(4):6-21.

Dave Eckles
Department of Anthropology
University of Wyoming
Laramie, Wyoming

BOOK REVIEW



Guns, Snakes and Spirit Animals. By Polly Schaafsma and Mavis Greer
(Printed by Sunstone Press, Santa Fe, New Mexico 2021, 168 Pages, illustrations, photos. $22.95).

This paperback volume is a retrospective of the fieldwork and rock art research of two noted and well-known researchers, Polly Schaafsma and Mavis Greer. The book consists of an introduction and seven chapters, each containing several stories of both researchers exploits, adventures and discoveries in the field of archaeology. The volume is well illustrated with color photographs of some of the more impressive rock art sites in the west United States and abroad. Interspersed among the entertaining vignettes are tidbits of ethnographic information, archaeological insight, ethnology and important rock art contributions.

Written primarily for an audience of colleagues, friends and avocationals and those who enjoy accounts of adventure, the volume is a delightful look back upon the careers of these two distinguished scholars. It will be enjoying and insightful reading for those who know and enjoy the adventures and misadventures of decades of fieldwork.

Reviewed by David Vlcek, Bonneville Archaeology.

GUIDELINES FOR CONTRIBUTORS TO THE WYOMING ARCHAEOLOGIST

GENERAL INFORMATION

The Wyoming Archaeologist accepts papers from professional archaeologists, students, and avocational archaeologists. Subjects published in The Wyoming Archaeologist include, but are not limited to, archaeological reports on sites in Wyoming and adjacent areas, descriptive project summaries, preliminary results of significant studies, archaeological method and theory, ethnographic studies, regional history, and book reviews. Submissions by professional archaeologists will be sent for peer review before acceptance.

As noted on the inside front cover of each issue of The Wyoming Archaeologist, authors submitting manuscripts for consideration should follow the style guidelines of the journal American Antiquity as updated in July 2018. The style guide is available on the Society for American Archaeology website at: https://documents.saa.org/container/docs/default-source/doc-publications/style-guide/saa-style-guide_updated-july-2018c5062f7e55154959ab57564384bda7de.pdf?sfvrsn=8247640e_6

MANUSCRIPT

Authors should submit a manuscript to The Wyoming Archaeologist editor via email. Optionally, a CD or flash drive may be mailed to the editor. Contact information can be found on the inside front cover of the latest issue of the journal. NOTE: paper copies are no longer desired. The manuscript should be double-spaced, with all pages numbered, and provided as an MS Word file. The maximum length of the manuscript text (including References Cited) should not exceed 40 pages (do not count photos, illustrations, or tables). Do not include a Table of Contents. For the Title page, provide a current mailing address and email address for each author, as well as an Abstract. Do not incorporate tables, figures, or photos in the manuscript – submit each one as a separate file. Tables need to be provided in MS Word format. Figure captions and Table captions each need to be provided as a single list in MS Word format. Wide tables can be published in landscape format, but tables wide enough to require three or more pages are discouraged. See a recent issue of The Wyoming Archaeologist for general layout, in-text citation style, and especially, the format for References Cited.

PHOTOGRAPHS

Electronic files are preferred over physical prints. Scanned photos should be provided at 300 dpi (no less than 200 dpi). Photos from camera phones or digital cameras will vary from 72 dpi to 350 dpi – 150 to 350 dpi is preferred. Smaller dpi values are not acceptable. Photos of artifacts should include a bar scale, in either metric or English format. Provide photos in JPG, JPEG, TIF, TIFF, PNG, or BMP format.

If sending a physical print, the photo should be no larger than 8 x 10 inches. Black and white prints with good contrast are preferred. Do not send photographic film negatives. Label physical prints on the back with a soft lead pencil (not ink) – only note the figure number, not the figure caption.

LINE DRAWINGS/ILLUSTRATIONS

As with photographs, electronic files are preferred. Image resolution should be provided at 300 dpi. A bar scale (not a ratio such as 1 inch = 5 m) should be included on all maps. Provide drawings or illustrations originally saved in TIF, TIFF, PNG, or EPS format. Do not save drawings in JPEG format and then convert to TIFF. Resolution is lost.

If original line drawings are submitted on paper, larger is better to ensure the best reproduction, but no larger than 8.5x11 inches. Use only black ink on albanene, acetate, mylar, smooth Bristol paper, or smooth Bristol board. Hand-written labels and keys must be large enough to be legible when reduced. Do not use stick-on letters.

Additional information on preparation of line drawings can be found at: https://www.cambridge.org/core/services/authors/journals/journals-artwork-guide.

ADDITIONAL CONSIDERATIONS

The full layout page size is 6.5 inches wide and 9.0 inches in height. You may size photographs, line drawings, or illustrations accordingly, but it is not required – the printing company can handle the layout. If you create a full page photo or illustration, use a maximum height of 8.5 inches, which will allow up to three lines of text for the figure caption. Sizing images or figures is not required – the printer will do that for you. Original materials submitted, such as photos, paper, CD, or flash drive, will not be returned unless specifically requested. The Wyoming Archaeologist contributor guidelines can also be found in The Wyoming Archaeologist section of the Wyoming Archaeological Society/Wyoming Association of Professional Archaeologists website: https://wyomingarchaeology.org

Carolyn M Buff
Wyoming Archaeological Society
Executive Secretary/Treasurer
1617 Westridge Terrace
Casper, WY 82604-3305

Non-Profit Org.
U.S. POSTAGE
PAID
Laramie, WY
82070
Permit No. 24

THE WYOMING Archaeologist

VOLUME 63; NUMBER 2; 2019

Table of Contents