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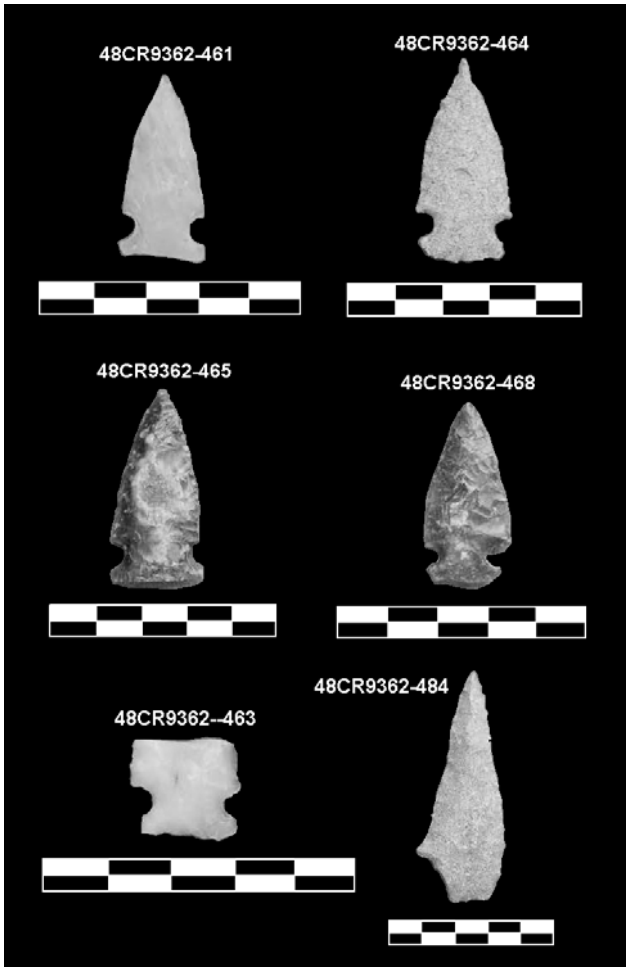

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On the Cover:

Projectile points from 48CR9362, Jack Sparrow Site. See Goodrich, this volume.

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ARCHAEOLOGICAL EXCAVATION AT THE JACK SPARROW SITE: A MULTICOMPONENT SITE LOCATED IN THE WASHAKIE BASIN OF SOUTHERN WYOMING

BY
BRENT A. BUENGER

ABSTRACT

The cultural deposit excavated at the Jack Sparrow site (48CR9362) yielded three cultural components dating to the Uinta phase of the Late Prehistoric period (Component 1), the Pine Spring phase of the Late Archaic period (Component 2), and the Opal phase of the Early Archaic period (Component 3). The majority of cultural materials recovered during the excavation were associated with the Early Archaic component. The cultural materials recorded from the three cultural components at the site suggests the various hunter-gatherer occupations of the locality represent multiple temporally punctuated short-term residential camps as well as semi-protracted housepit residential base occupations. The proximity of the site to Dry Cow Creek and Cow Creek was likely a contributing factor that conditioned the multiple occupations of the locality by hunter-gatherers over the course of around 3000 years.

INTRODUCTION

The excavation project at the Jack Sparrow site (Site 48CR9362) was conducted by Western Archaeological Services pursuant to cultural resource requirements stipulated for the Anadarko Exploration and Production Jack Sparrow Loop 1 pipeline. The Jack Sparrow site is located in south-central Wyoming 20 mi (32 km) north of Baggs, WY in the Atlantic Rim area of the Washakie Basin. The immediate site area is located 0.75 mi (1.2 km) west of Cow Creek and 0.50 mi (.80 km) east of Dry Cow Creek at the southwestern end of a broad interfluvial ridge (Figure 1). The confluence of the two creeks is located 1.5 mi (2.4 km) to the southwest. The area is generally open with a low east-west trending ridge located 50 m north of the site. The site is situated within a rolling sagebrush steppe ecoregion (Chapman et al. 2004). Eolian sand in the form of a broad sand sheet in various states of deflation is present along the slope and on site.

During the data recovery project at the Jack Sparrow site, 131 m² of intact eolian-derived sediment was excavated to depths ranging from 50 to 90 cm below the present ground surface (Figure 2 and Figure 3). The cultural deposit excavated at the site yielded three cultural components dating to the Uinta phase of the Late Prehistoric period (Component 1), the Pine Spring phase of the Late Archaic period (Component 2), and the Opal phase of the Early Archaic period (Component 3). Two conventional radiocarbon age estimates of 1580 ± 30 and 1550 ± 30 years B.P were obtained for Component 1, and one date of 4160 ± 30 years B.P was established for Component 2. Component 3 was represented by eleven conventional radiocarbon age estimates ranging between 5440 ± 30 and 4360 ± 30 years B.P. Most cultural materials recovered during the excavation were associated with Component 3. The excavation

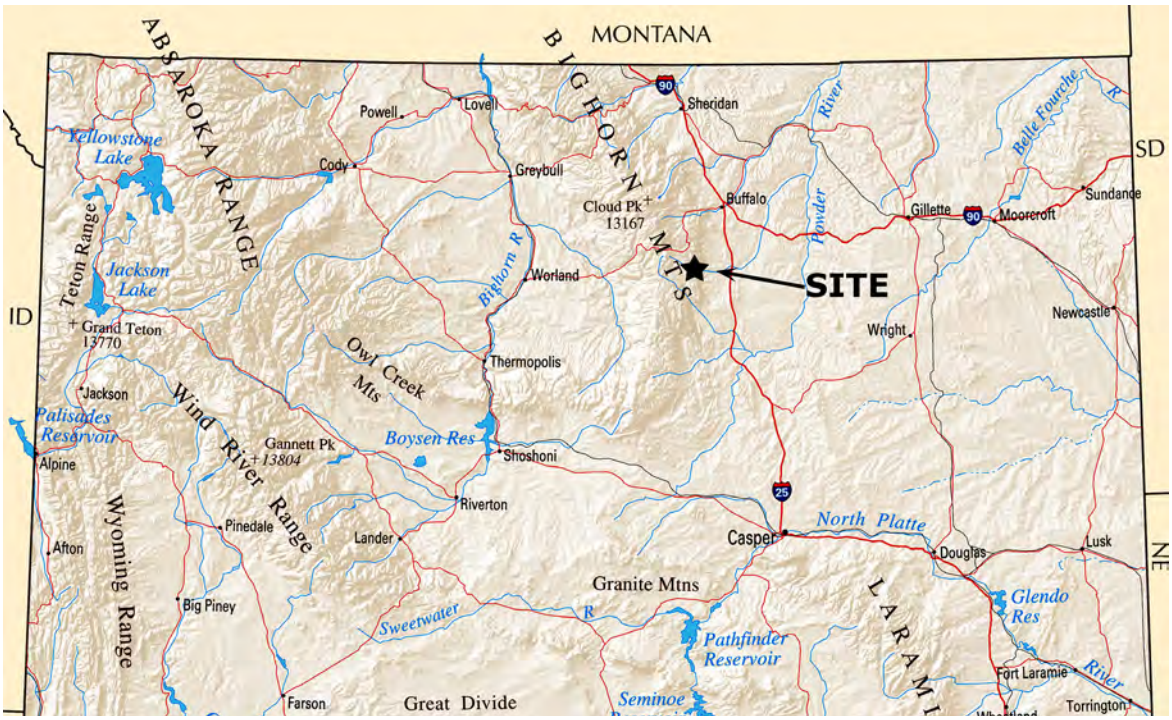

Figure 1: Aerial image of Jack Sparrow site (48CR9362) locality (adapted from Google Earth).

at the site yielded two housepit features (truncated), 18 thermal basins, 29 chipped stone tool specimens, 807 lithic reduction specimens, 11 groundstone specimens, 11 bone tools/modified bone artifacts, and 2657 cultural faunal specimens.

The archaeological materials excavated from the three cultural components at the Jack Sparrow site suggests the various hunter-gatherer occupations of the locality primarily represent multiple, temporally punctuated, short-term open camps; but also at least two semi-protracted, and perhaps repeated, housepit residential base occupations. The most intensive hunter-gatherer occupations of the site occurred during the Early Archaic. Each of the multiple occupations manifested at the site is indicative of small groups of highly mobile hunter-gatherers conducting basic broad-based foraging and seasonally-conditioned subsistence activities as the result of adaptive strategies expressed throughout prehistory within the region. The location of the Jack Sparrow site within close proximity Cow Creek, Dry Cow Creek, and associated riparian zones likely conditioned the periodic use of the locality by hunter-gatherers over an extended portion of Wyoming Basin prehistory.

GEOARCHAEOLOGICAL ASSESSMENT

The bedrock geology near the site consists of Upper Cretaceous Foxhills Sandstone and Lewis Shale (undivided) (Scott et al. 2011). The Foxhills Sandstone consists of yellowish gray fine to medium grained sandstone interbedded with gray shale (Hettinger et al. 2008). The Lewis Shale consists of gray marine shale interbedded with sandstones (Love and Christiansen 1985). Local surficial geology in the area consists of residuum mixed with scattered bedrock outcrops and eolian deposits (Case and Hallbery 2006). Windblown sand deposits are present in the immediate vicinity of the site, and Quaternary eolian deposits are also present in the Sand Hills located 3.0 mi (4.8 km) northwest of the site (Scott et al. 2011).

The site area is located near two soil unit boundaries described by NRCS as Tresano sandy loam and the Zeona-Ryark complex

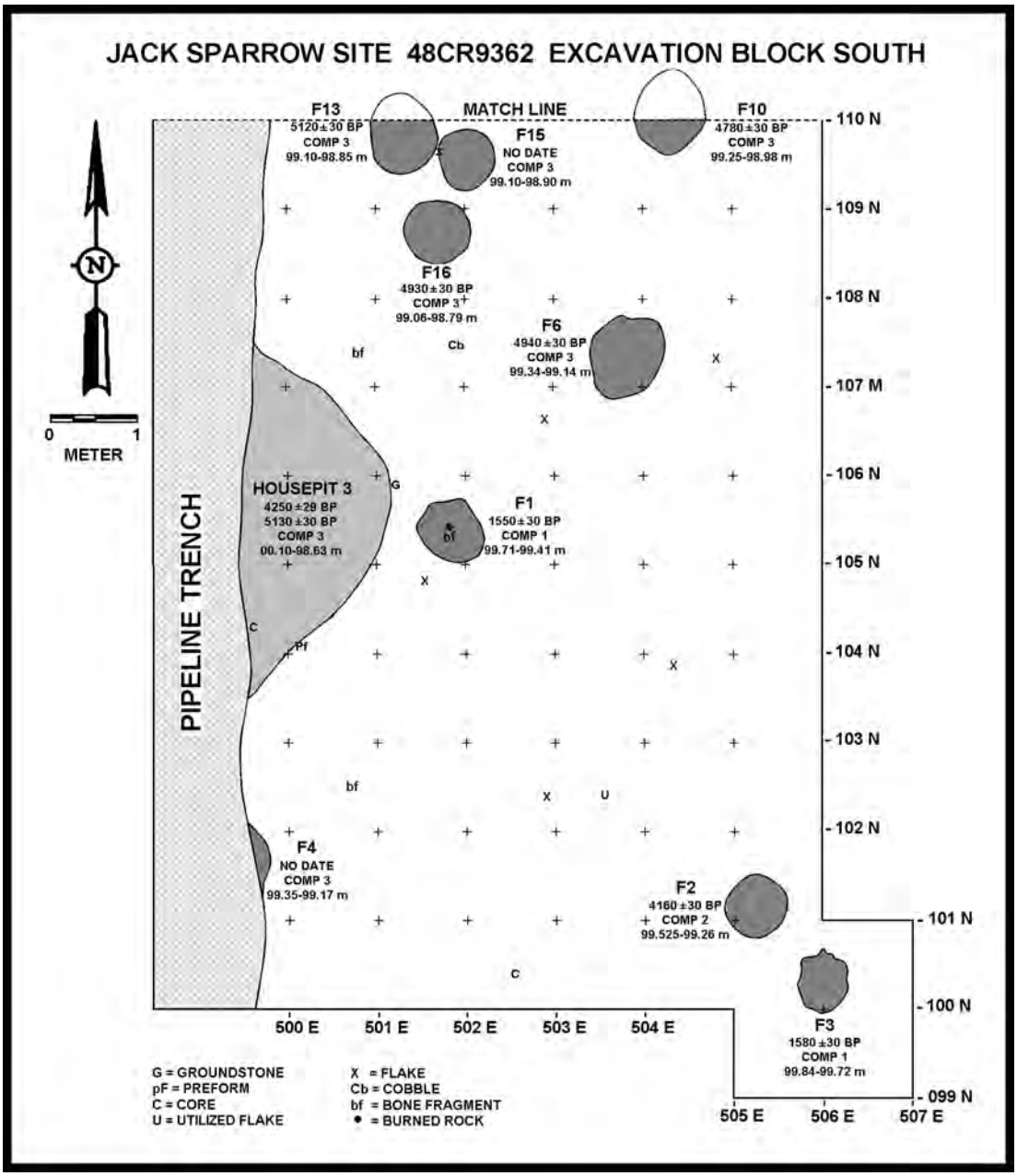

Figure 2: Excavation block map (south) from Jack Sparrow site (48CR9362).

(USDA 2016). The Tresano sandy loam is formed in alluvium derived from local bedrock and is present on fan piedmonts, terraces, and hillslopes. The Zeona-Ryark complex soils consist of eolian sand derived from sandstone and are present in eolian deposits formed on slopes. The Zeona soil consists of eolian sand comprised of fine sand, and the Ryark soil consists of coarse loamy eolian sand derived from sandstone.

Four stratigraphic units were recorded during the excavation at the Jack Sparrow site. These include Strata I, Ia, II, and III (Figure 4). These designations were made based on excavation block wall profiles and pipeline trench profiles. Each of the four strata was comprised of eolian sand (sand sheet) which aggraded on the leeward side of a small ridge located immediately north of the site. Bedrock was not encountered during mechanical or archaeologi-

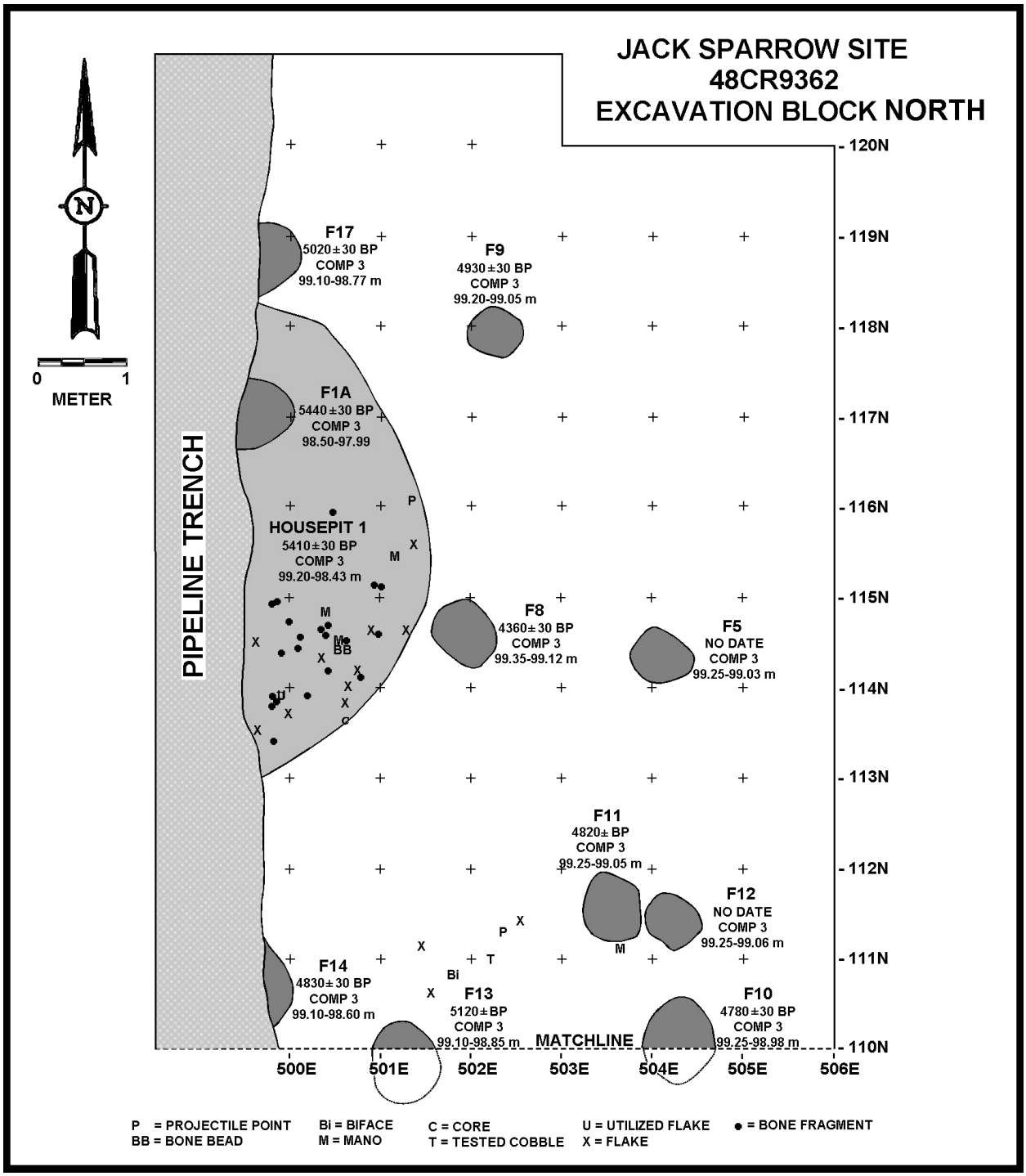

Figure 3: Excavation block map (north) from Jack Sparrow site (48CR9362).

cal excavation.

Stratum I consists of yellowish-brown (10YR5/4), massive, well sorted, fine grained sand derived from eolian deposition. Stratum I began at 50-60 cm below the present ground surface (bpgs) and extended to at least 150 cm bpgs where it was exposed in profile in the pipeline trench. Based on radiocarbon age estimates obtained during excavation, Stratum I is older than 5440 years B.P., and was likely deposited during a preceding period increased eolian activity during the Early Middle Holocene (ca.

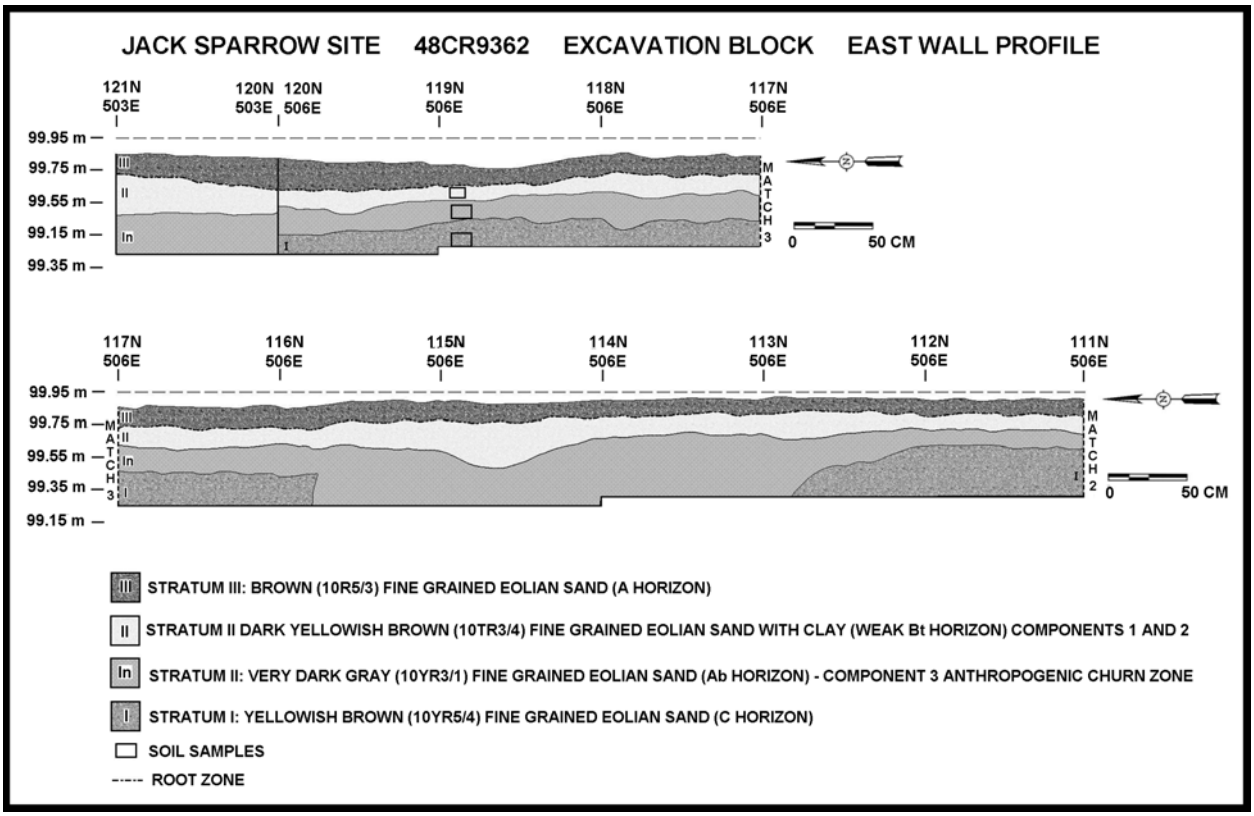

Figure 4: Stratigraphic profile of a portion of the east block wall at Jack Sparrow site (48CR9362).

7500 years B.P.) (Ahlbrandt 1974; Ahlbrandt et al. 1983; Gaylord 1982, 1990; Eckerle 1989; 1997; Forman et al. 2001; Halfen et al. 2010; Mayer and Mahan 2004; Stokes and Gaylord 1993).

Substratum Ia is predominantly intrusive and anthropogenic, representing an admixture of dark gray (10YR3/1) charcoal and organically stained sediment in Stratum I sand. It represents the cultural horizon primarily associated with the Early Archaic hunter-gatherer occupations of the site which occurred between 5440-4360 years B.P. (Component 3). The cultural horizon represents the churn zone created on the occupational surface before it was buried relatively rapidly by aggrading eolian sand. The cultural horizon within Stratum Ia represents a minimum of at least six Early Archaic hunter-gatherer occupations of the locality. It was 20-40 cm thick and, in profile, was observed to be discontinuous and undulating across the excavation block at depths of 30-60 cm bpgs.

Stratum II consisted primarily of brown (10YR4/3), massive, well-sorted, fine-grained sand derived from eolian deposition. It measured 15-25 cm in thickness and occurred between 15-40 cm bpgs. Stratum II contained a weakly developed Bt soil horizon giving it a darker hue, which became increasingly reddish brown in color when wet. The soil formed as the result of clay illuviation through the profile and surface stabilization likely associated with increased effective precipitation and vegetation growth occurring at some point after the site was abandoned, probably during the Early Late Holocene (1800-4500 B.P.). The Bt horizon is formed within the upper portion of Stratum II and directly overlies the Strata Ia and I. Although the Bt horizon was weakly developed, it is indicative of surface stabilization which occurred at some point after the primary, stratigraphically observable cultural horizon associated with Component 3 was buried by slowly aggrading sand at some point after 4360 years

B.P. The limited cultural deposits associated with Component 1 and 2 (Late Prehistoric and Late Archaic) were primarily contained within Stratum II.

Stratum III consists of brown (10YR5/3), massive, well-sorted, fine-grained sand derived from reworked eolian sand. It measured 10-15 cm in thickness and occurred between 0-15 cm bpgs. It represents the surface A soil horizon with humates caping the entire stratigraphic sequence recorded during excavation at the site. It represents an A horizon indicative of surface stabilization under vegetation. Stabilization of the sand surface resulted in the accumulation of organic material and humates in the upper portion of the profile.

The soil sequence at the Jack Sparrow site follows an A -Bt-Ab-C sequence. The surface A horizon consists of brown (10YR4/3) Tresano sandy loam and the Zeona-Ryark complex eolian sand/loamy sand. It represents the accumulation of organic material and humates associated with surface stabilization and vegetation growth. The Bt horizon formed in the upper part of Stratum II, above the Component 3 cultural horizon, and is the result of the illuviation of clay through the profile. It appears to be similar to, but less well developed as the Bt and Bt soil formation associated with moister Late Holocene environmental conditions that occurred within the region beginning after 4500 B.P. The soil occurs throughout the Wyoming Basin, and generally dates between 3000-1500 B.P. (Albanese and Frison 1995; Eckerle 1997). Similar Bt and Bt soil horizons were observed to overlie several Early Archaic housepit deposits in the region (Buenger and Goodrick n.d.). The Ab horizon represents the anthropogenically stained sediment and occupational trample zones containing organics and charcoal. The anthropogenic Ab horizon was variable in thickness, depth, and continuity across the extraction block and was primarily associated with the Early Archaic hunter-gatherer occupations of the locality. The underlying C horizon reflects a sedimentary unit relatively unmodified by soil formation and derived from eolian deposition.

COMPONENT 1

Component 1 at the Jack Sparrow site was manifested within upper portion of Stratum II (Bt horizon), but was not associated a distinct anthropogenically-stained horizon. Elevations for the cultural horizon across the excavation block were variable with the localized topography and ranged from 99.90-99.60 m. The radiocarbon data for Component 1 indicate the cultural deposit represents a single discrete hunter-gatherer occupation of the site which occurred during the Uinta phase of the Late Prehistoric period. The dated occupation was manifested as an ephemeral hunter-gatherer open camp with associated cultural materials indicative of a range of activities. The component yielded two radiocarbon age estimates of 1580 ± 30 and 1550 ± 30 years B.P. Statistical analysis of the dates showed they are statistically the same ($t = .028$; $x^2 = 3.84$; $df = 1, 2$; $p < .05$), suggesting the thermal basins were probably used during the same occupation of the site. The cultural materials associated with the Late Prehistoric occupation of the site include two thermal basins, 91 lithic reduction specimens, two stone tools, one groundstone fragment, and 78 fragmented faunal specimens.

Features

Two cultural features were recorded for Component 1 at the Jack Sparrow site. Both features consisted of hemispherical thermal basins (Feature 1 and 3). The thermal basins were probably utilized for multiple subsistence related purposes over the duration of the Component 1 hunter-gatherer occupation of the southern portion of the site. The presence of a thermally altered stone suggests one of the uses of the basin was to heat stones or incorporate heated stones for roasting floral or faunal resources within the basin. The presence of thermally altered large and small mammal remains also suggest these resources were likely processed

within or near the feature and were part of the subsistence base used by the hunter-gatherers that occupied the locality during the Late Prehistoric. The morphological characteristics, sampling results, and provenience information for features excavated at the Jack Sparrow site are summarized in Table 1.

Chipped Stone Tools

The Component 1 chipped stone tool assemblage from the Jack Sparrow site is comprised of only two biface specimens. The bifacial tools include a final biface / projectile point fragment and a blank fragment. The specimens were likely fractured during late stage manufacture and discarded thereafter. Table 2 provides a summary of chipped stone tool attributes and provenience information for tools recorded during the excavation.

Debitage

The Component 1 lithic debitage assemblage from the Jack Sparrow site consists of 91 specimens. Tertiary flakes represent the largest proportion of the assemblage at an observed frequency of 51.65%, followed by secondary flakes, which comprise 23.08% of the assemblage. Combined, tertiary flakes and secondary flakes comprise 74.73% of the debitage assemblage for Component 1. Primary flakes and shatter represent the next most prevalent lithic reduction types recorded for the assemblage at observed frequencies of 9.89% respectively. Early stage lithic reduction types including primary flakes and shatter represent 19.78% of the overall Component 1 assemblage. Finishing /maintenance flakes comprise 5.49% of the overall debitage assemblage for Component 1.

Ten general varieties of lithic raw material types are represented in the Component 1 lithic reduction assemblage. These include brown chert, tan chert, gray chert, red opaque chert, non-fossiliferous general chert, algalitic chert, ostracod chert, quartz crystal, white quartzite and red quartzite. Ostracod chert specimens were recorded at the highest observed frequency, comprising 62.64% of the total debitage assemblage. Brown chert was the second most prevalent raw material type recorded with an observed frequency of 10.99%. Tan chert and quartz crystal were observed frequencies of 5.49% each. Combined, these four raw material categories represent 84.61% of the overall lithic reduction assemblage for Component 1. The remaining less well represented raw material types recorded for Component 1 were recorded at observed frequencies ranging between 3.30% and 1.10%.

The combined debitage data indicate mid-stage lithic reduction was the primary stone-working activity conducted during the Component 1 hunter-gatherer occupation of the Jack Sparrow site. It is probable the Late Prehistoric hunter-gatherers that occupied the site curated, and transported partially reduced raw material and early-stage bifaces to the site. Ostracod chert was the dominant raw material type for the component, and was likely procured locally from the Delany Rim area located 50 mi. (80 km) west of the site, or from secondary lag deposits located closer to the site.

Groundstone

Only one groundstone specimen, consisting of a slab metate fragment derived from tan sandstone, was recovered from Component 1. The fragment was recovered *insitu* immediately next to Feature 1 in the south-central portion of the excavation block. The specimen may represent a portion of a slab metate used to process floral and other resources in association with the Feature 1 thermal basin. The specimen exhibited evidence of thermal alteration, hence it may have been fractured during use and discarded into the thermal basin, or used secondarily as stone to retain heat energy for roasting food resources in Feature 1. Table 3 provides a summary of provenience and artifact attribute information for the groundstone specimens recovered during the excavation.

Faunal Analysis

The Component 1 faunal assemblage was comprised of 78 cultural specimens. The com-

Table 1: Feature attribute summary table for features excavated at the Jack Sparrow site (48CR9362).

Feat.	Type	Elevation	Unit	L (cm)	W (cm)	D (cm)	Vol.* (L)	Area** (cm^2)	Artifacts (#)	FCR (#) (g)	Phytolith/ Starch	Date (yrs.B.P.)
1	Thermal Basin	99.71-99.41 m	105N 502-502E	72	65	30	73.84	3673.80	Flakes (0) Bone (30)	(17) (4630g)	N/A	1550±30
3	Thermal Basin	99.84-99.72 m	99-100N 505-506E	52	50	20	27.35	2041.00	Flakes (0) Bone (2)	0 (0g)	Cool Grasses No Starch	1580±30
2	Thermal Basin	99.52-99.26 m	101-102N 504-505E	75	70	26	71.79	4121.75	Flakes (1) Bone (6)	(0) (0g)	Cool Grasses No Starch	4160±30
4	Thermal Basin†	99.35-99.17 m	101-102N 499E	70	23 *70†*	18 *30†*	15.24 *77.31†*	1263.85 *3846.50†*	Flakes (0) Faunal (1)	(0) (0g)	Cool Grasses No Starch	N/A
5	Thermal Basin	99.25-99.03 m	114N 503-504E	65	60	22	45.13	3061.50	Flakes (2) Bone (23)	0 (0g)	N/A	N/A
6	Thermal Basin	99.34-99.14 m	106N 503E	84	80	20	70.69	5275.20	Flakes (0) Bone (10)	(0) (0g)	Cool Grasses No Starch	4950±30
8	Thermal Basin	99.35-99.12 m	114N 501-502E	75	70	23	63.51	4121.25	Flakes (0) Bone (14)	(0) (0g)	Cool Grasses No Starch	4360±30
9	Thermal Basin	99.20-99.05 m	117N 502E	65	55	15	28.20	2806.38	Flakes (2) Bone (4)	(1) (40g)	N/A	4930±30
10	Thermal Basin	99.25-98.98 m	109-110N 504E	88	80	27	99.97	5526.40	Flakes (0) Bone (13)	(0) (0g)	Cool Grasses Potato Tuber?	4780±30
11	Thermal Basin	99.25-99.05 m	111N 503E	75	65	20	51.28	3826.88	Flakes (0) Bone (9)	(0) (0g)	Cool Grasses No Starch	4820±30
12	Thermal Basin	99.25-99.06 m	111N 504E	65	62	19	40.27	3163.55	Flakes (0) Bone (14)	(0) (0g)	N/A	N/A
13	Thermal Basin	99.10-98.85 m	109-110N 501E	90	70	25	82.84	4945.50	Flakes (3) Bone (109)	(0) (0g)	Cool Grasses No Starch	5120±30
14	Thermal Basin†	99.10-98.60 m	110-111N 499E	80	28 *75†*	50	58.91 *157.79†*	1758.40 *4710.00†*	GS (1) Bone (16)	(0) (0g)	Cool Grasses No Starch	4830±30

15	Thermal Basin	99.10-98.90 m	110N 501-502E	67	65	20	45.81	3418.68	Flakes (3) Bone (33)	(0) (0g)	N/A	N/A
16	Thermal Basin	99.06-98.79 m	108-109N 501E	75	70	27	74.55	4121.25	Flakes (0) Bone (60)	(2) (540g)	Cool Grasses No Starch	4930±30
17	Thermal Basin†	99.10-98.77 m	118N 499E	86	45 *80†*	33	67.17 *119.41†*	3037.95 *5400.80†*	Flakes (6) Bone (64)	(4) (170g)	Cool Grasses No Starch	5020±30
HP1	Housepit†	99.20-98.43 m	113-118N 499-501E	500	225 *500†*	77	4556.04 *10124.54†*	88312.50 *196250.0†*	Flakes (125) GS (2) Bone (1145) Bone Tool (9)	(14) (1580g)	N/A	5410±30 (Testing)
1A	Subfloor HP1	98.50-97.99 m	116-117N 499E	77	33 *70†*	51	68.16 *144.58†*	1994.69 *4231.15†*	Flakes (1) Bone (82)	(0) (0g)	Cool Grasses No Starch	5440±30
HP3	Housepit†	99.10-98.63 m	103-107N 499-501E	410	165 *350†*	47	1672.28 *3547.27†*	53105.25 *112647.50†*	Flakes (29) Core (1) Bone (172)	(5) (570g)	N/A	5130±30 4950±30 (Testing)

*Volume (Liters) = ⅔ π (D)(L/2)(W/2)/1000 **Surface Area (cm^2) = π (W/2)(L/2). †Denotes feature truncated by pipeline trench and estimated intact measurement for feature. GS = Groundstone.

position of the Component 1 faunal assemblage from Jack Sparrow site is provided in Table 4. Identified taxa from Component 1 include deer/sheep/pronghorn, ground squirrel (*Spermophilis* sp.), pocket gopher (*Thomomys* sp.), cottontail (*Sylvilagus* sp.), and jackrabbit (*Lepus* sp.).

The limited faunal assemblage from Component 1 at the Jack Sparrow site suggests at least one deer/sheep/pronghorn, one cottontail rabbit, and one jackrabbit were likely processed on-site during the Late Prehistoric occupation of the site. Rabbits and rabbit-sized remains represent 23% of the cultural assemblage, while deer/sheep/pronghorn and similar large sized remains represent 13% of the assemblage. Squirrel, squirrel-sized, and mouse to rabbit-sized remains combined with the rabbit and rabbit-sized remains comprise 56% of the total faunal assemblage for Component 1. This is consistent with most of the contemporaneous interior basin sites from the Wyoming Basin which are typically associated with faunal assemblages that include greater proportions of small mammals such as jackrabbit, cottontail rabbit, various rodents, and to a lesser extent, larger mammals predominately consisting of pronghorn (Byers et al. 2005; Lubinski 2000).

COMPONENT 2

Component 2 at the Jack Sparrow site was manifested within the lower portion of the Stratum II Bt horizon and slightly above the upper portion of a diffuse anthropogenically-stained cultural horizon (Stratum Ia) associated with Component 3. The Component 2 cultural horizon was observed at elevations ranging between 99.60-99.50 m as it followed localized topographic variation across the excavation block and was not associated with an anthropogenically stained horizon in stratigraphic profile. The single radiocarbon date of 4160 ± 30 years B.P. established for Component 2 suggests the cultural deposit represents a single temporally discrete hunter-gatherer occupation of the site that occurred during the early portion

Table 2. Summary of chipped stone tool characteristics from the Jack Sparrow site (48CR9362).

Catalog #	Comp.	Location	Elev.	Tool Type	Lithic Type	Dimensions L x W x TH (mm)	Condition/ Portion	Edge Retouch/ Cross Section/ Morphology/ Comment
48CR9362-458	1	112N 504E	99.70-99.60m	Final Biface/ Projectile Point	Grey Non-fossiliferous Chert	23 x 19 x 2	Fragment/ Proximal-Medial	Bifacial All / Lenticular / Potlid fracture medial ventral edge along fracture line
48CR9362-73	1	113N 503E	99.70-99.60m	Blank	Tan Ostracod Chert	49 x 34 x 12	Fragment	Bifacial Some / Biconvex / Early stage biface with some cortex
48CR9362-12	2	110.42N 502.55E	99.55m	Core	White Quartz Crystal	86 x 65 x 51	Fragment	None / Irregular / Some cortex / Thermally altered (oxidized)
48CR9362-20	2	116.64N 503.26E	99.50m	Core	Tan Ostracod Chert	61 x 48 x 22	Exhausted	None / Irregular / Some cortex
48CR9362-60	2	104N 505E	99.60-99.50m	Tested Material	Brown Chert	43 x 32 x 21	Complete	None / Irregular / Cortex with two flakes removed
48CR9362-461	3	111.30N 502.36E	99.51m	Projectile Point	Translucent Chert	35 x 16 x 3	Nearly Complete	Bifacial All / Lenticular / Triangular, Side-notched, Elko-like, unfinished, fractured at base, similar fracture as -465
48CR9362-463	3	103N 499E	99.50-99.40m	Projectile Point	Chalcedony White Patina	16 x 19 x 4	Fragment Proximal	Bifacial All / Plano Convex / Triangular, Side-notched, Elko-like, cortex dorsal, proximal-medial fracture
48CR9362-464	3	109N 503E	99.50-99.40m	Projectile Point	Tan Ostracod Chert	41 x 21 x 4	Complete	Bifacial All / Lenticular / Triangular, Side-notched, Elko-like
48CR9362-465	3	112N 503E	99.50-99.40m	Projectile Point	Brown Chert	45 x 20 x 5	Nearly Complete	Bifacial All / Lenticular / Triangular, Side-notched, Elko-like, cortex both sides, fractured at base, similar fracture as -461
48CR9362-468	3	116.08N 501.37E	99.27m	Projectile Point	Brown Chert	40 x 18 x 4	Complete	Bifacial All / Lenticular / Triangular, Side-notched, Elko-like, cortex both sides
48CR9362-473	3	115N 500E House-pit 1	99.00-98.95m	Projectile Point	Brown Chert	7 x 18 x 4	Fragment Base	Bifacial All / Biconvex / N/A, Side-notched, far distal base fragment, lateral fracture
48CR9362-484	3	104.10N 500.13E	99.20m	Drill	Tan Ostracod Chert	72 x 27 x 9	Complete	Bifacial All / Biconvex / Triangular, Drill
48CR9362-483	3	119N 502E	99.25-99.20m	Awl	White Chert	21 x 15 x 6	Complete	Bifacial All / Biconvex / Triangular, Awl

Catalog #	Comp.	Location	Elev.	Tool Type	Lithic Type	Dimensions L x W x TH (mm)	Condition/ Portion	Edge Retouch/ Cross Section/ Morphology/ Comment
48CR9362-462	3	106N 503E	99.50-99.40m	Final Biface	Grey Chert	24 x 17 x 6	Fragment Proximal	Bifacial All / Plano Convex / Rectangular, cortex both sides, medial-distal fracture
48CR9362-467	3	114N 505E	99.40-99.35m	Final Biface	Grey Chert	24 x 21 x 6	Fragment Proximal	Bifacial All / Lenticular / Acuminate, cortex both sides, medial fracture
48CR9362-471	3	108N 501E	99.30-99.25m	Final Biface	Grey Ostracod Chert	20 x 11 x 5	Fragment Lateral	Bifacial All / N/A / N/A, Indeterminate, lateral fracture
48CR9362-470	3	119N 502E	99.25-99.20m	Biface	Translucent Chert	19 x 13 x 4	Fragment Indeterminate	None/ N/A / N/A, Indeterminate
48CR9362-266	3	112N 503E	99.30-99.25m	Blank	Grey Ostracod Chert	46 x 26 x 14	Fragment Indeterminate	Unifacial Some / Irregular / N/A, early stage biface
48CR9362-459	3	111N 501E	99.50-99.40m	Blank	Grey Ostracod Chert	54 x 30 x 10	Complete	None / Lenticular / Triangular, cortex both sides
48CR9362-460	3	110.86N 501.79E	98.52m	Blank	White Quartz Crystal	46 x 34 x 11	Complete	None / Irregular / N/A, early stage biface
48CR9362-466	3	113N 503E	99.40-99.35m	Blank	Grey Ostracod Chert	53 x 48 x 14	Fragment Medial-Distal	Some / Lenticular / N/A, lateral fracture, cortex both sides
48CR9362-472	3	105N 499E	99.25-99.20m	Blank	Grey Ostracod Chert	24 x 28 x 8	Fragment Indeterminate	Unifacial Some / Plano-Convex / N/A, cortex dorsal, early stage biface
48CR9362-103	3	108N 504E	99.50-99.40m	Core	Grey Ostracod Chert	50 x 36 x 17	Complete	None / Irregular / N/A, some cortex, exhausted core
48CR9362-226	3	102.40N 502.90E	99.30m	Core	Tan Ostracod Chert	58 x 50 x 13	Complete	None / Irregular / N/A, some cortex, chert pebble, several flakes removed
48CR9362-387	3	104.28N 499.58E House-pit 3	99.05m	Core	Grey Chert	54 x 36 x 28	Complete	None / Irregular / N/A, some cortex, exhausted core
48CR9362-130	3	102N 502E	99.50-99.40m	Tested Material	Grey Ostracod Chert	45 x 37 x 31	Complete	None / Irregular / N/A, much cortex, tested material, two flakes removed
48CR9362-208	3	111.00N 502.30E	99.30m	Tested Material	White Quartz Crystal	76 x 56 x 40	Complete	None / Irregular / N/A, much cortex, tested cobble, few flakes removed
48CR9362-301	3	117N 504E	99.24m	Tested Material	Tan Ostracod Chert	77 x 70 x 34	Complete	None / Irregular / N/A, much cortex, tested cobble, multiple flakes removed
48CR9362-469	3	113N 504E	99.30-99.25m	Utilized Flake	Tan Ostracod Chert	56 x 30 x 6	Complete	None / Irregular / N/A, some cortex, significant usewear one lateral edge

Table 3: Summary of groundstone specimens from the Jack Sparrow site (48CR9362).

Catalog #	Comp.	Location	Elevation	Type	Lithic Type	Weight (g)	Dimensions L x W x TH (mm)	Condition	Modification
48CR932-479	1	105.30N 502.17E	99.75m	Metate	Sandstone	500	150 x 114 x 19	Fragment	Ground unifactially, shaped thermally altered
48CR9362-474	3	103N 502E	99.18m	Basin Metate	Sandstone	3800	349 x 214 x 35	Complete	Ground unifacially concave, shaped, striations
48CR9362-475	3	115.46 501.20	99.17m	Mano	Granitic	198	65 x 64 x 41	Fragment	Ground, thermally altered, indeterminate mano fragment
48CR9362-476	3	105N 501E	99.43m	Indet.	Sandstone	392	102 x 79 x 27	Fragment	Ground unifacially, shaped, indeterminate fragment
48CR9362-477	3	115.52 500.55	99.10	Mano	Granitic	287	76 x 73 x 44	Fragment	Ground unifactially, shaped thermally altered
48CR9362-478	3	117N 500E House-pit 1	98.67m	Metate	Sandstone	906	122 x 109 x 38	Fragment	Ground bifacially, shaped
48CR9362-480	3	111.16 503.68	99.37m	Mano	Granitic	409	66 x 87 x 49	Fragment	Ground bifacially, shaped, thermally altered
48CR9362-481	3	117N 500E	99.00-98.90m	Metate	Sandstone	1600	182 x 160 x 82	Fragment	Ground unifacially, shaped, fragmented into three pieces
48CR9362-482	3	104N 501E	99.50-99.40m	Mano	Granitic	55	36 x 48 x 24	Fragment	Ground, polish, shaped, thermally altered
48CR9362-502	3	E. Trench Wall	95.5 cm bpgs	Mano	Sandstone	647	93 x 87 x 54	Complete	Ground bifacially, shaped, pecked, striations, battering, polish, thermally altered
48CR9362-503	3	110.87 499.84 Feature 14	99.02m	Metate	Sandstone	1000	190 x 275 x 36	Fragment	Ground unifacially, shaped, pecked, striations, battering, polish, flaked, thermally altered Pollen wash: possible grass seed (Poaceae) grinding

Table 4. Summary of Component 1 faunal remains from the Jack Sparrow site (48CR9362).

Order	Taxon	Common Name	All Remains		Cultural[1]	
			NISP	MNI	NISP	MNI
Class Mammalia (mammals)						
Artiodactyla	D/S/P	Deer, sheep, or pronghorn	1	1	1	1
Rodentia	*Spermophilus* sp.	Ground squirrel	2	1	2	1
	Thomomys sp.	Pocket gopher	2	1	--	--
Lagomorpha	*Sylvilagus* sp.	Cottontail rabbit	1	1	1	1
	Lepus sp.	Jackrabbit	2	1	2	1
Unknown	Size Class II	Squirrel-sized	9	--	9	--
	Size Class III	Rabbit-sized	15	--	15	--
	Size Class I-III	Mouse to rabbit-sized	15	--	15	--
	Size Class IV	Coyote-sized	1	--	1	--
	Size Class V	Deer-sized	6	--	6	--
	Size Class IV-VI	Coyote to bison-sized	1	--	1	--
	Size Class V-VI	Deer to bison-sized	2	--	2	--
	Unidentified	Unidentified mammal	22	--	22	--
Total Identified to Class			79	5	75	--
Unidentified			1	--	1	--
Total			**80**	**5**	**78**	**4**

[1] Excludes most complete specimens from Size Class I-II taxa, taxa with skeletal completeness, and specimens with digestive or carnivore modification (see text for explanation).

Pine Spring phase of the Late Archaic period. The occupation was manifested as an ephemeral hunter-gatherer open camp with limited associated cultural material. The cultural materials associated with the Component 2 Late Archaic occupation of the site include one thermal basin, two cores, one tested cobble, 70 lithic reduction specimens, and 59 fragmented faunal specimens.

Features

One cultural feature (Feature 2) consisting of hemispherical thermal basin was recorded for Component 2 at the Jack Sparrow site. The thermal basin was probably utilized to roast faunal resources (rabbit) and other subsistence related purposes over the duration of the short-term Component 2 hunter-gatherer occupation of the southeastern portion of the site. See Table 1 for the morphological characteristics, sampling results, and provenience information for the Component 2.

Cores / Tested Material

Two cores and one tested material specimen were recovered during the excavation of Component 2 at the Jack Sparrow site. See Table 2 for a summary of chipped stone artifact attributes and provenience information for the Component 2 assemblage.

Debitage

The Component 2 lithic reduction assemblage from the Jack Sparrow site consists of 70 specimens. The limited quantity of lithic reduction material recovered from Component 2 precludes any substantive analysis of stone working activity during the Late Archaic hunter-gatherer occupation of the site. Tertiary flakes and secondary flakes comprise the majority of the debitage assemblage at observed frequencies of 52.86% and 27.14% respectively. Combined, these two lithic reduction type categories represent 80.00% of the total debitage assemblage for Component 2. Primary flakes

represent 8.57% of the overall debitage assemblage for the component. Shatter and finishing/maintenance flakes were both recorded at an observed frequency of 5.71%. No other flake types were recorded for the Component 2 debitage assemblage.

In total, seven general varieties of lithic raw material types are represented in the Component 2 lithic reduction assemblage. Recorded raw material types include brown chert, gray chert, red opaque chert, chalcedony, ostracod chert, quartz crystal, and white quartzite. Ostracod chert specimens dominate the assemblage and were recorded at the highest observed frequency, comprising 82.86% of the total debitage assemblage. Brown chert and gray chert were the next most prevalent raw material types, but were recorded at appreciably more distant observed frequencies of 4.29% each. White quartzite and quartz crystal were recorded at observed frequencies of 2.86% each. Red opaque chert and chalcedony were the least prevalent raw material types with both being recorded at an observed frequency of 1.43%.

The limited debitage data indicate mid-stage lithic reduction was the primary stone-working activity conducted during the Component 2 Late Archaic hunter-gatherer occupation of the Jack Sparrow site. Ostracod chert was the dominant raw material type represented in the debitage assemblage. It is probable hunter-gatherers transported locally procured ostracod chert to the site where additional reduction, bifacial thinning and tool production activities may have been performed. The ostracod chert may have been procured from the Delany Rim area located west of the site or from more proximate secondary lag sources located near the site.

Faunal Analysis

The Component 2 faunal assemblage is comprised of 59 cultural specimens. The composition of the Component 2 faunal assemblage from Jack Sparrow site is summarized in Table 5. Identified taxa from Component 2 include pronghorn (*Antilocapra americana*), deer/sheep/pronghorn, ground squirrel (*Spermophilus* sp.), pocket gopher (*Thomomys* sp.), vole (Subfamily Arvicolinae), jackrabbit (*Lepus* sp.), and lizard (Order Squamata).

Overall, the limited faunal assemblage from Component 2 suggests at least one pronghorn and one jackrabbit were likely processed on site during the Late Archaic occupation of the site. Rabbits and rabbit-sized remains 54% of the cultural assemblage, while deer/sheep/pronghorn and similar sized remains represent 10% of the assemblage. Again, this is consistent with most of the contemporaneous interior basin sites from the Wyoming Basin which are typically associated with faunal assemblages that include larger proportions of small mammals such as jack rabbit, cottontail rabbit, various rodents, and to a lesser extent, larger mammals predominately consisting of pronghorn (Byers et al 2005; Lubinski 2000).

COMPONENT 3

Component 3 at the Jack Sparrow site was manifested as a 20-30 cm thick cultural horizon with diffuse and discontinuous linear anthropogenic staining contained within eolian sand (Stratum Ia). Elevations for the cultural horizon across the excavation block were variable with the localized topography and ranged from 99.40-99.10 m. The radiocarbon data for Component 3 indicate the cultural deposit represents at least six temporally distinct hunter-gatherer occupations of the site that occurred the Opal phase of the Early Archaic period. However, additional undated occupations may also be represented within the component. The majority of archaeological materials recovered during the excavation at the Jack Sparrow site are associated with the use of the locality by Early Archaic hunter-gatherers. Several of the occupations were manifested as ephemeral hunter-gatherer open camps, but two housepit occupations were also recorded during the excavation. Component 3 is represented by eleven conventional radiocarbon age estimates ranging

Table 5: Summary of Component 2 faunal remains from the Jack Sparrow site (48CR9362).

Order	Taxon	Common Name	All Remains		Cultural[1]	
			NISP	MNI	NISP	MNI
Class Mammalia (mammals)						
Artiodactyla	*Antilocapra americana*	Pronghorn	2	1	2	1
	D/S/P	Deer, sheep, or pronghorn	1	1	1	1
Rodentia	*Spermophilus* sp.	Ground squirrel	1	1	1	1
	Thomomys sp.	Pocket gopher	1	1	1	1
	Subfamily Arvicolinae	Unidentified Vole	1	1	1	1
Lagomorpha	*Lepus* sp.	Jackrabbit	3	1	3	1
Unknown	Size Class I-II	Mouse to squirrel-sized	2	--	2	--
	Size Class III	Rabbit-sized	29	--	29	--
	Size Class I-III	Mouse to rabbit-sized	15	--	15	--
	Size Class V	Deer-sized	2	--	2	--
	Size Class V-VI	Deer to bison-sized	1	--	1	--
	Unidentified	Unidentified mammal	1	--	1	--
Class Reptilia (reptiles)						
Squamata	Unidentified lizard	Lizard	1	1	--	--
		Total Identified to Class	60	7	59	6
		Total	**60**	**7**	**59**	**6**

[1] Excludes complete specimens from Size Class I-II taxa, taxa with skeletal completeness, and specimens with digestive or carnivore modification (see text for explanation).

between of 5440 ± 30 and 4360 ± 30 years B.P. These include conventional radiocarbon dates of 5440 ± 30, 5130 ± 30, 5120 ± 30, 5020 ± 30, 4950 ± 30, 4930 ± 30, 4930 ± 30, 4830 ± 30, 4820 ± 30, 4780 ± 30, and 4360± 30 years B.P. The material correlates associated with the Early Archaic occupations of the site include two truncated housepit features, one truncated internal subfloor thermal basin, 13 thermal basins, 641 lithic reduction specimens, 24 stone tools, 10 groundstone specimens, 11 bone tool/artifact specimens, and 2520 fragmented faunal specimens.

Features

Sixteen cultural features were recorded for Component 3at the Jack Sparrow site. These consisted of two truncated housepit features, one truncated subfloor thermal basin within a housepit, and 13 thermal basins. Based on the presence of thermally altered bone recovered from some of the thermal basins, many were probably utilized to process faunal material over the duration of each of the respective Component 3 hunter-gatherer occupations of the site. No direct evidence of floral resource processing was recorded for any of the thermal basins; however, this does not preclude the possibility some of the features were used for this purpose. Based on spatial proximity and statistical similarity of radiocarbon dates, some of the thermal basins may have been used concurrently during the same open camp occupation of the site. These include: Features 5 and 8; Features 6, 9, and 16; Features 10, 11, 12, and 14; and Feature 13 and 15. See Table 1 for the morphological characteristics, sampling results, and provenience information for the Component 3 features.

The housepits were likely used as short-term residential structures by small groups of hunter-gatherers. Activities conducted within at least one of the structures included the processing of jackrabbit, pronghorn, and possibly deer and bison faunal resources. In addition, mid to late stage stone working, bone bead manufacture, potential hide working, and a range of other potential subsistence and domestic activities were probably conducted during the occupations of the housepit structures. Direct evidence of floral resource processing was not recorded for the housepits. However, this does not preclude the possibility it occurred in association with the occupations of the housepits. The structures were likely utilized as a sheltered residential base from which to conduct a range of hunter-gatherer activities during a portion of the cold/low biomass season (fall to spring), and potentially on more than one occasion over multiple seasons or longer durations of time.

Housepits

Housepit 1 represents a housepit substructure whih contained one associated internal subfloor thermal basin (Feature 1A). The western portion of Housepit 1 was truncated during the construction of the pipeline trench, impacting around 55% of the housepit substructure. Pipeline trench construction also truncated about 30% of Feature 1A, the subfloor thermal basin located within the housepit substructure (Figure 5). The extant eastern portions of the housepit and subfloor thermal basin were exposed in profile in the eastern vertical wall of the pipeline trench. There were probably other additional subfloor thermal basins located with the western portion of the housepit substructure, since Wyoming housepits from the Archaic typically have an average of three subfloor features (Buenger and Goodrick n.d.).

The overall dimensions of the extant portion of the housepit measured 500 cm L x 225 cm W x 77 cm D with a corresponding volume of around 4556.04 L and surface area of 88312.50 cm^2 (Figure 3). The estimated dimensions of the intact housepit are 500 cm L x 500 cm W x 77 cm D with an estimated volume of 10124.54 L and surface area of 196250.0 cm^2. The housepit substructure was excavated into Stratum I. No evidence of posthole molds or a superstructure was observed during excavation of the housepit. Post-occupationally, the housepit was filled with Stratum Ia sediment, consisting of an admixture of post-occupation eolian sand interspersed with organics associated with the cultural occupation(s) of the housepit structure. No discrete evidence of stratified cultural lenses or distinct soil horizons indicative of multiple, temporally punctuated cultural occupations of the structure was observed during excavation of the housepit. Radiocarbon analysis of sample collected from the lower fill within the exposed profile of Housepit 1during the post-discovery documentation phase of the project yielded a conventional date of 5410 ± 40 B.P. Radiocarbon analysis of Housepit 1 fill sediment was not conducted during excavation. However, charcoal collected from Feature 1A fill sediment yielded a conventional radiocarbon age estimate of 5440±30 B.P. The 5410 ± 40 date from Housepit 1 and the 5440 ± 30 from Feature 1A were shown to be statistically the same (t = 0.36; x^2 = 3.84; df = 1, 2; $p < .05$), and not indicative of temporally punctuated occupations. The Housepit 1 occupation was the oldest Component 3 hunter-gatherer occupation of the site recorded during the excavation at the Jack Sparrow site.

Cultural materials recovered from the Housepit 1 housepit during excavation included 125 lithic reduction flakes, one stone tool, one groundstone specimen, nine modified bone artifacts, and 1140 faunal specimens. In addition, 14 thermally altered stone fragments weighing 1580g were recovered from Housepit 1 during excavation. The stone tool specimen consisted of the extreme proximal base portion of projectile point. It was recovered from the central portion of the housepit substructure within the upper portion of the fill sediment

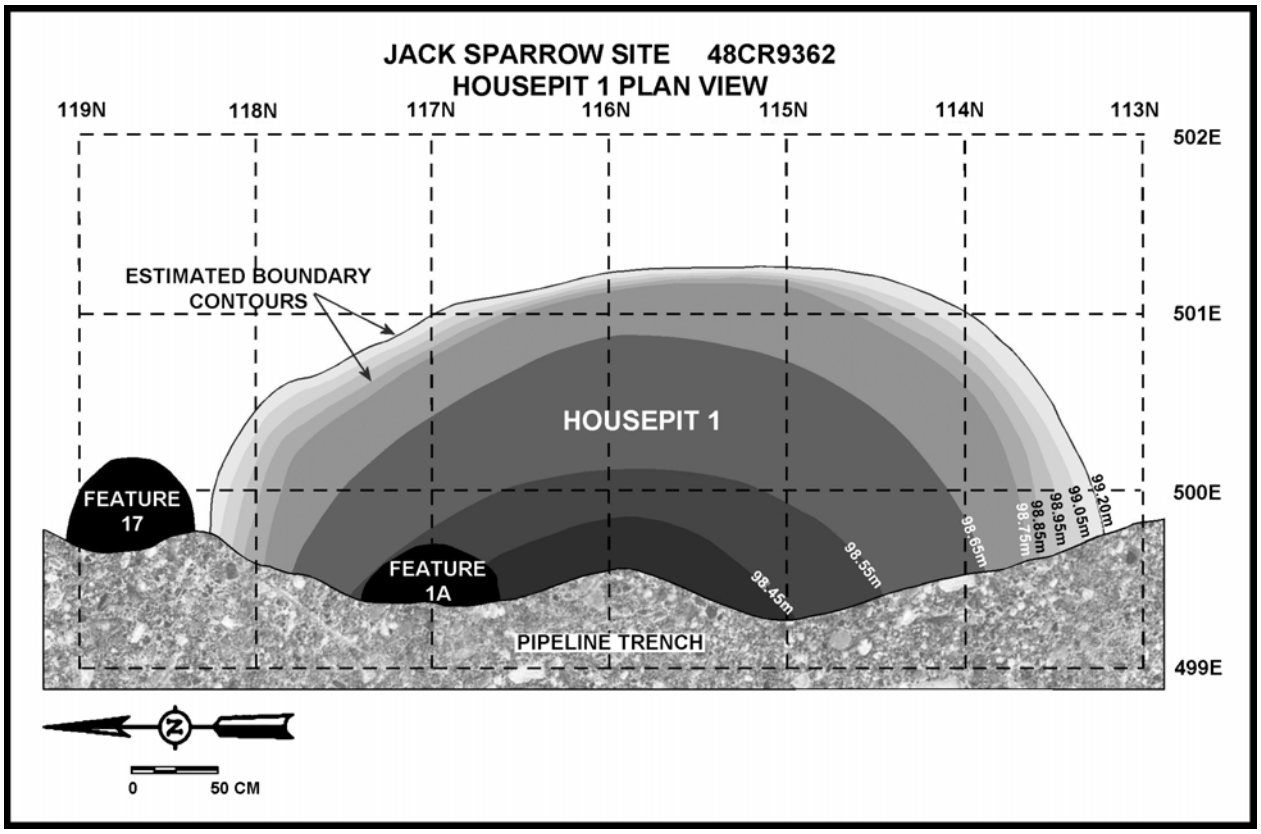

Figure 5: Planview map of Housepit 1 (Component 3) from Jack Sparrow site (48CR9362).

associated with Housepit 1. Since the specimen was recovered from the upper fill of the housepit substructure it cannot be considered to be directly associated with the hunter-gatherer occupation(s) of Housepit 1. The groundstone specimen consisted of a small metate fragment derived from tan sandstone. The metate fragment was recovered from the north central portion of the Housepit 1, near Feature 1A.

Tertiary and secondary flakes comprised the majority of the debitage assemblage and were recorded at observed frequencies of 40.80% and 22.40% respectively. Combined, these two lithic reduction type categories represent 63.20% of the total debitage assemblage recovered from Housepit 1. Finishing/maintenance flakes and shatter respectively represent 12.00% and 11.20% of the total debitage recovered from the housepit. These two debitage types account for 23.20% of the Housepit 1 debitage assemblage. Blades, bifacial thinning flakes without cortex, flake fragments without cortex, and primary flakes combined represent only 13.60% of the total debitage assemblage from Housepit 1, with observed frequencies ranging between 4.00% and .080%. No other flake types were recorded for Housepit 1.

In total, ten general varieties of lithic raw material types are represented in the Housepit 1 lithic debitage assemblage. Recorded raw material types include brown chert, tan chert, gray chert, red opaque chert, general chert, algalitic chert, ostracod chert, quartz crystal, white quartzite, and red quartzite. Ostracod chert specimens dominate the assemblage and were recorded at the highest observed frequency, comprising 60.80% of the total debitage assemblage. Quartz crystal was the next most prevalent raw material type, but was recorded at an appreciably lower observed frequency of 11.40%. Red opaque chert and algalitic chert were recorded at observed frequencies of 5.60%

each. Tan chert, gray chert, general chert, white quartzite and red quartzite were recorded at low observed frequencies ranging from 2.40% to 0.80%.

Overall, the debitage data indicate mid-stage lithic reduction and potentially stone tool manufacturing/maintenance were the primary stone-working activity conducted during the Early Archaic hunter-gatherer occupation(s) of the Housepit 1. Ostracod chert was the dominant raw material type for the housepit debitage assemblage. Ostracod chert was likely procured locally from the Delany Rim area, or from localized secondary lag deposits near the site.

n total, 1,140 cultural faunal specimens were recovered from Housepit 1. Identified taxa recorded from the housepit included pronghorn (*Antilocapra americana*), jackrabbit (*Lepus* sp.), ground squirrel (*Spermophilus* sp.), pocket gopher (*Thomomys* sp.), and vole (*Microtus sp.*). In addition, nine modified bone artifacts were recovered from the housepit. The faunal assemblage from Housepit 1 is summarized in Table 6.

Two specimens were identified as pronghorn and an additional six specimens were identified as deer, sheep, or pronghorn (two with cutmarks; two green bone fractured). Another 62 specimens identified as mammal Size Class V (deer-sized) likely represent artiodactyl remains as well (eight thermally altered; three green bone fractured). A single longbone shaft flake was identified as mammal Size Class VI (bison-sized). An additional 240 specimens were identified as mammal Size Class V-VI (deer to bison-sized) and likely represent artiodactyls also (one thermally altered). Another 30 specimens that also likely represent artiodactyls were identified as mammal Size Class IV-VI (dog to bison-sized) (1 thermally altered).

Lagomorphs were represented by 67 specimens identified as jackrabbit (three with cutmarks; 11 thermally altered; six green bone fractured). These specimens represent a minimum of five individual jackrabbits based on right tibia counts. An additional 441 specimens (76 thermally altered; seven green bone fractured) were identified as mammal Size Class III (rabbit-sized) and likely represent jackrabbits as well. In addition, 165 specimens (23 thermally altered) were identified as mammal Size Class I-III (mouse to rabbit-sized). One ground squirrel specimen exhibited evidence of thermal alteration, the others are considered to be intrusive.

Housepit 3 consisted of a housepit substructure truncated during the construction of the pipeline trench. Pipeline construction impacted about 55% of the western side of the housepit substructure (Figure 6). The eastern portion of Housepit 3 was exposed in profile in the eastern vertical wall of the pipeline trench. No internal subfloor thermal basins were recorded in the extant portion of Housepit 3. Since Archaic period Wyoming housepits typically have an average of around three subfloor features, there may have been 2-3 subfloor thermal basins located with the western portion of the Housepit 3 substructure, (Buenger and Goodrick n.d.).

The overall dimensions of the extant portion of Housepit 3 measured 410 cm L x 165 cm W x 47 cm D with a corresponding volume of 1672.28 L and surface area of 53105.25 cm^2 (Figure 4). The estimated dimensions of the intact housepit are 410 cm L x 350 cm W x 47 cm D with an estimated volume of 3547.27 L and surface area of 112647.50 cm^2. The upper portion of the housepit substructure was located near the lower margin of Stratum Ia the majority of the substructure was excavated into Stratum I. No evidence of posthole molds or a superstructure was observed during excavation of the housepit. Post-occupationally, the housepit was filled with Stratum Ia sediment, consisting of an admixture of post-occupation eolian sand interspersed with organics associated with the cultural occupation(s) of the housepit structure. No discrete evidence of stratified cultural lenses or distinct soil horizons indicative of multiple, temporally punctuated cultural occupations of

Table 6: Summary of Housepit 1 faunal remains from the Jack Sparrow site (48CR9362).

Order	Taxon	Common Name	All Remains		Cultural[1]	
		NISP	MNI	NISP	MNI	
Class Mammalia (mammals)						
Artiodactyla	*Antilocapra americana*	Pronghorn	2	1	2	1
	D/S/P	Deer, sheep, or pronghorn	6	--	6	--
Rodentia	*Spermophilus* sp.	Ground squirrel	7	1	7	1
	Thomomys sp.	Pocket gopher	1	1	1	1
	Microtus sp.	Small-eared vole	2	1	2	1
	Subfamily Arvicolinae	Unidentified vole	1	--	--	--
Lagomorpha	*Lepus* sp.	Jackrabbit	67	5	67	5
Unknown	Size Class I	Mouse-sized	1	--	--	--
	Size Class II	Squirrel-sized	3	--	3	--
	Size Class I-II	Mouse to squirrel-sized	2	--	2	--
	Size Class III	Rabbit-sized	441	--	440	--
	Size Class I-III	Mouse to rabbit-sized	167	--	167	--
	Size Class V	Deer-sized	62	--	62	--
	Size Class IV-VI	Coyote to bison-sized	30	--	30	--
	Size Class V-VI	Deer to bison-sized	240	--	240	--
	Size Class VI	Bison-sized	1	--	1	--
	Unidentified	Unidentified mammal	108	--	108	--
Class Aves (birds)						
Passeriform	Unidentified		1	1	--	--
		Total Identified to Class	1,142	10	1,137	9
		Unidentified	3	--	3	--
		Total	**1,145**	**10**	**1,140**	**9**

[1] Excludes complete specimens from Size Class I-II taxa, taxa with skeletal completeness, and specimens with digestive or carnivore modification (see text for explanation).

the structure was observed during excavation of the housepit.

Two radiocarbon age estimates of 5130±30 B.P. and 4950±30 B.P were obtained for Housepit 3. The 4950±30 date was derived from a sample taken from the middle fill of the exposed profile of Housepit 3 during the post-discovery documentation phase of the project. The 5130 ± 30 date was obtained from a sample collected from the lower fill sediment of during the excavation project. The two dates from Housepit 3 were shown to be statistically different ($t = 12.96$; $x^2 = 3.84$; $df = 1, 2$; $p < .05$). This is most likely due to presence of younger, intrusive post-occupational fill sediment in the middle portion of the profile where the first sample was taken, and is not considered to be indicative of multiple, temporally punctuated occupations of the structure. The radiocarbon data also indicate the occupations of Housepit 1 and Housepit 3 do not overlap temporally since the dates obtained for the two housepits are separated by 280 radiocarbon years.

Cultural materials recovered from Housepit 3 during excavation included 29 lithic reduction flakes, one core, one modified bone artifact, and 158 cultural faunal specimens. In addition, five thermally altered stone fragments weigh-

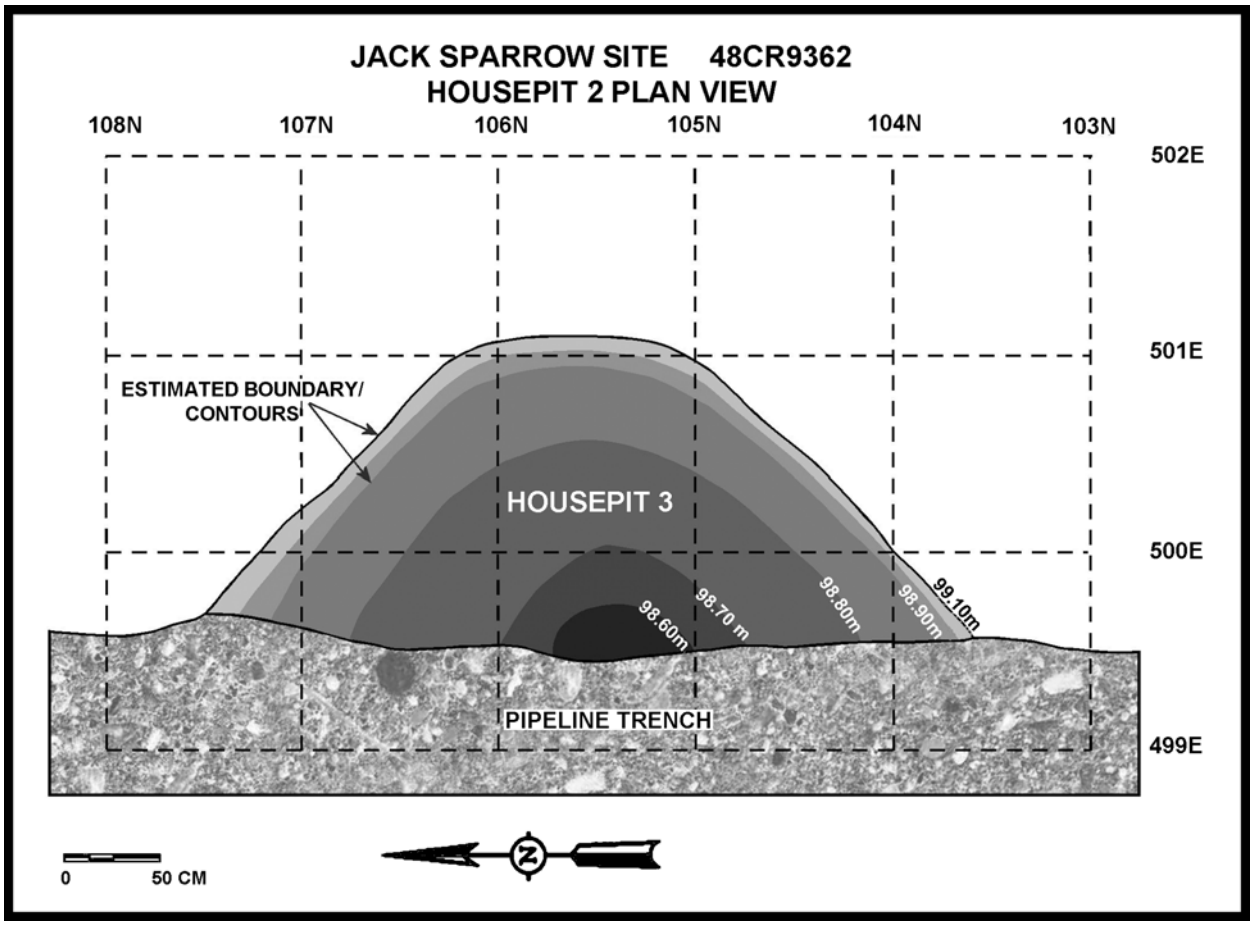

Figure 6: Planview map of Housepit 3 (Component 3) from Jack Sparrow site (48CR9362).

ing 570g were recovered from the housepit substructure during excavation.

The paucity of lithic debitage recovered from the housepit precludes substantive analysis. The debitage was comprised of 10 (34.48%) tertiary flakes, six (20.69%) secondary flakes, four (13.79%) pieces of shatter, two (6.90%) flake fragments without cortex, two (6.90%) flake fragments cortex, two (6.90%) bifacial thinning flakes without cortex, two (6.90%) finishing/maintenance flakes, and one (3.45%) blade. Raw material types represented in the assemblage consisted of 55.17% ostracod chert, 20.69% quartz crystal, 10.34% white quartzite, 6.90% chalcedony, 3.45% brown chert, and 3.45% tan chert. Overall, the limited lithic debitage assemblage from Housepit 3 suggests the ostracod chert was the dominant raw material type and mid to later stage lithic reduction were likely the primary types of stone working activities conducted in association with the occupation of Housepit 3. The core specimen recovered from Housepit 3 consisted of an exhausted core derived from gray chert. It was recovered *insitu* in the far south-central portion of the housepit substructure. No lithic reduction flakes derived from gray chert were recovered from Housepit 3.

The 158 cultural faunal remains recovered from Housepit 3 are summarized in Table 7. Identified taxa included ground squirrel (*Spermophilus* sp.), pocket gopher (*Thomomys* sp.), vole (Subfamily Arvicolinae), and jackrabbit (*Lepus* sp.). Artiodactyls are represented by three specimens, and a single specimen was identified as mammal Size Class V (deer-sized). In addition, an unknown fragment from was identified as mammal Size Class V-VI (deer to

bison-sized) and another unknown fragment was identified as mammal Size Class IV-VI (dog to bison-sized).

Lagomorph remains were represented by four specimens identified as jackrabbit (one thermally altered; one green bone fractured). An additional 75 mammal Size Class III (rabbit-sized) specimens include 59 longbone shaft flakes (24 thermally altered; three green bone fractured), and 16 fragments from unknown elements (eight thermally altered). Another 68 mammal Size Class I-III (vole to rabbit-sized) specimens likely represent rodents or lagomorphs. They include three longbone shaft flakes and 66 fragments from unknown elements (six thermally altered).

Chipped Stone Tools

The Component 3 chipped stone tool assemblage from the Jack Sparrow site is comprised of 24 specimens. Bifacial tools include six projectile points and point fragments, three final biface fragments, one biface fragment, and five bifacial blanks and fragments. In addition, one drill and one stone awl are represented in the assemblage. Cores and tested material are represented by six specimens. Flake tools consisted of only a single utilized flake specimen. See Table 2 for a summary of chipped stone tool attributes and provenience information for the Component 3 assemblage. Five of the projectile point specimens exhibited morphological attributes consistent with the Elko type, which has a wide ranging distribution across the Great Basin and Rocky Mountain West. Digital images of selected projectile point specimens and the drill specimen are provided in Figure 7.

Bone Tools / Modified Bone Artifacts

Eleven modified bone artifacts were recovered from the Jack Sparrow site during the excavation project. Table 8 provides a summary of the Component 3 bone tool and modified bone artifact attributes and provenience information. Nine of the modified bone artifacts were recovered from Housepit 1, two of which were recovered from within Feature 1A. The modified bone artifacts recovered from Housepit

Table 7: Summary of Housepit 3 faunal remains from the Jack Sparrow site (48CR9362).

Order	Taxon	Common Name	All Remains		Cultural[1]	
			NISP	MNI	NISP	MNI
Class Mammalia (mammals)						
Rodentia	*Spermophilus* sp.	Ground squirrel	1	1	--	--
	Thomomys sp.	Pocket gopher	1	1	1	1
	Subfamily Arvicolinae	Unidentified Vole	3	1	3	1
Lagomorpha	*Lepus* sp.	Jackrabbit	4	1	4	1
Unknown	Size Class I	Mouse-sized	2	--	2	--
	Size Class II	Squirrel-sized	6	--	5	--
	Size Class I-II	Mouse to squirrel-sized	3	--	--	----
	Size Class III	Rabbit-sized	75	--	75	--
	Size Class I-III	Mouse to rabbit-sized	68	--	59	--
	Size Class V	Deer-sized	1	--	1	--
	Size Class IV-VI	Coyote to bison-sized	1	--	1	--
	Size Class V-VI	Deer to bison-sized	1	--	1	--
	Unidentified	Unidentified mammal	4	--	4	--
		Total Identified to Class	170	4	156	3
		Unidentified	2	--	2	--
		Total	**172**	**4**	**158**	**3**

[1] Excludes complete specimens from Size Class I-II taxa, taxa with skeletal completeness, and specimens with digestive or carnivore modification (see text for explanation).

1 include two bone awl shaft fragments, one bone awl/needle tip fragment, one bone bead fragment, and five pieces of bone bead production debris.

One modified bone artifact was also recovered from Housepit 3 during excavation. It consisted of a thermally altered large mammal longbone shaft flake interpreted to represent a possible needle fragment. In addition, a bone bead fragment was recovered from the central part of the excavation block, about one m east of Feature 13 (5120±30 B.P.), Feature 15 (no date), and Feature 16 (4930±30). Based on the stratigraphic position of the bone bead fragment it is likely associated with the use of one of these features at some point between 4930-5129 years B.P. The specimen was derived from a rabbit-sized long bone shaft fragment.

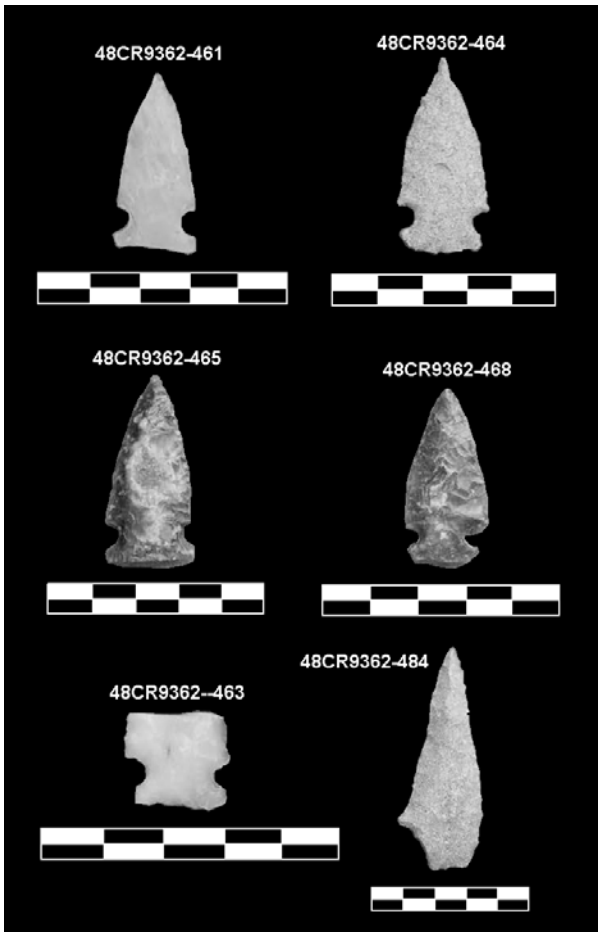

Figure 7: Selected projectile point specimens and drill specimen from Component 3 at Jack Sparrow site (48CR9362).

Debitage

The Component 3 lithic debitage assemblage from the Jack Sparrow site consists of 641 specimens. Tertiary flakes constitute the largest proportion of the assemblage at an observed frequency of 44.93%, followed by secondary flakes, which comprise 21.06% of the assemblage. Combined, these two debitage types comprise 65.99% of the total debitage recorded for Component 3. Shatter specimens represent the third most prevalent lithic reduction type recorded for the assemblage at an observed frequency of 10.76%. Finishing/maintenance flakes comprise 7.49% of the overall debitage assemblage for Component 3. Blades were recorded at an observed frequency of 6.24%, and primary flakes were recorded at an observed frequency of 4.52%. Flake fragments without cortex and flake fragments with cortex comprise 2.34% and 1.09% of the total assemblage respectively. Bifacial thinning flakes without cortex were recorded at an observed frequency of only 1.56%. Combined, middle and later stage lithic reduction types including finishing/maintenance flakes, bifacial thinning flakes without cortex, blades, tertiary flakes, and secondary flakes comprise 79.56% of the total Component 3 assemblage. Early stage lithic reduction types including primary flakes and flake fragments with cortex represent only 7.33% of the overall Component 3 assemblage.

In total, twelve general varieties of lithic raw material types are represented in the Component 3 lithic debitage assemblage. Recorded raw material types include brown chert, tan chert, gray chert 1, grey chert 2, red opaque chert, general chert, oolitic chert, ostracod chert, quartz crystal, white quartzite, red quartzite, and brown quartzite. Ostracod chert was the most dominant raw material type represented for Component 3, comprising 57.41% of the total debitage assemblage. Quartz crystal was the next most prevalent raw material type, but was recorded at an appreciably lower observed frequency of 18.56%. Brown chert was third most

Table 8: Summary of Component 3 faunal remains from the Jack Sparrow site (48CR9362).

Order	Taxon	Common Name	All Remains		Cultural[1]	
			NISP	MNI	NISP	MNI
Class Mammalia (mammals)						
Carnivora	*Mustela* sp.	Weasel/ferret/mink	1	1	1	1
Artiodactyla	*Odocoileus* sp.	Deer	1	1	1	1
	Antilocapra americana	Pronghorn	5	1	5	1
	D/S/P	Deer, sheep, or pronghorn	12	--	12	--
	Bos/Bison sp.	Domestic cattle or Bison	1	1	1	1
Rodentia	*Tamias* sp.	Chipmunk	30	3	--	--
	Spermophilus sp.	Ground squirrel	27	3	24	3
	Cynomys sp.	Prairie dog	3	1	3	1
	Thomomys sp.	Pocket gopher	7	2	4	1
	Microtus sp.	Small-eared vole	2	--	2	--
	Subfamily Arvicolinae	Unidentified vole	6	2	6	2
Lagomorpha	*Sylvilagus* sp.	Cottontail	1	1	--	--
	Lepus sp.	Jackrabbit	115	7	112	7
	Family Leporidae	Rabbits and Hares	1	--	1	--
Unknown	Size Class I	Mouse-sized	11	--	10	--
	Size Class II	Squirrel-sized	30	--	27	--
	Size Class I-II	Mouse to squirrel-sized	5	--	2	----
	Size Class III	Rabbit-sized	880	--	876	--
	Size Class I-III	Mouse to rabbit-sized	642	--	621	--
	Size Class V	Deer-sized	212	--	212	--
	Size Class IV-VI	Coyote to bison-sized	50	--	50	--
	Size Class V-VI	Deer to bison-sized	329	--	329	--
	Size Class VI	Bison-sized	4	--	4	--
	Unidentified	Unidentified mammal	209	--	208	--
Class Aves (birds)						
Galliform	Family Phasianidae	Unidentified grouse	1	1	1	1
Passeriform	Unidentified		2	1	1	1
Unidentified	Unidentified	Unidentified bird	4	--	4	--
Class Amphibia (amphibians)						
Anura	*Unidentified*	Frog or Toad	1	1	--	--
		Total Identified to Class	2592	25	2,511	18
		Unidentified	9	--	9	--
		Total	**2601**	**25**	**2,520**	**18**

[1] Excludes complete specimens from Size Class I-II taxa, taxa with skeletal completeness, and specimens with digestive or carnivore modification (see text for explanation).

prevalent material type, albeit at a relatively low observed frequency of 7.80%. Chalcedony and white quartzite were recorded at observed frequencies of 3.90% each. Grey chert 2 comprised only 3.43% of the debitage assemblage for the component, and tan chert was recorded at an observed frequency of 2.18%. Gray chert 1, red opaque chert, oolitic chert, brown quartzite and red quartzite were recorded at low observed frequencies ranging from 0.16% to 0.47%.

The combined debitage data indicate mid to later stage lithic reduction activities, and to a

lesser extent, final-stage tool manufacture and re-tooling were the primary stone-working activities conducted during the multiple Early Archaic hunter-gatherer occupations represented within Component 3 at the Jack Sparrow site. Ostracod chert was the dominant raw material type for the Component 3 debitage assemblage, which was likely procured locally from the Delany Rim area located 50 mi. (80 km) west of the site, or from secondary lag deposits located closer to the site. Other less well represented raw material types were also likely procured locally from secondary deposits.

Groundstone

Ten groundstone specimens were recovered from Component 3 during the excavation at the Jack Sparrow site. These include a complete metate, a complete mano, four mano fragments, three metate fragments, and one indeterminate fragment. See Table 3 for a summary of provenience and artifact attribute information for the groundstone specimens recovered from Component 3. Specimen 48CR932-503 represents a slab metate fragment derived from tan sandstone recovered *insitu* within Feature 14. It may have been fractured during use and discarded into the thermal basin at some point thereafter. The original intact specimen was likely utilized to process floral and other resources in association with Feature 14 during an Early Archaic hunter-gatherer occupation of the site dating to 4830 B.P. The pollen wash sample conducted for the specimen yielded a pollen record dominated by *Artemisia* pollen, followed by Poaceae and High-spine Asteraceae pollen as sub-dominants. Recovery of the elevated Poaceae pollen frequency may suggests the use of the metate for grinding grass seeds, or alternatively, the presence of a large quantity of Poaceae pollen in the Feature 14 fill sediment.

Faunal Analysis

The Component 3 faunal assemblage is comprised of 2520 cultural specimens, representing >90% of the total faunal remains recovered from the site during the excavation project. The Component 3 faunal assemblage from Jack Sparrow site is summarized in Table 9. Identified taxa from the Component 3 faunal assemblage included deer (*Odocoileus* sp.), pronghorn (*Antilocapra americana*), deer/ sheep/pronghorn (DSP), bison (*Bison* sp.), weasel/ ferret/mink (*Mustela* sp.), chipmunk (*Tamias* sp.), ground squirrel (*Spermophilus* sp.), prairie dog (*Cynomys* sp.), pocket gopher (*Thomomys* sp.), vole (*Microtus sp.*), cottontail (*Sylvilagus* sp.), jackrabbit (*Lepus* sp.), grouse (Family Phasianidae), and perching bird (Order Passeriformes).

Overall, the faunal assemblage from Component 3 at the Jack Sparrow site shows at least one pronghorn, one deer, and one bison were probably procured during the multiple Early Archaic hunter-gatherer occupations of the site. These large-bodied animals may have been killed at some distance away from the site with the high utility portions of which being differentially transported back to the camp location. These identified large mammal taxa and faunal remains identified as deer-sized, coyote to bison-sized, deer to bison-sized, and bison-sized comprise 24.36% of the total cultural faunal assemblage for Component 3. At least seven jackrabbits were also procured during the occupations, and these animals were likely processed whole on site after being procured and transported to the camp locality. Jackrabbits and rabbit-sized remains represent 39.20% of the cultural assemblage. In addition, the identified rodent taxa and the mouse-sized, squirrel-sized, and mouse to rabbit-sized remains comprise 26.19% of the faunal assemblage. These remains combined with rabbit specimens constitute 65.39% of the Component 3 cultural faunal assemblage. This is consistent with most of the contemporaneous interior basin sites from the Wyoming Basin which are typically associated with faunal assemblages that include larger proportions of small mammals such as jackrabbit, cottontail rabbit, various rodents, and to a lesser extent, larger mammals

Table 9: Summary of bone tool and artifact characteristics recovered from Component 3 at the Jack Sparrow site (48CR9362).

Catalog #	Location	Elev.	Species	Element	Tool Type	Dimensions L x W x TH (mm)	Condition	Comment
48CR9362-747	109N 503E	99.30-99.25m	Size Class III	Long bone Shaft	Bone Bead	13 x 4 (dia.)	Fragment	Polished, grooved and beveled both ends
48CR9362-935	105N 499E Housepit 3	99.10-99.05m	Size Class V	Long bone Shaft Flake	Needle?	14 x 9 x 2	Fragment	Polished, striations, thermally altered
48CR9362-1087	119.94N 499.84E Housepit 1	98.78m	Size Class V	Long bone Shaft flake	Bone Awl	26 x 5 (dia.)	Fragment	Tapering, striations, conjoin with specimen 48CR9362-1088
48CR9362-1088	119.94N 499.84E Housepit 1	98.79m	Size Class V	Long bone Shaft flake	Bone Awl	60 L	Fragment	Splintered, conjoin with specimen 48CR9362-1087
48CR9362-1088	119N 499E Housepit 1	98.75-98.70m	Size Class III	Long bone shaft	Bone bead	7 x 6 (dia.)	Fragment	Split longitudinally, grooved both ends
48CR9362-1288	115N 499E Housepit 1	99.60-98.55m	Jackrabbit	Metatarsal Shaft	Bone Bead Debris	12 x 9 (dia.)	Fragment	Bone bead production debris
48CR9362-1289	115N 499E Housepit 1	99.60-98.55m	Jackrabbit	Metatarsal Shaft	Bone Bead Debris	11 x 6 (dia.)	Fragment	Bone bead production debris
48CR9362-1323	116.22N 499.80E Housepit 1	98.49m	Jackrabbit	Humerus Shaft	Bone Bead Debris	29 x 10 (dia.)	Fragment	Bone bead production debris, grooving on end
48CR9362-1328	116N 499E Housepit 1	Floor Cleanup	Jackrabbit	Long bone Shaft Splinter	Bone Awl	23 x 3 (dia.)	Fragment	Grinding, sharp point, rounded one edge
48CR9362-1331	116N 499E Feature 1A Housepit 1	98.50-97.91m	Jackrabbit	Metatarsal Shaft	Bone Bead Debris	19 x 9 (dia.)	Fragment	Grooved and snapped, thermally altered, bone bead production debris
48CR9362-1340	116 499E Feature 1A Housepit 1	98.50-97.91m	Size Class III	Long bone Shaft	Bone Awl/ Needle	12 x 2	Fragment	Grinding, polished, awl or needle tip

predominately consisting of pronghorn (Byers et al 2005; Lubinski 2000). Nonetheless, based on the faunal data it appears various groups of Early Archaic hunter-gatherers who occupied the site procured faunal resources ranging in size from grouse to bison, most of which were likely procured on an encounter basis using the site as a logistical base for hunting.

SUMMARY AND DISCUSSION

The cultural deposit excavated at the Jack Sparrow site (48CR9362) yielded three cultural components dating to the Uinta phase of the Late Prehistoric period (Component 1), the Pine Spring phase of the Late Archaic period (Component 2), and the Opal phase of the Early Archaic period (Component 3) (Wyoming Basin Chronology). Two conventional radiocarbon age estimates 1580 ± 30 and 1550 ± 30 years B.P were obtained for Component 1, and one date of 4160 ± 30 years B.P was established for Component 2. Component 3 is represented by eleven conventional radiocarbon age estimates ranging between 5440 ± 30 and 4360 ± 30 years B.P. The Late Prehistoric and Late Archaic components consisted of ephemeral open camp hunter-gatherer occupations with limited associated cultural material. The majority of cultural materials recovered during the excavation were associated with the Early Archaic component. The excavation at the Jack Sparrow site yielded two housepit features (truncated), 18 thermal basins, 29 chipped stone tool specimens, 807 lithic reduction specimens, 11 groundstone specimens, 11 bone tools/modified bone artifacts, and 2657 cultural faunal specimens.

The Early Archaic component at the site was associated with at least six temporally distinct hunter-gatherer occupations of the site. Two of these occupations were relatively protracted housepit residential base occupations while the others were more short term open camp occupations. The most intensive use of the site was associated with the occupation of Housepit 1. Cultural materials recovered from Housepit 1 during excavation included 125 lithic reduction flakes, one stone tool, one groundstone specimen, nine modified bone artifacts, and 1140 faunal specimens. This is a significant amount of cultural material considering only 45% of the housepit substructure remained intact for excavation. The housepits and cultural materials recorded during the excavation are viewed as representing the use of the site by small groups of hunter-gatherers during at least two semi-protracted residential base occupations of the site.

Housepit 1 may potentially have been represented by multiple temporally punctuated occupations of the housepit structure and site. The compilation of morphological data available for 99 sampled housepits from Wyoming shows the average dimensions of an Archaic period housepit feature are 333.17 cm L x 289.01 cm W x 39.23 cm D (Buenger and Goodrick n.d.). Based on the appreciable depth and size (77 cm deep and 500 cm long) of the Housepit 1 substructure, it is possible the housepit may have been reused at the site over time, perhaps by related groups of hunter-gatherers over the course of a few seasonal rounds, or possibly over a longer expanse of time. With each reuse of the housepit, the substructure may have been excavated deeper and wider because of debris cleaning in preparation for reuse.

Smith (2003) and Smith and McNees (2011) have discussed the temporally punctuated reuse of housepits by hunter-gatherers during the Archaic as existing facilities in the context of land use strategies. In addition, Buenger and Goodrick (n.d.) view the structured use and reuse of housepit localities near perennial water sources as a strategy used by hunter-gatherers to mitigate risk associated with a potential reduction in ecological diversity and carrying capacity within the region during the Middle Holocene when environmental conditions were believed to have been arid (Ahlbrandt 1974; Ahlbrandt et al. 1983; Gaylord 1982, 1990; Eckerle 1989; Forman et al. 2001; Halfen et

al. 2010; Mayer and Mahan 2004; Stokes and Gaylord 1993). Site localities located near perennial water sources would have supported more year-round ecological diversity compared to more marginal portions of basin interiors. The strategy may have developed through seasonally-conditioned land use in which predictable local resources such as reliable access to water, fuel, and the seasonally available floral and faunal resources were procured through a combination of logistical forays and foraging from the residential focal point of the housepit. The presence of predictable water, an established riparian zone, and probable increased floral and faunal resource densities associated with Cow Creek and Dry Cow Creek would have been a selective factor in the construction and habitation of a housepit structure by a group or multiple groups of hunter-gatherers. The location of the site on the semi-sheltered, leeward side of a low slope near Cow Creek and Dry Cow Creek was likely strategic and part of broader pattern of housepit use and adaptive strategies employed by hunter-gatherers during a portion of the Early Archaic.

Similarly, the variables conditioning the Early Archaic housepit occupations at the site likely also contributed to the multiple Early Archaic open camp occupations as well as the more ephemeral Late Archaic and Late Prehistoric occupations. The topographic location and occupational contexts of the site localities is a reflection of a broader adaptive system expressed by hunter-gatherers in the region throughout a significant portion of prehistory. Again, the location of the sites near perennial water sources was likely a contributing factor conditioning the multiple hunter-gatherer occupations of the site localities. Hunter-gatherers probably established seasonally-conditioned base camps at the sites for the purpose of foraging available floral and faunal resources and conducting logistical forays along the surrounding well-watered areas and upland areas. Many of these camps may have been organized in the late spring through the fall when ungulate populations were possibly more plentiful/healthy and various floral resources became exploitable in terms of maturity and caloric return. This strategy was likely integral to hunter-gatherer life within the context of the high altitude xeric environment of the Wyoming Basin. Overall, the information obtained during excavation at the Jack Sparrow site illuminates the relatively consistent adaptive strategies expressed by hunter-gatherers within the region throughout much of prehistory.

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CRAZY WOMAN CAVE, NORTHERN WYOMING: ABRADED GROOVES AND THE POTENTIAL FOR PREHISTORIC ROCK ART AMONG MODERN GRAFFITI

By
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ABSTRACT

An open cave in an active tourist area on the east side of the Bighorn Mountains is covered with intensive graffiti obscuring the original wall surface. However, inspection of the cave walls revealed earlier Native American grooves among and beneath modern incisions and paint. These figures are part of a common rock art theme dating back at least to the Late Archaic and continues into the Historic period, with grooves at this site probably made during the Late Prehistoric period. Although many archeologists originally thought grooves mostly resulted from tool sharpening, a set of distinctive characteristics recognized by previous researchers demonstrate some, like those here, have a non-secular function on the Northern Plains. They were apparently made in association with ritual abrading activities. This cave also shows vandalized sites should not be written off or ignored without intensive inspection, especially when the setting is typical for prehistoric rock art.

INTRODUCTION

Crazy Woman Canyon is advertised on the Internet as one of the more popular tourist attractions in Wyoming. It is also listed as one of the two top places for tourists to visit near Buffalo. The North Fork of Crazy Woman Creek runs through the canyon along the well-improved Crazy Woman Canyon Road (48JO769) originally constructed about 1936 by CCC crews (SHPO 2020) and now maintained as a major attraction for recreationalists and hunters. One can enter the canyon from an upland highway in the Big Horn Mountains and proceed eastward down the gravel road following the creek through Bighorn National Forest as the canyon narrows toward its lower end into essentially sheer sandstone walls lined with trees and barely wide enough at the bottom for one vehicle. The year-round creek becomes fuller and is a favorite place to fish. The county road leaves the National Forest and enters private land toward its lower end, with seasonally used cabins and walking bridges across the creek.

Crazy Woman Cave (48JO4523) is on the north side of the creek just at a slightly widened area inside the last narrow constriction of the sheer walls. It is just west of where the canyon widens only slightly before exiting the east escarpment of the Big Horn Mountains (Figure 1), where the creek continues onto the rolling plains. The road continues east across private lands with scattered ranches and an intricate county road system. This eastern edge of the mountains is a steep face covered with exposed sandstone fins ("flatirons") and with high cliffs cut into by several short rocky canyons. To the north, these formations are known collectively as Crazy Woman Mountain.

THE CAVE

The cave is in the bottom of the canyon, just up a short colluvial slope above the road run-

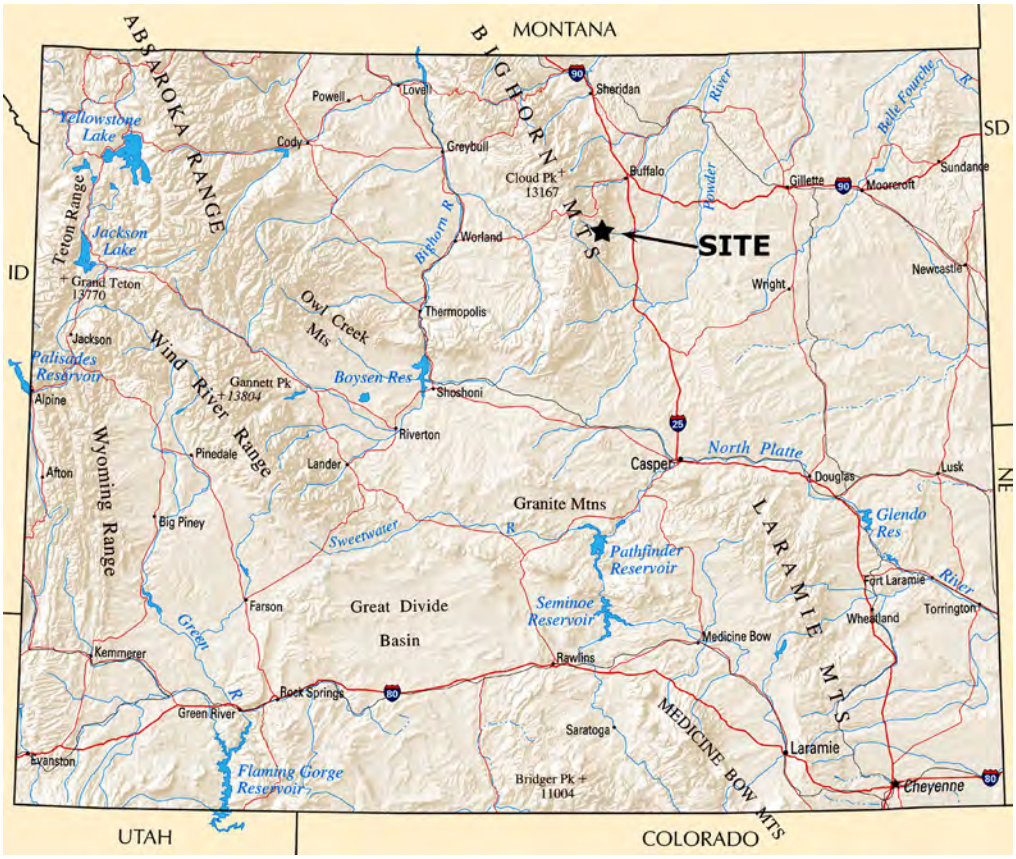

Figure 1: Crazy Woman Cave location within Wyoming.

ning along the lower terrace and not far above the creek. The open cave room faces southwest, somewhat upstream, and is easily recognized and beckons visitors, especially from traffic going east, downstream. The high triangular opening is about 6.1 m wide across the mouth and about 6.4 m high at the pointed ceiling (Figures 2-5). The left wall (facing in) is nearly vertical, and the right wall slopes outward from the pointed ceiling down to the floor at the widest part of the cave, forming somewhat of a right triangle in frontal view. The cave tapers about 9.1 m back to the narrow rear of the open room and has an amply wide nearly flat floor with a modern rounded-boulder retaining wall across the front edge of the south half of the floor (Figure 6). Just below this is a large modern fireplace bordered with similar boulders.

The entire rock surface around both sides of the cave mouth and back into the cave has been extensively and intensively covered with painted and incised graffiti (Figures 3, 6-9). There are thousands of initials, names, dates, additional drawings or symbols (Figure 10), and words and sayings carved, scratched, and cut into the rock walls. Most painted additions are sprayed, but there are also some done in brushed-on liquid paint and various marking pens. Dates range from at least the early 1940s to September 2020. It appears all graffiti was done by Euroamerican visitors, probably mostly young people. The cave is commonly used as a party location at least for local teenagers and is easily accessed from the east by the county road system which passes by at least two main fishing lakes.

ROCK ART

On the few patches of original wall not covered with graffiti, the rock surfaces inside

Figure 2: General view of cave mouth, looking southeast.

Figure 3: Mavis at mouth of the cave, looking east.

Figure 4: View out the cave mouth from the back wall, looking southwest.

the cave and extending outside the mouth are a medium brown patina. In the interior, small patches of nearly black, thick patina from the original surface remain. It is on those brown and black patches where we first recognized the Native American abraded depressions and narrower grooves. They are placed on the north wall, and on a large sloping boulder forming the northwest edge of a large firepit just on the south side of the cave mouth and in front of the rock retaining wall (Figure 5). Only modern graffiti was observed on the south wall.

NORTH WALL

A few remnant pieces of original surface are widely scattered along the left wall (facing into the cave). Near the rear of the cave are two wide oval depressions, Grooves 1-2. In front of these, nearer to the middle of the cave, are two vertical abrasions, Grooves 3-4 positioned one above the other. Just outside the mouth of the cave is a slightly larger circular depression, Groove 5. The rest of the wall is densely covered with incised graffiti and painted figures, names, and dates. The abraded features are numbered from the rear of the cave to the front/mouth.

Groove 1 is an abraded oval depression 15 cm vertical by 7 cm horizontal and about 2 cm deep (Figures 6 and 11-13). In outline, it is rounded at the top and tapers at the bottom. The interior is slightly indented and evenly ground smooth. It is near the rear of the cave, about 1.4 m above the natural floor, and is cut into the thick dark gray patina which also partially fills the depression.

Groove 2 is also an abraded oval depression 16 cm vertical by 9 cm horizontal and 3 cm deep (Figures 11, 12, and 14). It is also near the rear of the cave, at a height about 1.4 m above the floor, and just out from Groove 1 (Figures 11 and 12). On the smoothly ground depressed interior is a limited group of small chopping marks (probably modern) and lightly incised modern graffiti (Figure 14). The depression is abraded into an orange surface formed when a large portion of the early dark gray patinated

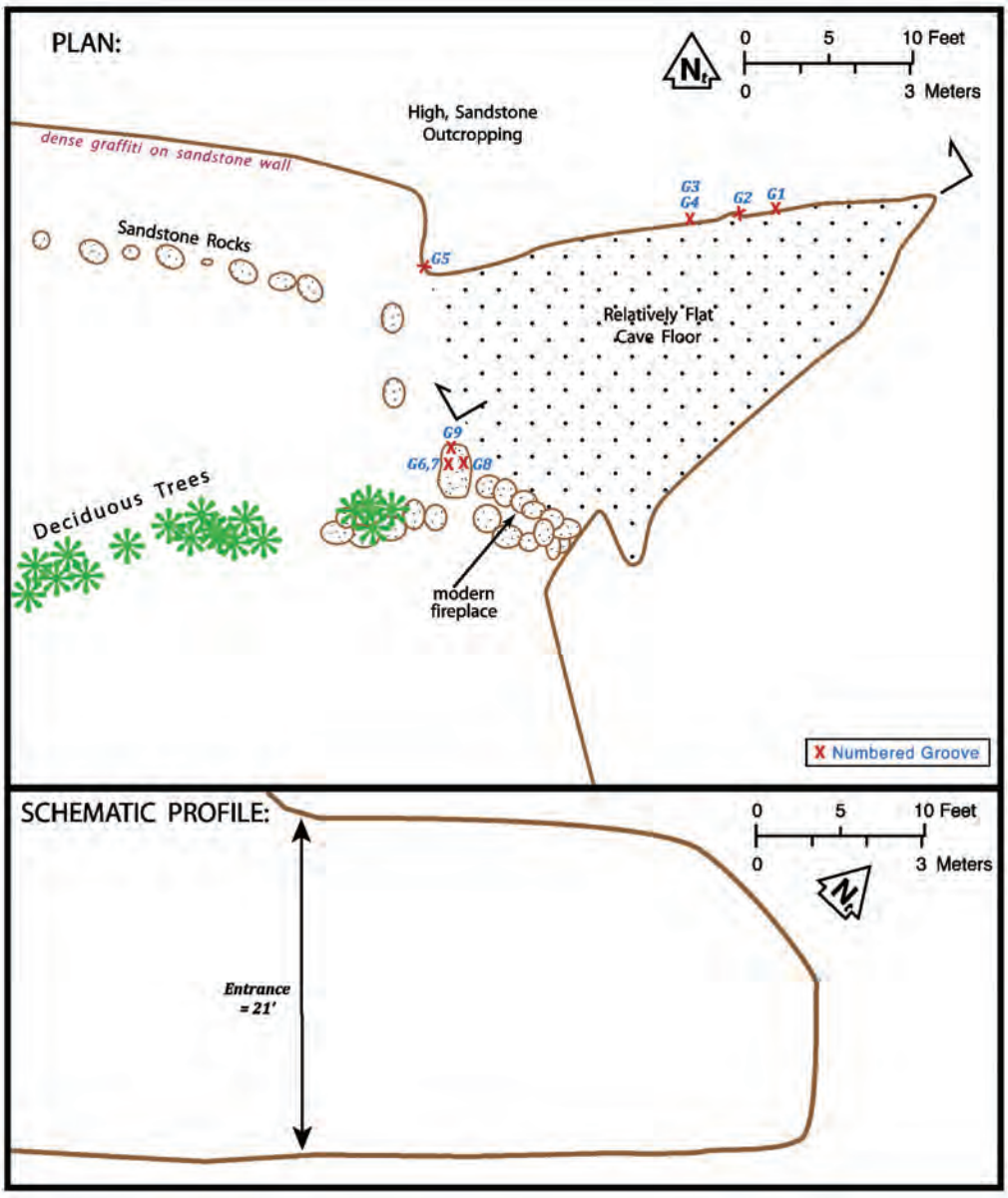

Figure 5: Plan and profile of Crazy Woman Cave showing locations of the images.

surface spalled off the cliff. The well-worn depression is clearly much older than surrounding incised graffiti.

Grooves 3 and 4 are vertical narrow abraded grooves about halfway along the north/left wall, about 0.6 m west (to the cave mouth) of Groove 2 and slightly higher (Figure 15). The two are arranged vertically, with #3 above #4, and are ground vertically into the rock. The upper Groove 3 is 11 cm vertical, and the lower Groove 4 is 8 cm vertical. Both are about 1-1.5 cm wide, taper at the upper and lower ends, and have a wide rounded interior bottom. As such they are more like "banana grooves" with broadly ground bottoms than conventional "tool grooves" with V-shaped bottoms. Groove 4 is about 1.8 m above the floor, on a sloping ledge.

Groove 5 is a larger abraded depression, circular in outline, and about 17.5 cm tall by 15 cm wide (Figure 16). The main depressed interior is about 15 cm tall by 12.5 cm wide, with a widely indented smooth bottom only about 2 cm deep. This depression is within and covered by the dark gray original patina. Modern incised

Figure 6: Cave interior showing the entrance rock retaining wall, looking northeast. John is at the back of the cave pointing to the Groove 1 depression.

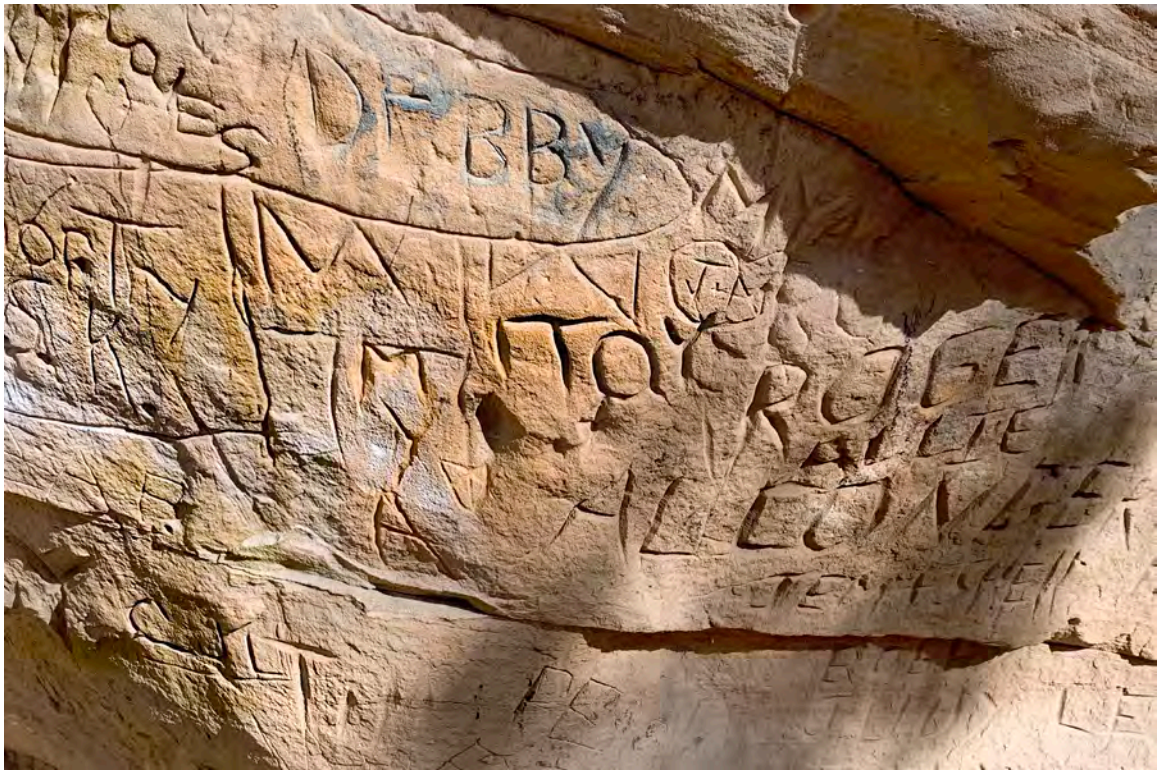

Figure 7: Example of inscribed and carved modern graffiti, north wall.

Figure 8: Example of painted modern graffiti, north wall.

Figure 9: Example of painted modern graffiti, south wall looking southeast.

Figure 10: Modern graffiti symbol of rayed circle, north wall.

Figure 11: Mavis pointing at Groove 1 depression at back of the cave; Groove 2 depression to the left; looking northeast.

Figure 12: Position of Groove 1 depression (right) and Groove 2 depression (left).

Figure 13: Detail of Groove 1 depression with centimeter scale.

Figure 14: Detail of Groove 2 depression with centimeter scale.

graffiti is also within and all around the depression. Groove 5 is about 0.9 m above the floor.

BOULDER

Four narrow grooves are located on the upper surface of a pyramid-shaped sloping boulder on the south side of the cave mouth (Figures 5 and 17). This large natural rock is west of several smaller rocks which have fallen near the entrance, several of which have been moved to form a modern firepit between the boulder and the cave wall. In addition to the abraded grooves the rest of the boulder is covered with modern incised graffiti. The four grooves were numbered left-to-right and then the top abrasion.

Grooves 6 and 7 are similar abraded parallel grooves in the middle of the sloping boulder face (Figure 18). Groove 6 (left) is 10.5 cm tall by 3 cm wide, and Groove 7 (right) is 9.5 cm tall by 2.2 cm wide. Both taper to the upper and lower ends, are shallow, and have a widely smoothed bottom, about the width of a finger. These vertical grooves are aligned down the sloping surface of the rock and are cut into and through the thick black patina.

Groove 8 is an abraded groove to the right, near the edge of the boulder, and again is vertical and aligned down the sloping surface of the rock (Figure 19). The groove measures 11.5 cm tall by 3 cm wide and about 1.5 cm deep with a smooth rounded bottom. It is incorporated into the thick black patina and appears to be older than Grooves 6 and 7.

Groove 9 is a curved, irregular groove about 20.5 cm long and 2-2.5 cm wide beginning at the top of the boulder and angling to the left (Figures 18 and 19). It is somewhat incorporated into the grayish patina and does not appear to be modern.

HISTORY OF GROOVE TERMINOLOGY

The observed depressions and grooves all fall within the old established category of "tool grooves," which are found across the world, including most of western North America (Feyhl 1980:28; Loendorf and Willis 2020:167). Forty

Figure 15: Groove 3 (top) and Groove 4 (bottom) on north wall with scale.

Figure 16: Detail of Groove 5 depression at cave mouth (hand for scale), looking north-east.

Figure 17: General view of sloping boulder inside cave entrance, looking northeast. John holding centimeter scale beside Grooves 6-7.

Figure 18: Detail of Grooves 6 (left) and 7 (right) on sloping boulder, with centimeter scale. Curved Groove 9 on upper-left.

years ago, the encompassing term was used for all groove features having a range of sizes and shapes from narrow V-shaped forms to wide, elongated ellipses referred to as "banana grooves" (Feyhl 1980:3). As people began looking more closely at grooves in general, there was more attention given to interior attributes -– the overall width:depth ratio, detailed profile, shapes of the sides, degree of constriction of the bottom of the groove, sharpness or roundness of the rim, and details of the ends. It became obvious grooves were, at best, a loose *class* category, and to begin understanding function and use, it is necessary to look more thoroughly at detailed attributes of the groove.

While most international discussions of groove attributes have dealt primarily with petroglyphs (e.g., Consens et al. 1989; Sujo 1975; Urbani 1998), the attention of these researchers to detail pertains to linear, "banana," and boat-shaped grooves and depressions, such as discussed here. For instance, a narrow V-shaped groove with pointed bottom and usually a sharp angular rim probably represents an anvil function for cutting, such as trimming succulent leaves (like yucca or lechuguilla) or cutting hide or bark into strips. A slightly wider V-shaped groove with a narrow, rounded bottom and slightly rounded lateral rim could have served to form or sharpen bone awls or other narrow tools or ornaments. Wide, parallel-sided, dish-shaped grooves with vertical sides, evenly smoothed bottoms, and gentle slopes up to each end are for shaping and sharpening celts and axes. Shallow, widely oval to circular grooves or depressions with wider bottoms and rounded rims, like those at Crazy Woman, probably served some other, nonutilitarian function not associated with shaping a potential tool or specific object. The class category of *grooves* is considerably diverse and with its undefined use is comparable to terms like *biface* or *uniface*.

On the Northern Plains, V-shaped grooves with a narrow or knife-like bottom are shown

Figure 19: Detail of boulder surface. Parallel Grooves 6-7 left, centimeter scale below Groove 8 (right), and curved Groove 9 at top.

by experiment to result from sharpening tools or serving as anvils (Feyhl 1980:21-26). Other shapes have long been recognized as functioning differently from V-shapes and clearly are not the result of sharpening or shaping anything. More recently, Keyser and Klassen (2001:295) continue to use the term "tool grooves" in their overview of Plains rock art, but they too acknowledge many are not associated with tool sharpening or shaping. They note, based on experimental and ethnographic data as well as placement and groupings, grooves were made in association with ritual activities and had symbolic importance. They reference a Piegan tribal member in Alberta who remembered a large rock with abraded grooves as marking a burial ground. The informant proposed "each group of grooves marks the location where an elder was laid to rest" (Keyser and Klassen 2001:295). They do not propose other non-utilitarian origin or use for grooves in general, but they recognize grooves deserve much more formal study before assigning function to a general class of features. Also by that time, researchers were beginning to recognize and record rock art consisting of interacting grooves forming designs and patterns, and grooves forming parts of figurative art, such as human images. It was obvious the old term for these features was inadequate and often simply wrong.

By 2002, researchers were searching for a term to replace "tool grooves" that would more aptly describe these features in rock art. Linea Sundstrom used the term "abraded grooves" for wider depressions and grooves (Sundstrom 2002:107; 2004:199), but she continued to use the term "tool grooves" for some of the narrower features (Sundstrom 2004:93). About the same time, Keyser referred to these features as the "Plains Grooved" tradition. He noted they were made from at least the Late Archaic into the Historic period, and their function ranged from simple counts to supernatural control (Keyser 2004:52-53). Subsequently he retreated from the "Plains Grooved" term, although not completely abandoning it (Keyser 2009:44), and mainly reverted to the generic term "tool grooves" (Keyser and Poetschat 2005:119-120, 2009:43-44).

Sundstrom's expansive studies of grooves in the Black Hills presented ethnographic evidence to suggest narrow grooves were produced by girls and women during the production of bone tools (mainly awls) needed for their activities, making them a symbol of womanhood and continuity of life. Her explanation explicitly designates grooves of this type or form as producing women's tools. She teams them with tracks and vulva forms as part of the "Track-Vulva-Groove" rock art style, associated with women, which is characterized by "deeply ground and abraded animal tracks and human vulvas" (Sundstrom 2004:83, 90-98). She suggests the repetitive, rhythmic motion associated with abrading may have been accompanied by chanting, swaying, and prayers, which would act as a transformation experience (Sundstrom 2004:93-94). Her theory is the abraded style of "Track-Vulva-Groove" rock art expresses both the connection between women's reproductive and nurturing potential and endurance and longevity represented by the rock art and awls (Sundstrom 2004:98).

Hedges (2005) examined groups of multiple abraded grooves beside sandstone portals of Spanish churches and uses the term "Pilgrim Marks" because they are apparently the result of people rubbing on the wall to remove sand for good luck. He notes those grooves are identical to rock art forms elsewhere and reviews the distribution of similar forms in the United States, again using the term "tool grooves" (Hedges 2005:99-102). He discusses people worldwide make grooves with their hands to obtain power from sacred rocks, and this interaction reflects on the power of the landscape at that place, whether on a rock in nature or part of a constructed building now considered sacred.

Although the term "tool grooves" continues in the literature (Keyser and Poetschat

2005:119-120, 2009:43-44; Loendorf and Willis 2020:167-168) with the few attempts to change the terminology falling short and mostly ignored, such change of the term is worthwhile and justified. We feel Sundstrom's term "abraded groove" should be adopted for this type of rock art feature as it is more encompassing of what is observed and more generically acceptable to any function for which the features were made.

AGE AND FUNCTION OF ABRADED GROOVES IN THE CAVE

At this site the three relatively broad depressions on the north wall (G1, 2, 5) have wide evenly smoothed bottoms and are fairly shallow, 1-3 cm deep. The narrower vertical grooves, two on the north wall (G3-4) and four on the boulder (G6-9), are about the width of a finger, are fairly shallow, and have the same evenly convex to somewhat rounded bottoms as the larger depressions. Those narrower grooves do not have straight sides or an edge-like V-shaped bottom such as bone awl grooves or anvil grooves. The features here do not appear to have been made to sharpen or shape tools.

This site is just one of many across Wyoming, southern Montana, and the Black Hills of South Dakota with grooves having this distinctive shallow abrading and wide smooth bottoms. Some grooves at other sites are different with wide highly curved outlines and constricted (but rounded) ends. Also, there are sites with grooves connected to other incised figures for enhancement of the original figure (including humans, such as at Talking Rocks, 48AB303, in central Wyoming) or are arranged into various geometric patterns and designs (such as at Cedar Canyon, 48SW943, in southwestern Wyoming).

The lack of figurative art in this cave means an age estimate must be based on other clues. The presence of modern incised graffiti within some of the ground depressions indicates they pre-date modern use of the cave. There appears to be a lack of associated post-horse imagery, suggesting the grooves are earlier than the Protohistoric period and likely date to the Late Prehistoric period. There is no indication of pecked Archaic petroglyphs, and the mostly somewhat limited patination within the grooves suggests they may not be as old as known Archaic age rock art in the region.

It is unlikely these features mark burials, and their shapes and sizes suggest a function probably unrelated to formal tool production. The various locations within the cave, different heights above ground, and variety of shapes suggest they were made by different people. There is no indication they were all made at the same time, but they could have been. There is no specific evidence of association with women's work, although the abrasions resemble some discussed by Sundstrom (2004) for that purpose in the Black Hills. Most likely they were done over time by people who recognized this cave as a sacred location where rituals occurred which involved making abraded grooves, possibly associated with obtaining power from the rock.

SITE RECOGNITION IN VANDALIZED LANDSCAPES

Setting is typical for prehistoric rock art in Wyoming and Montana. The cave is near the face of the mountain, not far into a deeply cut canyon, and just past the entrance fins which form the restricted canyon mouth. Because of the setting, it is assumed the site once contained more Native American rock art, probably mostly incised figures, but older pecked figures and painted pictographs also would be likely. No such earlier images now remain, and no other rock art sites are recorded further up the canyon, although the area is not known to have been surveyed for archeological remains.

This site shows the potential to recognize Native American rock art amid intense modern damage from graffiti. On such affected sites, figures or pieces of figures are occasionally discernible on remnants of the original, undisturbed rock surface, such as the grooves

reported here, confirming sometimes early figures can be identified even when covered with more recent incisions or scratches put there in prehistoric, historic, or modern times. Through careful scrutiny of shelter walls and boulders on the floor, it may be possible to discern those older figures now covered with and potentially disfigured by later intensive graffiti. It is necessary not only to look for unaffected wall space, which may be difficult to recognize before early figures become obvious, but perhaps more importantly to look for forms and shapes known to occur in rock art, then try to make out the rest of the figure. This is the same process used for the European "macaroni" scratched surfaces of Paleolithic plaques and wall incisions where elephants and rhinos are recognized by distinctive curvature lines on parts of the body, perhaps the curvature of the tusks, or the hump on top of the head, and finally other figures can be discerned (Bandi et al. 1961). On the Plains, one must look for the curved line of a shield outline or parallel lines bordering the torso of a rectangular-body or V-necked human. Horses are recognized by any of several distinctive curves or angles, such as their triangular legs or distinctive neck curve. Bears, especially grizzlies, likewise can be distinguished by their hump, open mouth with teeth, or their rounded rump. Once just one distinctive line or curve or other attribute is identified, then the observer can usually "pull out" the figure from the superimposed graffiti that otherwise obscures the older drawing.

We have done this in southwest Texas, at the Fate Bell Rockshelter (41VV74), where the unique wide angle of the stick legs of a Red Linear Style human can be identified amid and beneath a plethora of incised lines on a polished boulder surface. Incisions covering the boulder and its polished surface undoubtedly result from processing succulent plants such as lecheguilla or sotol, and the high polish could have been enhanced during processing of animal hides on the same boulder used for generalized food processing. Once the widely splayed single-line legs of the human are found, the rest of the figure becomes recognizable, even after decades of research and thousands of visitors. This identification in turn makes possible relative dating of the later incisions as well as piecing together other aspects of the culture history of the area.

The same has occurred at a small rockshelter (48AB2882) in southeastern Wyoming where a lightly incised armored horse from the late 1700s is covered with more recent incisions across the surface of the sloping boulder within the front of the shelter. The horse's V-shaped legs and hooked feet descend from a slightly convex horizontal line and identifies this as a leather armor covering. The distinctive front and rear edges of the armor are fairly clear with close inspection. While the top of the armor is difficult to make out, detailed photos show it comes to a point with the typical rounded indentation for the rider (Main 2004). No rider or horse features are definite, but the figure is clearly identifiable by recognition of a few key lines as an armored horse, with typical leather armor cover of a distinctive shape not duplicated in any other Native American drawings. The figure is covered with scratched graffiti dating back at least to 1903. This and other nearby shelters also contain typical shallow abraded grooves, some arranged into geometric patterns. Patience and close attention to detail helped "tease out" the early important figure.

SUMMARY

Crazy Woman Cave and others like it have the potential for recognition of Native American rock art under challenging conditions and in geographic settings which often contain such images. Consistently used settings can predict locations for new sites, and careful inspection of even highly vandalized walls can sometimes reveal figures or drawings otherwise thought no longer to exist. Because of this at Crazy Woman Cave we can add to our understanding of Late Prehistoric use of Big Horn Mountain caves for abraded groove-related rituals and ceremonies.

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