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Archaeology IN MONTANA

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Cover Photo: Shield Bearing Warrior at Owl Canyon, Figure 6 from article by Loendorf and Kaiser in this issue of AIM.
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Archaeology IN MONTANA

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EDITOR'S COMMENTS

THE 63RD ANNUAL Montana Archaeological Society (MAS) Conference was recently held in Helena. Marv Keller deserves high praise for a well-organized and executed conference. This is a huge effort for our president and takes countless hours to successfully plan and organize. Our hat is off to you, Marv! Next year, Scott Dersham takes on the presidential role and will plan the next MAS conference, which will likely be held in Livingston.

This is our first issue of Archaeology in Montana (AIM) for the 2024 year. We strive to publish articles on a range of subjects and feel we achieved that in this issue. Many archaeological research and stewardship projects conducted in Montana are the result of cooperative agreements between agencies and universities and from volunteer efforts. The paper authored by Larry Loendorf and David Kaiser was possible due to efforts of highly trained volunteers lead by professionals. The projects undertaken by the Sacred Sites Research organization that Loendorf leads are often completed by volunteers and university students.

In this issue, the article by Nancy Mahoney shows how the MAS and AIM changed over time in terms of journal authors, moving away from articles written by amateurs to articles exclusively by those trained in the field of archaeology. Mahoney considers the benefits of the bygone efforts of MAS in working with volunteers and local communities on archaeological projects. Through these types of projects, she feels we learn about archaeological sites on private lands as community members feel more comfortable sharing this type of information after positively interacting with archaeologists.

The Madison Buffalo Jump project was the result of a cooperative agreement between Montana State Parks and the University of Montana. The field crew was comprised solely of students and one of the students (the lead author) wrote his Master's thesis on the project. Montana State Parks works to engage universities in cooperative projects and has completed similar projects at other state parks including Rosebud Battlefield, First Peoples Buffalo Jump and Fort Owen.

In Munson's article he describes house pit excavations for a coal mine compliance project in Wyoming, yet another type of archaeological project that generates hundreds of reports each year. Although AIM focuses on research projects in Montana, information from neighboring states is also relevant, as state boundaries hold no real importance from an archaeological perspective.

We are always looking for manuscripts on a variety of topics. If you are working on a paper, please consider publishing it in AIM. The quality and the content of the journal are dependent on members like you, so please send your articles to AIM. Also, please remember to keep your membership dues current. Our membership costs are outlined on the inside cover of the journal.

Up next, our fall issue of AIM will feature an article on basic rock art recording methods by Mavis and John Greer and much more.

INFORMATION FOR AUTHORS

All articles for *Archaeology in Montana* should be emailed to Sara Scott at sascott0012@gmail.com. Your article can be sent in a zipped folder or by using Google Docs or Dropbox. You can also email me for direct contact information if you prefer to send your files on a jump drive.

For information regarding article layout and format, authors should refer to "Editorial

Policy and Style Guide for American Antiquity." This information is available at https://documents.saa.org.

Manuscripts submitted for publication in AIM should be double-spaced with wide margins. Graphics should be high quality and show good contrast. Digital photos and graphics should be submitted in jpeg or tif format. All graphics should be submitted as individual separate files and should not be embedded in the manuscript.

Figure and table captions should be provided in a separate WORD document and keyed clearly to the individual figures/tables and their citation in the text.

Please consult this issue or the 2023 issues of AIM for basic format questions. Submitted articles should follow the article format as shown in these recent issues of AIM.

ABOUT THE AUTHORS

Brandon J. Bachman received his Master of Arts degree in Anthropology in 2016 from the University of Montana. His thesis was a comprehensive analysis of the archaeological features and artifacts identified at Madison Buffalo Jump State Park, the topic of the article contained in this issue of AIM. He currently resides in Guam with his family and works as an archaeologist on the Guam Archaeology Project.

David A. Kaiser has been an independent rock art researcher for the last twenty years, conducting field recordings, analysis, and writing covering half a dozen western states in the U.S. as well as Alberta, Canada. His work primarily focuses on the Pacific Northwest and the Northern Plains. He has written, co-authored, and edited over 50 rock art publications. He recently co-authored the book *War Stories: Reading Plains Indian Biographic Rock Art* with James Keyser. Currently on the board of the American Rock Art Research Association (ARARA), he lives in Portland, OR.

Lawrence L. Loendorf is an archaeologist who has completed research across the Intermountain West for the past 60 years. Much of his Montana work has been in the Pryor Mountains and surrounding canyons. He is the President of Sacred Sites Research, Inc., a 501c3 non-profit company that is dedicated to protecting and preserving rock art sites.

Douglas H. MacDonald has been an archaeologist in the Department of Anthropology at the University of Montana, Missoula since 2006. His primary area of research is the Native American archaeology of Montana and Wyoming, including the Greater Yellowstone Ecosystem. MacDonald has written five books, including Before Yellowstone: Native American Archaeology of the First National Park, published in 2018 by the University of Washington Press. A forthcoming book, set to be released in 2024 by the Montana Historical Society Press, is entitled Land of Beginnings: the Archaeology of Montana's First Peoples; it describes the archaeological evidence for the migration of Montana's earliest Native Americans from Siberia to Montana.

Nancy M. Mahoney is currently an Instructor in the Department of Sociology and Anthropology at Montana State University (MSU) in Bozeman. She conducted archaeological fieldwork in Cyprus, Turkey, Morocco, Arizona and Utah before moving to Montana and learning about the prehistory of the Northern Plains region. She acted as Assistant Director on three MSU field schools, and carried out research and then published on Depression-Era archaeology in Montana. Nancy is the co-host of The Dirt on the Past, a podcast of the Extreme History Project, which focuses on recent research in History, Anthropology and Archaeology.

Gene Munson has been the President of GCM Services, Inc. for over 40 years. He has conducted an abundance of cultural resource surveys and site excavations in the Powder River Basin of southeast Montana and northeast Wyoming.

ARCHAEOLOGY OF MADISON BUFFALO JUMP STATE PARK (24GA314), GALLATIN COUNTY, MONTANA

BRANDON J. BACHMAN
DOUGLAS H. MACDONALD

INTRODUCTION

THE MADISON BUFFALO JUMP PROJECT entailed the archaeological survey of the 640-acre Madison Buffalo Jump State Park (24GA314) near Three Forks, Montana (Figure 1) by the University of Montana (UM). Madison Buffalo Jump is considered one of the most important buffalo jump sites used by Native American tribes in Montana (Davis and Brownell 2016; Scott 2010, 2012). In accordance with the Montana Antiquities Act, Montana Fish, Wildlife, and Parks (FWP) funded the survey project in support of infrastructure improvement in the vicinity of the visitor pavilion. A multitude of archaeological artifacts and features were recorded by UM at Madison Buffalo Jump (24GA314), including: 1) four drive lines that were used to funnel bison to specific jump locations; 2) bison bone concentrations located below the nick point on the face of the jump; 3) artifact and bone concentrations in the processing area in the creek valley west of the jump; 4) several lithic artifact concentrations located within the gathering basin above the jump, including one possible white chert/petrified wood quarry; 5) 78 stone circles in four occupation areas surrounding the jump; 6) two likely fasting beds on a ridge top north of the jump; 7) an Early Archaic projectile point manufactured from Cashman dacite; 8) 15 dacite/obsidian artifacts (including the Early Archaic projectile point) that were sourced to the Obsidian Cliff, Bear Gulch and Cashman sources; 9) One bison bone pelvic fragment that yielded a Late Prehistoric radiocarbon date for the buffalo jump processing area; and 10) four locations of historic/modern inscriptions located across the state park.

PROJECT LOCATION: GEOLOGY, PHYSIOGRAPHY, AND HYDROLOGY

Madison Buffalo Jump State Park (24GA314) is located in the Three Forks basin, approximately seven miles (11.2 km) south of the small town of Logan, Montana, and one mile (1.6 km) to the southeast of the town of Three Forks. The Three Forks basin encompasses approximately 1,000 square miles (Robinson 1961) and is the location where the Gallatin, Jefferson, and Madison rivers conjoin to form the Missouri River (Berry 1943). The Gallatin and Madison rivers both originate in the northwest portions of Yellowstone National Park, along the Continental Divide, approximately 90 miles (145 km) south of the Three Forks basin (Malouf 1975); the Jefferson's source is located nearby as well. From their sources, the Jefferson River flows east and northeast through the central part of the region, while the Madison River flows north from Yellowstone National Park, through the Madison River Valley (Berry 1943); the Gallatin River lies to the east of the Madison River and flows north until it reaches Logan, Montana, where it turns west and flows to form the headwaters of the Missouri River. The rivers each enter the basin through long and broad canyons and valleys (Robinson 1961; Wyckoff and Hansen 1991).

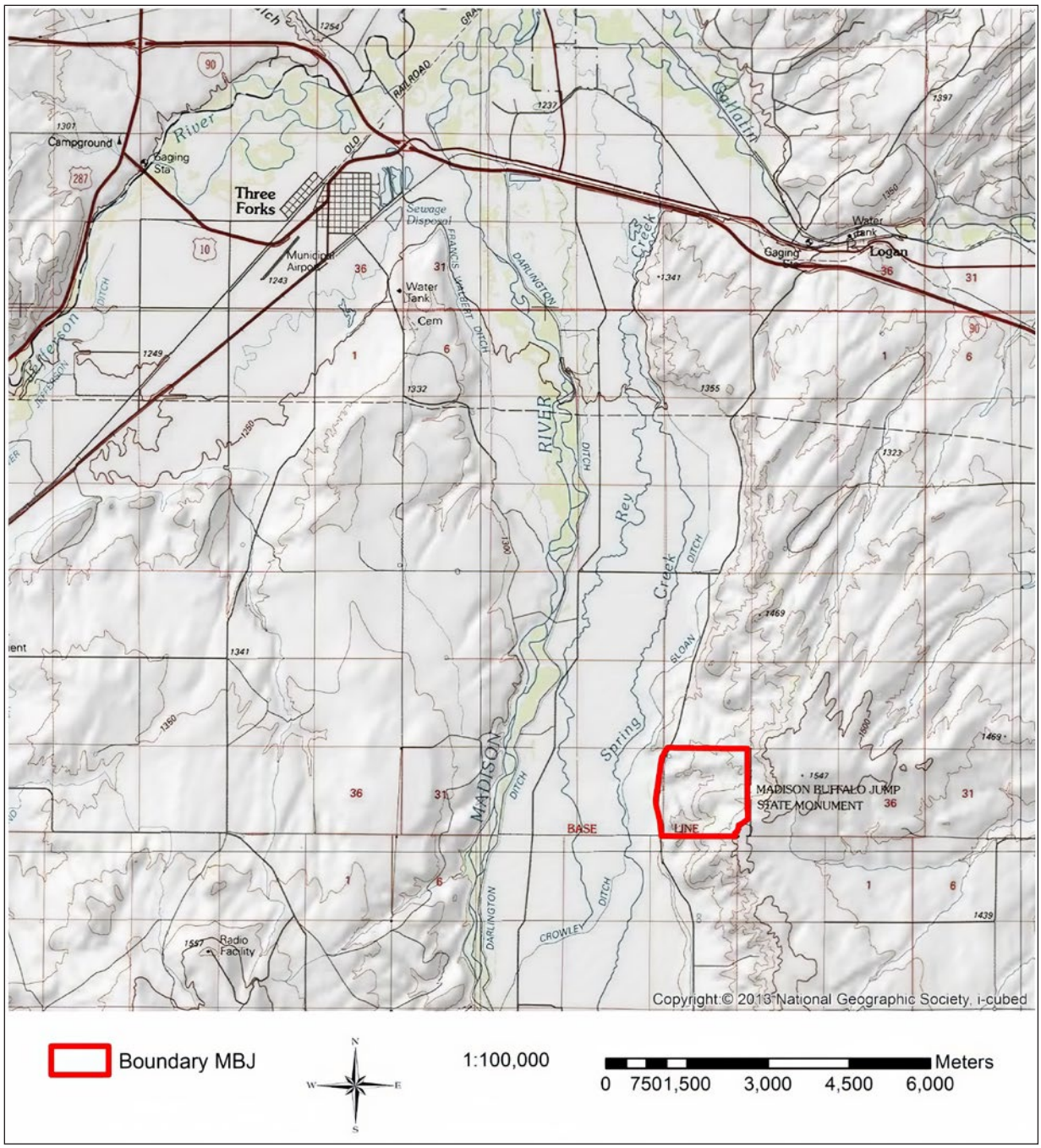

Figure 1. Location of Madison Buffalo Jump State Park in Gallatin County, Montana.

Madison Buffalo Jump is separated by approximately 2 miles (3 km) of wide, flat valley to the northward-flowing Madison River. The Madison River valley is comprised of a series of elevated, sloping, terraced benches and large alluvial fans (Wyckoff and Hansen 1991). Taylor (1971:2) explains that the Madison River "carved out a broad and fertile north-south valley some four miles wide, cut several hundred feet deep from the high plain which extends on either

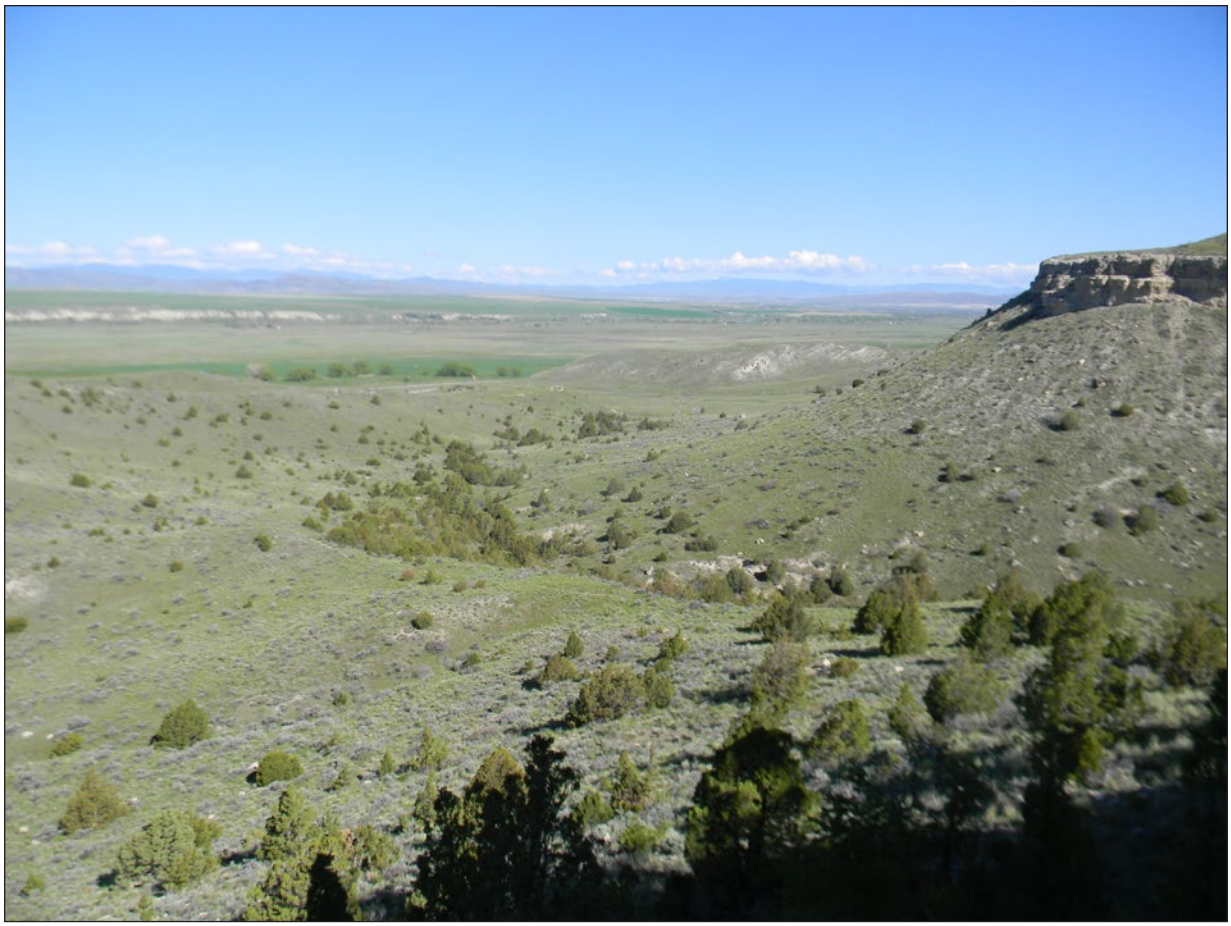

Figure 2. View northwest from the top of the main cliff at Madison Buffalo Jump State Park, looking towards the Madison River Valley near Three Forks, Montana.

side. The eastern wall of the valley for some two miles on either side of the Buffalo Jump is deeply cut into ravines, rising sharply to the foot of sheer bluffs from twenty to one hundred feet in height." Madison Buffalo Jump is located in these bluffs along the far eastern side of the Madison River Valley, and faces directly west with a panoramic view of the river (Figure 2) (Malouf and Conner 1962).

The geology of Madison Buffalo Jump consists of both Madison Plateau and Madison Valley Formation sandstone and conglomerate deposits; formations which are prominent landform markers south of Manhattan and Three Forks in the Madison River valley. As explained by Vuke (2003), the surface geology of the park is comprised of Madison Plateau deposits that are characterized by rounded cobbles, gravel, and/or small boulders cemented together by calcium carbonate that dates to approximately 10 million years ago, which is covered by fine-grained, primarily unconsolidated sediment. These cobble deposits generally consist of hand-sized or larger orthoquartzite cobbles that are found in excess in the hillsides of the eastern section of the park. The orthoquartzite cobbles at Madison Buffalo Jump are of moderate quality, though very few artifacts are recovered from the park that are manufactured by this material; however, these cobbles comprise a large majority of the cobbles

used in cairns for the drive lines and stone circles found within the park.

Stratigraphically beneath the Madison Plateau deposits, the Madison Valley Formation primarily consists of white tuffaceous sandstone and siltstone (Robinson 1961), inter-bedded with marl (Vuke 2003). Barstovian mammal fossils are recorded within these deposits dating to 15 million years ago (Dorr 1956; Tabrum et al. 2001). UM identified one such fossil in the roof of a rock shelter at the base of Madison Buffalo Jump's rim. Previous reports document the presence of fossils, petrified wood, and beds of sandstone with chert and quartz (Mifflin 1963), while white chert/chalcedony and various colors of petrified wood are most prevalent. Both Dorr (1956) and Vuke (2003) report an abundance of petrified wood occurring at or near the base of conglomerate deposits. In our study, we recorded the presence of Native American quarry activity in the chert/petrified wood deposits in the Madison Valley Formation in the uplands of Madison Buffalo Jump State Park.

The surface of the Madison Buffalo Jump State Park is comprised of "a series of discontinuous drop-offs created by erosional incising of the plateau, from any of which bison could have been forced or misled into falling" (Davis and Brownell 2016:2). Lapham and Ely (1905) describe the ground surface as being comprised of dissected creek valleys and upland flat areas, which include steep dissected canyons and creek bottoms. North and east of the jump area are several canyons that are deeply incised, creating a dissected landscape with canyons, finger ridges, and occasional flats. East of these canyons are surficial deposits of the Madison Plateau consisting of an abundance of cobbles. On the park's easternmost limits are large and steep slopes containing thousands of rounded Madison Plateau cobbles. Agricultural fields are located above the park to the east, outside of park boundaries. The terrain of the central portion of the park is comprised of Madison Valley Formation canyons and cliffs that are generally steeply-incised canyons located between upland plateaus. The jump itself is the most prominent exposure of Madison Valley Formation sandstone.

CLIMATE, FLORA AND FAUNA

The surface vegetation varies throughout the Madison River Valley, depending on aspect, elevation, slope, and soil conditions (Wyckoff and Hansen 1991). Specifically, the vegetation comprising the Madison Buffalo Jump State Park grasslands is characterized by a mixed grass prairie consisting of Idaho fescue, grama grass, needle grass, and wheatgrass (Wyckoff and Hansen 1991), interspersed with juniper and sagebrush clusters in north-facing walls of canyons, in addition to well-watered areas. Riparian vegetation exists along the Madison River, as well as along the tributary streams and includes a mixture of wet grasslands and stands of aspen, cottonwoods, and willow (Wyckoff and Hansen 1991).

For over a century the Madison River Valley was utilized by local ranchers for grazing cattle (1870 and earlier) and sheep (beginning 1870's). Today, cattle are still very prevalent in the area, but sheep have all but disappeared from local livestock numbers (Wyckoff and Hansen 1991). Additional fauna within the park includes bobcats, cougars, coyotes, mule deer, elk, antelope, and in the past, bison. Reptiles are spread thin throughout the park, with bull snakes and rattlesnakes both observed in low densities, primarily among rocky outcrops and grassy areas with sagebrush. Finally, numerous species of birds, including crows, eagles, hawks, sparrows, vultures, and even Great Horned Owls, call the cliffs of the Madison Buffalo Jump and its surrounding canyons home.

HISTORY OF ARCHAEOLOGICAL REASEARCH AT MADSION BUFFALO JUMP

For almost a century, Madison Buffalo Jump was an area of immense popularity for both Native American artifact collectors and professional archaeologists. Unfortunately, due to the former, many important archaeological artifacts were recovered without any form of documentation, contextual or geographical, and taken to be part of personal collections. Of the primary bone deposit area, Lew Napton proclaimed, "Most of the deposit is a chaos of pits and trenches dug by relic hunters" (Taylor 1971). Taylor (1971) notes that very few of those early-collected artifacts are available for study. Napton (cited in Taylor 1971) upholds this feeling with his statement, "One is left with the observation that probably there was more excavation done at the site which is unknown and not described than there is that we know about" (Taylor 1971). Below we briefly describe the history of professional and semi-professional archaeology previously conducted at Madison Buffalo Jump. Measurements are provided in feet as per the original investigations. For the UM investigation, we provide measurements in meters (m) in accordance with current standard practices.

Charles A. Kinsey

The first known excavations to take place were conducted by an amateur collector named Charles A. Kinsey, and extended over a number of years during the 1930's. Around 1935, Kinsey dug a pit into the primary bone deposit on the slope, from which he claimed that he recovered a large variety of points (Malouf and Conner 1962). Malouf claimed that some of these points could be typologically dated to as far back as 4,000 years ago.

Regarding an interview with Kinsey, Lew Napton wrote, "Judging from Kinsey's photographs, his major excavation was more than 30 square feet. Kinsey informed the author that he found two distinct bone layers: an 'upper' layer two feet thick, and a 'lower' layer some three to five feet thick. Each layer contained side-notched projectile points. Kinsey also discovered a 'bottom layer,' as he called it, which contained fragments of projectile points larger than those found in the overlying layers" (Taylor 1971).

Two samples were drawn from obsidian projectile points from the Kinsey collection and sent to be analyzed via X-Ray Fluorescence (XRF) in order to determine source affinity and geochemistry; results determined that the source of the obsidian was Obsidian Cliff in Yellowstone National Park (Davis and Brownell 2016). Obsidian artifacts were also dated using the obsidian hydration method, with results indicating a Late Prehistoric age for the site. In addition to projectile points, the Kinsey collection contains cutting, scraping, piercing, and butchering tools (Davis and Brownell 2014). Incidentally, during our 2014 survey, UM identified an inscription with Kinsey's initials and date of investigation in a secluded canyon wall in the interior of the state park.

Roy Austin

The exact date of Austin's excavation is unknown although he clearly "seemed quite familiar with the site in 1939 when apparently he directed a crew from the Carnegie Institute to it" (Taylor 1971; on Lewis's notes from 1947). Among artifacts discovered by Austin and his crew were "Yuma-like" specimens, recovered from a depth of 6.5 to 7.5 feet beneath the surface (Napton 1966). These slender chipped stone "Yuma-like" projectile points measured to be about an inch, or slightly longer, in length, possessed a general triangular shape, and were notch-less (Taylor 1971). Austin and his Carnegie crew similarly compared these projectile points, and their depths, to artifacts identified at Whitehall Cave in 1939.

H.P Lewis and F.F. Sparks

During the summer of 1940, H.P. Lewis and F.F. Sparks excavated a six-foot-deep pit in the "central portion of the kill," the primary bone deposit, and recovered two of the Yuma-like points from the deepest bone layer (Taylor 1971). Lewis described their best example of this type of point, which was made from petrified wood and found at a depth of approximately five feet beneath the surface, as being an inch long and not more than one-quarter inch wide at the base; the point was blunt and it contained no notches. Lewis and Sparks also discovered two more "Yuma-like" points on the surface in one of the ravines. In addition to the "Yuma-like" projectile points found, Lewis and Sparks collected several "ordinary," triangular, side-notched points as well as scrapers and blades. They were also the first to note the presence of buried hearths in the gully walls, though there are no drawings or photographs of the hearths (Taylor 1971).

Lew Napton

Dr. Lew Napton was the first to "make a career" out of investigating the Madison Buffalo Jump, conducting research or reporting on the site for over 20 years. Napton's first experience at Madison Buffalo Jump, in 1944, involved recording his observations on the stone circles and drive lines located on the drive plateau, on top of the jump (Taylor 1971). In addition to discovering that the midden (primary bone) deposit extended for 200 meters downslope from below the jump-off, noting that this area had already been heavily looted (Davis and Brownell 2016). In 1949, Napton mapped a portion of the stone circles in the lower/occupation/processing area, located west of the jump and primary bone deposit. During this time he also extended a trench across his "Ring One," which he described as being made from double-course construction, approximately 12 feet in diameter, and partly overlapped by another similar stone circle (Taylor 1971). This trench was five feet wide by 15 feet long, but not even one foot deep, because he only found one "basically diamond-shaped" projectile point. Napton did note an abundance of petrified wood and splintered bone.

In both 1950 and 1957, Napton again conducted survey, mapping, and testing at Madison Buffalo Jump, though only one map appears to exist regarding these investigations and it is unknown what, if anything, was recovered from the test trenches. During the summer of 1958, Napton excavated what is known as "Test Pit I," with the work supervised by Dr. Carling Malouf. Within the pit Napton interpreted a series of distinct strata layers comprised of bison bone, each approximately 1-1.5 feet thick (Davis and Brownell 2016). Napton's thoughts on the area was that uncontrollable digging ruined most of the bone deposits at Madison Buffalo Jump. During this field session Napton also discovered two hearths that were eroding out of the gully bank in the lower occupation and processing area. One hearth was a foot below the surface and the other was at 1.5 feet, both hearths contained some flaking debris and burned bone, but lacked any significant artifacts (Taylor 1971). Lastly, at some point Napton dug another pit into the primary bone deposit and recovered six projectile points. The date for this excavation is unknown, and Napton did not report the stratigraphy of the trench nor did he describe the points that he collected (Taylor 1971).

Carling Malouf

In 1958, Dr. Malouf took members of a Montana State University (then located in Missoula) archaeology class to Madison Buffalo Jump and excavated a total of 10 sampling trenches (Malouf and Conner 1962). Two trenches,

known as pits "B" and "I" (the trench Napton excavated), were dug into the primary bone deposit area. Both of these trenches contained three well-defined layers of bone deposits, with each being divided by an intervening layer of sterile soil; flaking debris was also found in each bone layer. The bones in the top layer were in the best condition, with some bones still partially articulated and some vertebrae still properly aligned. A core basalt knife was recovered at a depth of 12 inches. A sterile layer of soil existed from 20-29 inches below the surface. The next bone layer was between 30-36 inches and the bones in this layer were in a more advanced state of decomposition than those in the earlier layer. Also present was a thin black line of organic material, indicating that something had been burned. Between 37-42 inches below the surface was another sterile layer. From 45-50 inches below surface more bones appeared, these bones were in an even more fragile state of decomposition. At 50 inches below the surface another thin line of organic debris and burned bones was discovered.

None of the bones in the lowest layers were found to be articulated suggesting waste and indicating that an economic surplus probably characterized the economy of Madison Buffalo Jump for later occupants (Malouf and Conner 1962). Another interesting observation of the bones in this area was the apparent lack of head bones; this could be due to the fragile nature of head bones, or it could indicate that the head bones were deliberately broken in order to obtain the brains which played an important role in the process of tanning hides (Taylor 1971). Malouf and Conner (1962) reported that the projectile points recovered from Pits "B" and "I" were comprised of three shapes: un-notched triangular points, corner-notched points, and side-notched points. Excavation details were not given for the other eight trenches, which were placed along the terraces of the lower occupation and processing area.

In addition to the trenches dug in 1958, Malouf and Conner (1962) was the first to document the presence of "several score" stone circles that were located on a hilltop approximately one-half mile north of the jump (now referred to as the North Ridge), in association with an abundance of flaking debris, mostly of petrified wood. Also identified on this North Ridge area were two "unusually large rock piles," which Malouf postulated to be old forts or eagle-catching pits. However, he noted that these rock features were previously looted, and stated that it is impossible to truly know how they were used (Malouf and Conner 1962). We provide additional information on these rock features in the current report, interpreting them as fasting beds.

Dee Taylor

In 1968, Dr. Taylor conducted excavations at Madison Buffalo Jump and, as a result, produced one of three known artifacts assemblages from Madison Buffalo Jump. During the excavation, Taylor (1971) thought they recovered six ceramic sherds, though the University of Montana's geologist believed otherwise; in fact, only one was an actual potsherd. This sherd was identified within a trench placed between stone circles in the lower occupation/processing area, at six inches below the surface, and was part of the rim.

The lip of the sherd was rounded with a body that slightly curved out below the rim. The exterior surface was smooth with a few visible striations, while the interior surface was rough and pitted. Temper used in the sherd is a course, gravelly black sand or obsidian or basalt (largest visible particle is 5mm in diameter), and the paste used was dark grey/black. In 1960, members of the Montana Archaeological Society

found four ceramic fragments near what was Dr. Malouf's Pit "D" (Napton 1966). None of these ceramic sherds were diagnostic, though in private conversations, Dr. Malouf consistently referred to the sherds as "Shoshone" (Taylor 1971). Based on this information, the display at Madison Buffalo Jump describes the site as an area utilized by the Shoshone, although it is certainly possible that additional regional tribes, including the Crow, Blackfeet, Nez Perce and Salish, also participated in jump events at the site.

PREHISTORY OF THE MADISON RIVER VALLEY

As described above, numerous professional and amateur archaeologists conducted work at Madison Buffalo Jump. In this section, we provide a brief overview of the regional archaeological finds, as well as those found specifically at Madison Buffalo Jump. Several cultural chronologies for the greater western Montana region are utilized to classify the prehistory of the area (Flint 1982; Malouf 1975; Mulloy 1958; and Roll 1982). Herein, we primarily use the chronology established in MacDonald (2012) which includes Paleoindian (12,000-8,000 B.P.), Early Archaic (8,000-5,000 B.P.), Middle Archaic (5,000-3,000 B.P.), Late Archaic (3,000-1,500 B.P.), Late Prehistoric (1,500-500 B.P.), and the Contact period (500-100 B.P.).

To date, a total of 30 known Paleoindian projectile points are documented as being found at Madison Buffalo Jump. During his excavations, Roy Austin identified two "Yuma-like" projectile points- unfluted projectile points which resemble late Paleoindian projectile points (Clark and McFadyen 1983) that were found between 6.5 to 7.5 feet below surface. These "Yuma-like" projectile points were approximately one inch in length and were similarly compared to projectile points discovered at Whitehall Cave from the same depths (Taylor 1971). H.P Lewis and F.F. Sparks found four additional "Yuma-like" projectile points during their time researching Madison Buffalo Jump; these points were also approximately one inch long, un-notched and about one-quarter inch wide. Two of the "Yuma-like" points were recovered from the deepest bone layer in their test pit, five feet below surface, while the remaining two were located on the ground surface in one of the ravines (Taylor 1971). Lastly, a very large majority of the Paleoindian projectile points documented at Madison Buffalo Jump come from Dee Taylor and his excavation in 1968. It was during this excavation that Taylor and his crew recorded and collected 24 different Paleoindian projectile points. Taylor himself stated that these un-notched points must be those labeled "Yuma-like" by H.P. Lewis. Davis and Brownell (2016) referred to one of Taylor's points as being a complete lanceolate projectile point that resembled the 8,800-year-old Ruby Valley Paleoindian point from Barton Gulch, near Dillon, Montana.

Few examples of Early Archaic points or sites are identified in the vicinity of Madison Buffalo Jump, although we report herein on our identification of a Cashman dacite Early Archaic point at Madison Buffalo Jump. Middle Archaic sites are more common in central Montana. At the Sun River site, near Great Falls, Montana, Oxbow points were dated to 5,200 years B.P. putting the existence of this type slightly earlier in Montana than places farther east and north (McLeod and Melton 1986). Middle Archaic archaeological sites present in southwestern Montana include the Myers-Hindman, Rigler Bluffs, and Airport Rings sites. To date, no definitive Middle Archaic projectile points are identified or recovered/documented from Madison Buffalo Jump.

Late Archaic archaeological sites are spread

throughout Montana, ranging from its far northwestern rivers to the southeast corner, with three of note in southwestern Montana: the Schmitt Quarry, the Antonsen Bison Jump, and the Yellowstone Bank Cache sites (MacDonald 2012). Surprisingly, only a handful of Late Archaic projectile points were found and documented at Madison Buffalo Jump. Charles Kinsey claimed he collected a variety of projectile points, of which Malouf and Conner (1962:14) state could typologically date back to "early Forager times, not more than 4,000 years ago." During his 1968 excavations, Taylor also found two Late Archaic projectile points, which he described as being triangular shaped with corner notching, with basal indentations that were manufactured from thin flakes utilizing delicate pressure flaking (Taylor 1971). Davis and Brownell (2016: 8) state:

> "The absence of projectile points in these collections that are diagnostic for the Middle period is remarkable… Suffice to conclude that the dominant occupation at and use of Madison Buffalo Jump was associated with the final period in regional history."

The Late Prehistoric Period is a time in which bison were increasingly exploited by Montana hunter-gatherers. The introduction of the bow and arrow is the defining technological achievement that characterizes the beginning of the Late Prehistoric period, and was utilized for hunting bison, deer, elk, and other game. There are dozens of Late Prehistoric archaeological sites identified across Montana (MacDonald 2012). Based on the known archaeological evidence, Madison Buffalo Jump was most heavily and consistently utilized during this period, as we confirmed in the current study.

Late Prehistoric projectile points were found during many of the prior studies at Madison Buffalo Jump; most notably by Charles Kinsey, H.P. Lewis and F.F. Sparks, and Dee Taylor. Based on Taylor's report (1971), it is known that Kinsey recovered a minimum of four Late Prehistoric projectile points (photo from Taylor 1971:11). Additionally, Taylor (1971:13) notes that Lewis and Sparks collected "several specimens of 'ordinary' (triangular, side notched) points…Our copies of the Lewis manuscript does not include any drawings or photographs." Lastly, Taylor himself recorded and collected a total of 12 Late Prehistoric projectile points. According to Taylor (1971), these points were triangular shaped with shallow side notching, straight to concave bases and showed evidence of fine pressure flaking and retouch.

Based on projectile point typology, Davis and Brownell (2016) conclude that Madison Buffalo Jump was most heavily utilized relatively late in prehistoric/pre-contact times, most likely from 450-200 years B.P. As discussed in more detail later in the paper, the bison bone sample (FS-11, a bison pelvis fragment) that UM collected from 15 cm below ground surface (cmbs) in the processing area (just west of the jump) returned a calibrated radiocarbon age of A.D. 1650 (Beta-388917). Les Davis' obsidian hydration dates of artifacts from Madison Buffalo Jump revealed dates of use between 670 and 1440 years B.P. All of these data suggest that the most intensive period of use of Madison Buffalo Jump was during the Late Prehistoric period.

STRUCTURE OF THE MADISON BUFFALO JUMP CULTURAL LANDSCAPE

As reviewed above, numerous archaeological studies were conducted in and around Madison Buffalo Jump and Three Forks in central Montana. These prior studies established the assemblage of archaeological features that

comprise the Madison Buffalo Jump cultural landscape. Based on these studies, the Madison Buffalo Jump bison hunting landscape consists of five archaeological attributes (Davis and Brownell 2016; Malouf and Conner 1962; Taylor 1971). These include: 1) a grazing/gathering area; 2) drive lines; 3) the jump-off/nick point; 4) primary butchering area; and 5) occupation areas. In this section, we briefly review the prior work within each of these areas of the site. After, we review our archaeological findings within the context of these prior studies.

Grazing/Gathering Area

The gathering/grazing area at Madison Buffalo Jump is located above the jump-off and extends in all directions except for west (the jump); this area encompasses many square miles, especially to the east and southeast (Malouf and Conner 1962). In addition to this area, the bison probably also lived in the Madison River breaks in the bottomlands and over in the Madison River Valley. Many archaeologists believe that corralling the bison into the grazing/gathering area is the single most important aspect of the utilization of buffalo jumps, and this is especially true for Madison Buffalo Jump. According to Dr. Dee Taylor (1971), "The most difficult part of the drive operation must have involved a careful movement of the bison herd west along the plains until the animals had passed over the valley rim and down onto the drive plateau." Until reaching this point, depending on the drive line construction and use, the bison could run off in almost any direction and escape.

Drive Lines/Lanes

According to Taylor (1971), "In many bison jumps the most obvious drive lanes are formed by small rock cairns arranged in V-shaped lines which converge at the cliff's edge." The rock lines at Madison Buffalo Jump follow this composition, as depicted in Figure 3 (Drive Line 2) in the eastern-most uplands of the site. Prior research and surveys conducted at Madison Buffalo Jump identified a total of three rock lines; two of the lines are located on top of the jump, and were used to funnel the bison towards the jump precipice, or nick point/jump-off. Malouf and Connor (1962) identified nine small cairns in the area on top of the jump (Rock Line 3). This drive line is aligned parallel to the north rim of the promontory on which the jump is located. The cairns consisted of anywhere from 2-4 visible stones and were placed approximately 10 feet apart from each other along a general east-to-west direction. Taylor (1971) postulated that these cairns were probably used to support vertical poles that held bits of fur, hide, and/or feathers.

A reconnaissance conducted by the Fish and Game Department (Taylor 1971) initially identified segments of the other two additional drive lines. One drive line (Rock Line 2) consisted of cairns that were 6 to 9 inches (15 to 23 cm) high and extended for over one-quarter of a mile east of the jump; the cairns were situated anywhere from 6 to 20 feet (2 to 6 m) apart. This drive line begins the peninsula-shaped drive plateau/gathering basin. Another shorter row of rock cairns was identified even further east, located at the edge of the canyon lip; however, the land east of Rock Line 2 is now farmland.

The Jump-Off (Nick Point)

The cliff jump, or nick point, was formed by the weathering edge of the thick formation of soft, chalk colored limestone (Figure 4). On top of this formation, the land dips slightly towards the east into an open gathering/grazing area (Taylor 1971). A vertical drop forms the initial jump-off, though the actual distance of vertical drop is debated. Malouf believed the vertical drop to be 10 m (30 feet), while

Figure 3. Southern boundary of Drive Line 2 at Madison Buffalo Jump.

Taylor estimated the drop to be 35 to 40 feet (12 to 14 m), and H.P. Lewis claimed it to be 75 feet (25 m); in actuality, the vertical drop is approximately 25 to 40 feet (8 to 13 m) in the main jump area. Below the steep cliff face, a steep, rocky slope continues for approximately another 150 feet (45 m) before finally tapering off with a slight slope for another 200 feet (70 m) leading down into a perennial stream bed (Malouf and Conner 1962). The main visitors pavilion is another 600 feet (200 m) east of the stream below the jump.

Figure 4. Madison Buffalo Jump Drop-Off/Nick Point. View northeast.

Primary Bone Deposit

Most of the bone fragments identified at the jump are scattered across the steeply sloped area beneath the jump/nick point. Prior research identified very few bones or bone fragments directly at the base of the cliff/jump-off; this was to be expected due to the steep slope. More and more bone fragments were discovered throughout the steep slope, with the largest deposits recorded at the base of the steep inclined slope; indicating that at least the majority of the bison continued to roll down the slope after the initial impact from the vertical drop.

Occupation/Habitation Areas

There are two areas of occupation present at Madison Buffalo Jump: one area is located on what is identified as the North Ridge, and the other, the Lower/Primary Occupation and Processing area, exists downslope from the jump. The North Ridge occupation area is north of the jump across the intervening ravine on a sloping promontory; it is approximately one-quarter mile from the kill site. Initial investigation of this area led to the identification of "several score" stone circles (Taylor 1971). There are no known excavation reports regarding subsurface materials in this area, and Taylor also mentions that bone does not appear to be as abundant in this area compared to the Lower Occupation/Processing area.

The Lower Occupation and Central Processing area (Figure 5) is located approximately 984 feet (300 m) west and downslope of the jump itself. There is a gully/creek bed that cuts through the center of this area, running

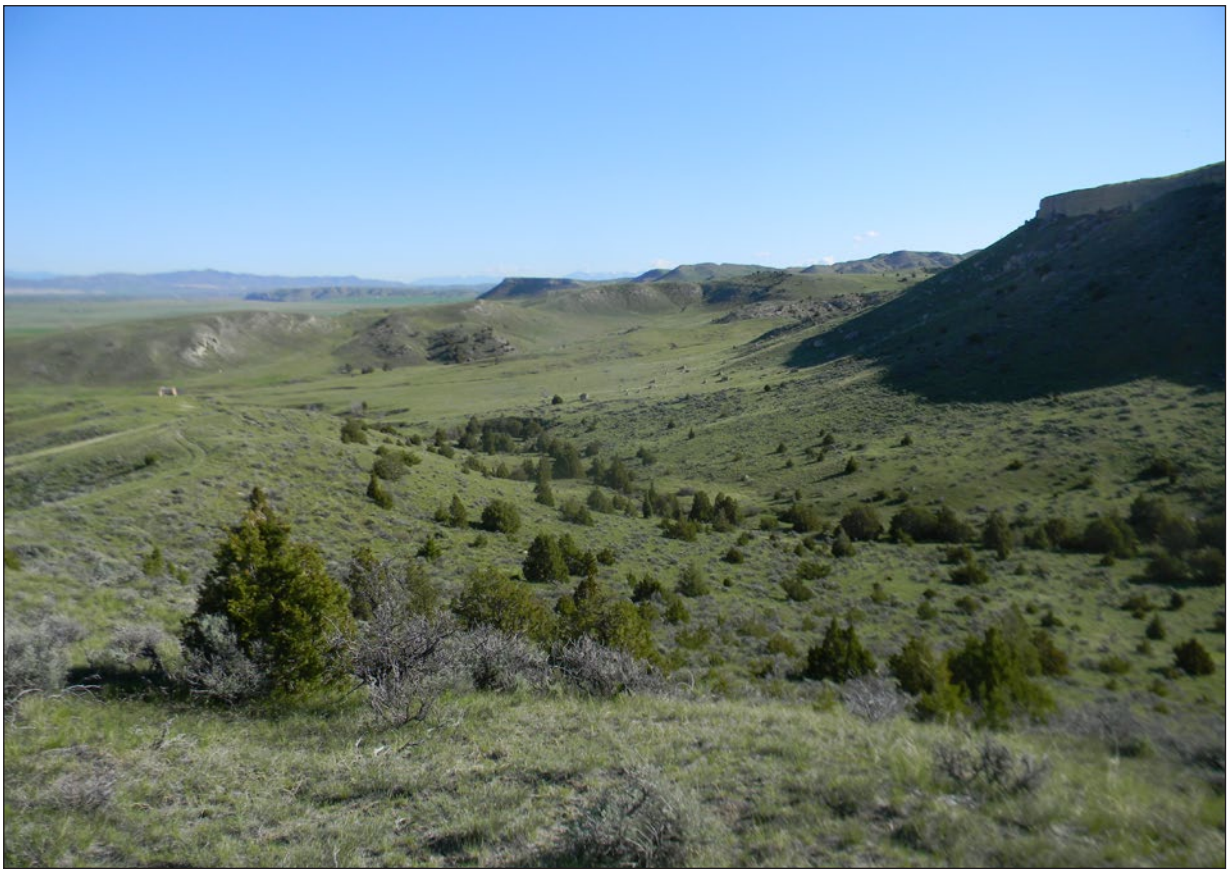

Figure 5. Lower Processing Area between the Interpretive Center to the west (left) and the Buffalo Jump to the east (right).

roughly in a northwest direction; stone circles are situated on both sides of this stream bed, though most are found on the southern side. Malouf and Connor (1962) identified these stone circles as being single-course stone circles. Intermixed among the stone circles in this area were many different kinds of artifacts, including stone projectile points, chips, flaking debris, domestic tools, and bone fragments.

RESULTS OF THE UM ARCHAEOLOGICAL SURVEY AT MADISON BUFFALO JUMP

On the heels of these prior studies, the University of Montana archaeological survey of Madison Buffalo Jump State Park identified a multitude of archaeological materials and features. Past work at Madison Buffalo Jump yielded excellent information surrounding the lower occupation/processing area (Taylor 1971), but little information was collected regarding the drive lines and primary bone deposit/butchering areas. Below, we describe the UM archaeological survey results of the various features of Madison Buffalo Jump (with measurements, as previously mentioned, in meters). We divide our survey results into four separate sections: 1) buffalo jump features; 2) stone circles; 3) stone tool manufacture areas; and 4) historic/modern inscriptions. We focus on the first three areas of Madison Buffalo Jump associated with the Native American use of the jump and only briefly touch on the historic/modern inscriptions. For more information regarding the historic inscriptions, we refer the reader to

a master's thesis written by Jay Vest (2019). In addition, more details regarding the pre-contact Native American survey results are available in Bachman (2016).

MADISON BUFFALO JUMP FEATURES

As described previously by Malouf and Connor (1962), Taylor (1971) and Davis and Brownell (2016), Madison Buffalo Jump is comprised of five distinct, but interrelated archaeological features: drive lines, the grazing/gathering area, the jump off/nick point, primary butchering/bone deposit area, and occupation/processing areas. UM surveyed all of these areas, with results presented below.

Drive Lines

As reported by Davis and Brownell (2016), past research at Madison Buffalo Jump identified two central areas of drive lines. One drive line was identified on top of the jump, located along its northern rim. A second drive line was previously identified along the southern rim boundary, above the jump and to the east. Unfortunately, these prior recordings at Madison Buffalo Jump failed to provide specific details regarding cairn numbers and locations, quantities and composition of the stones comprising the cairns, or drive line length. In response, we provide these additional details about the two known drive lines, as well as information on two "new" drive lines not previously reported in earlier studies.

Drive Line 1

Drive Line 1 is located in the area of Madison Buffalo Jump that UM refers to as the "North Ridge." The North Ridge is an upland flat located approximately 500 m north of the main jump, with a steep canyon between the two areas. In addition to the drive line, the North Ridge area contains 38 stone circles and two rock features (described later in the paper).

Drive Line 1 consists of 24 cairns, or rock piles, that run for approximately 106 m, in a general northwest direction, down the edge of a plateau rim west of the stone circle area. Each cairn comprising Drive Line 1 consisted of 1 to 4 large orthoquartzite cobbles that were placed approximately 4 to 7 meters apart (Figure 6). It is possible that this drive line may actually be the remnants of a historic/modern fence line. UM identified and recorded a series of six intermittently placed wooden posts near Drive Line 1. The wooden posts do not appear to be related to the cairns and are potentially modern updates of an older cairn-supported fence line. They also could be part of a fence reconstruction associated with the remapping of property boundaries in the early 20th century (MacDonald 2014).

While Drive Line 1 could be an historic fence line, the sequence and placement of cairns most closely resembles a prehistoric drive line, and in following its directionality, would have pressed bison over a steep terrace edge that was utilized as a nick point; possibly as an alternate kill site for any bison that escaped the primary gathering basin/drive lane by heading north instead of west. UM conducted a careful survey of the terrace margin located below this potential jump location but it yielded no bone, although, if this spot was utilized long enough ago, bone may not be visible on the ground surface.

Drive Line 2

Drive Line 2 is located in the south-eastern portion of Madison Buffalo Jump State Park, beginning at the far eastern boundary. This drive line was first discovered around 1970, during a reconnaissance conducted by the Montana Fish and Game Department (Taylor 1971). Davis and Brownell (2016) provide a map identifying the approximate location of this drive line; however, they do not provide specific details such as the drive lines exact location, number of cairns

Figure 6. Drive Line 1 rock cairns. View west.

associated with the line, or the distance that the drive line spans.

UM first encountered Drive Line 2 when a crew member identified one of the drive line's cairns while conducting standard pedestrian survey of the far eastern slopes of the park boundaries. The UM survey identified an additional 58 cairns. While only a few of the cairns for Drive Line 2 contain single large cobbles, the majority of them vary in quantity, containing anywhere from 2 to 11 small to medium sized cobbles. The functional need for cairns consisting of several rounded cobbles largely supports the interpretation that the cairns were likely used to support a post for the drive line. The cairns of Drive Line 2 are all (primarily) comprised of the local, readily available orthoquartzite cobbles that exist in the Madison Plateau surface gravels abundantly present in this area of Madison Buffalo Jump.

The 59 cairns that comprise Drive Line 2 extend from the far eastern boundaries of Madison Buffalo Jump (at a farm field) for approximately 350 m, in a general east-west direction, essentially to the rim of the buffalo jump. Cairns were placed anywhere from 4-8 m away from each other, though occasionally there would be a gap of 25-40 m between cairns. Drive Line 2 acted as a marker for the southern boundary of the gathering basin/drive lane, and as a physical boundary for the bison entering the gathering basin/drive lane from the east through the open meadows (meadows that are now farmland). Located approximately 400 m to the north is a ridgeline that served as a natural, northern boundary for the gathering basin/drive lane. Drive Lines 3 and 4 appear to be a final extension of the drive lane, funneling the bison from the top of the jump toward the nick point and over the jump.

Of the four drive lines that UM identified at Madison Buffalo Jump, Drive Line 2 was the most substantial both in length and importance. This drive line served as a boundary to keep the bison within the gathering basin/drive lane and move them toward the jump. This was possible due to the substantive composition of the many well-built cairns. The construction and maintenance of this considerable drive line was due to the lack of any acceptable natural boundaries to serve as a southern boundary for the gathering basin/drive lane, such as the ridgeline used for the northern boundary. Without a drive line situated in this location it is likely that many of the bison would have wandered off and avoided the push through the drive lane by escaping to the south.

Drive Line 3

Drive Line 3 is located on top of the jump itself, running almost parallel to the northern rim. This drive line was first identified and recorded by Malouf and Connor (1962) and at the time of its discovery only nine cairns were documented. Based on the UM survey, Drive Line 3 consists of a total of 25 cairns, the majority being comprised of a single large stone, though a few cairns consisted of multiple stones. The drive line stretches approximately 175 m in an east-west direction, with cairns spaced out every 7 m on average. Drive Line 3 acted as the northern boundary of the primary drive lane, and ultimately funneled the bison that made it down to the gathering basin to the final nick point.

Drive Line 4

Drive Line 4 is located on top of the buffalo jump and is situated south of, and runs approximately parallel to, Drive Line 3. This drive line is comprised of 23 primarily larger, single-stone cairns. It is slightly larger than Drive Line 3, stretching to a length of approximately 206 m, with cairns placed approximately 9 m apart from another. However, there were a few gaps of 20 m, and one

of 60 m. Just as Drive Line 3 marked the northern boundary of the final portion of the drive lane, Drive Line 4 served as the southern boundary. Throughout the area surrounding Drive Line 4, especially to the west and south, numerous lithic scatters of considerable size were identified (discussed more below). Drive Lines 3 and 4 were used together, to create the primary jump lane, with the intent of funneling the bison toward the nick point at the jump's western edge.

Gathering Basin

The Gathering Basin, otherwise known as the Drive Lane, covers the area between Drive Line 2 to the natural ridgeline located approximately 400 m north of Drive Line 2, and expands east from Drive Lines 3 and 4 to the eastern boundary of Madison Buffalo Jump; an area that encompasses approximately 145,000 square meters, or 36.5-acres. In the past, the Drive Lane extended further east into an area now used as farmland. At Madison Buffalo Jump, this space is widest on its eastern edges, stretching north of Drive Line 2, up 400 m to the natural ridgeline/northern boundary. This area gradually narrows as it progresses west, forming a funnel into Drive Lines 3 and 4, ultimately leading to the jump precipice. However, unlike most other buffalo jump gathering basins/drive lanes, which are spacious and flat, Madison Buffalo Jump's gathering basin consists of extremely undulating terrain (Berry 1943).

For most buffalo jumps, bison herds were rushed into the gathering basin, through the drive lines, and pushed further through the drive lane and over the jump precipice in a single effort (Taylor 1970). If this drive process were utilized at Madison Buffalo Jump, due to the steep and incised terrain of its gathering basin, the bison likely would avoid the jump and instead escape through one of the several steeply-incised drainages located away from the jump. It is for this reason that it is more likely that one of two other drive processes took place at Madison Buffalo Jump. Once herded into the gathering basin the bison would have either: a) been separated into smaller groups within the gathering basin itself, in essence allowing for multiple, smaller scale kill events to take place; and/or b) the bison herd, in its entirety, was slowly ushered through the steep drainages into the more open meadow on top of the jump just before the precipice, from which the bison were driven off in one final push.

Regardless of which method was actually incorporated by native people occupying Madison Buffalo Jump, it is apparent that the drive process was complex and required an extremely high level of coordination consisting of multiple, smaller staging events prior to the ultimate kill episode. In either case, once the bison herd was coerced into the gathering basin/drive lane, Native Americans, due to the complex drive process, likely retained the bison there for several days leading up to the kill event.

Although the gathering basin/drive lane is arguably one of the most important aspects of a successful buffalo jump, since it is the area where the bison are gathered together before the process begins, there is generally little visible archaeological evidence associated with these areas (Wirth 1964). At Madison Buffalo Jump, the only archaeological evidence present was an occasional, dense lithic scatter and the cairns comprising Rock Line 2. However, just south of the gathering basin, and Drive Line 2, a possible prehistoric quarry was identified (discussed more below) evidenced by thousands of flakes. This would have allowed for the production of stone tools while simultaneously offering an excellent vantage point from which to keep an eye on the bison, while still keeping a safe distance.

Primary Bone Deposits

The primary bone deposit lies just below (west) of the cliff face, or nick point, and continues downslope for 200 m to the stream below the jump. This high-density area of bone fragments surrounds the state park trail that begins at the base of the actual jump location/precipice and increases in concentration as the trail wends down the steep slope toward the lower occupation and processing area, or Stone Circle Area 4 (to be discussed). Several other previous researchers of the Madison Buffalo Jump (Malouf and Conner 1962; Taylor 1971; Davis and Brownell 2016) identified the primary bone deposit as being in this same area.

In total, 246 bones and bone fragments were discovered and recorded by the UM crew during survey work in 2014 of the primary bone processing area. Though some bone fragments were scattered throughout Madison Buffalo Jump State Park (likely due to natural animal deaths), the vast majority of bones identified on the surface establish the parameters of the primary bone deposit located beneath the jump's precipice.

Of the 246 total bones recorded, 243 were determined to be bison bone fragments, though the kind of bone was not discernable, and two were unidentified mammal bones. A large variety of bone types does exist among the 20 individual bones and bone fragments that were identifiable. These included one small rodent skull (found in one of the drainages in the gathering basin); five fragments of bison enamel; four bison tooth fragments; one bison vertebra; four bison long bones; two bison rib fragments; one bison carpal; and one Barstovian era fossil, along with two unidentified bison bones, which were noted as being possibly fossilized. Additionally, two bison bone fragments (FS - 10 and 11 in our collection) were recovered from a blowout in the trail west of the primary bone deposit, one of which was a larger pelvis fragment that was submitted for radiocarbon dating.

Occupation Areas and Stone Circles

During the fieldwork conducted at the Madison Buffalo Jump State Park, UM recorded and mapped 78 stone circles across four different occupation areas. Many more details of the stone circles, including individual plan view maps of each circle, are included in Bachman's 2016 M.A. thesis. In this section we describe the assemblage of stone circles in the four occupation areas within the state park.

Stone Circle Area 1

Prior survey and excavations at Madison Buffalo Jump documented three stone circles in Stone Circle Area 1, in addition to the presence of Shoshone ceramics. The fieldwork conducted by UM was only able to identify one remaining stone circle (Stone Circle 1) in the area and no ceramics were discovered. Stone Circle 1 is located northwest of the Madison Buffalo Jump on a small finger terrace adjacent to a small ephemeral creek that stretches east-to-west through the central portion of the state park. At no point, during any of the periods of fieldwork in 2014, was flowing water observed in the creek bed.

Stone Circle 1 measures ca. 4 m in diameter, similar to a large number of stone circles in the park, though approximately one meter smaller than the average size of all stone circles at Madison Buffalo Jump (4.9 meters). The stone circle consists of approximately 15 medium to large sized cobbles, which were likely obtained from the (now dry) stream bed and finger ridges surrounding the ridge on which the circle lies. UM was unable to identify a door location for Stone Circle 1. A dense lithic scatter comprised of white chert and petrified wood flaking debris is associated with this circle.

Figure 7. Stone Circle 16 on the North Ridge, with the Madison Buffalo Jump in the background. View southwest.

Stone Circle Area 2 (and Fasting Beds)

Located in the North Ridge portion of the state park, near its northern boundary, Stone Circle Area 2 is approximately 600 m upslope and to the northeast of Stone Circle 1. Many of the previous researchers of Madison Buffalo Jump identified the presence of stone circles in the area, though none documented them in detail. For this reason, UM surveyed the entire north ridge area, identifying a total of 38 stone circles (Stone Circles 2-39) encompassing an area of 17,510 square meters of this upland flat landform (Figures 7 and 8). We also identified two probable fasting beds in this area.

The stone circles located in Area 2 varied in size with diameters ranging from 3.5 (Stone Circle 8) to 7 m (Stone Circle 4); though they were remarkably consistent for the most part,

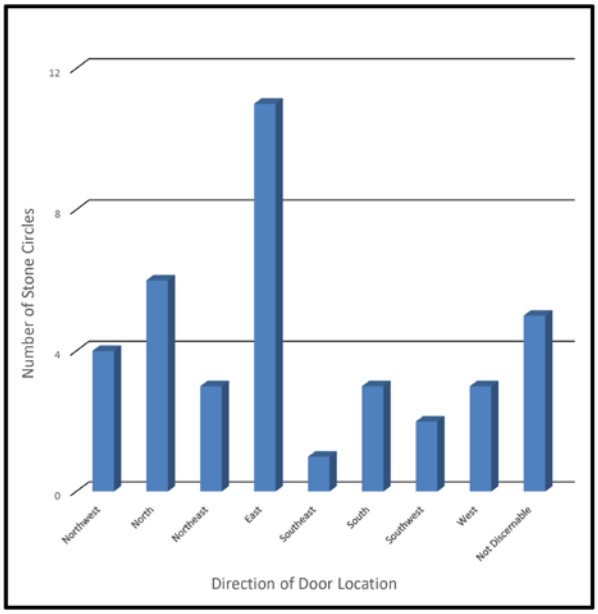

Figure 8. Summary chart of door locations in stone circles in the North Ridge Area.

Figure 9. Photograph of Rock Feature 1 (possible fasting bed) in Stone Circle Area 2 on edge of ridge north of the main Madison Buffalo Jump (background).

with the majority of stone circles measuring approximately 4-5 m in diameter. The average diameter for stone circles in Area 2 is 4.8 m, very close to the average of all stone circles documented at Madison Buffalo Jump in 2014. Stone circles in Area 2 varied greatly in the number of rocks used to construct each stone circle; ranging from 27 rocks (Stone Circle 10) to 106 rocks (Stone Circle 20), with the average number of stones for each circle in Area 2 being 55 rocks. When doors are distinguishable, they are generally present somewhere along the east facing edge of the circle; however, a few of the stone circles exhibited either no gaps or too many to be able to discern where the door was located. The purpose for multiple gaps in the rocks might be evidence of recycling by later occupants of the site.

UM identified two possible fasting beds (Rock Features 1 and 2) in Stone Circle Area 2. Figures 9 and 10 show Rock Feature 1, while Figure 11 shows Rock Feature 2. Both rock features are comprised of numerous cobbles in a rectangular shape (ca. 2x3 m) on a west-facing ridgeline, overlooking the wide Madison River Valley. These rock features were identified by prior researchers, though each offered their own perspective as to their function. Malouf believed the rock features to be old forts, or perhaps eagle catching pits; while Taylor suggested

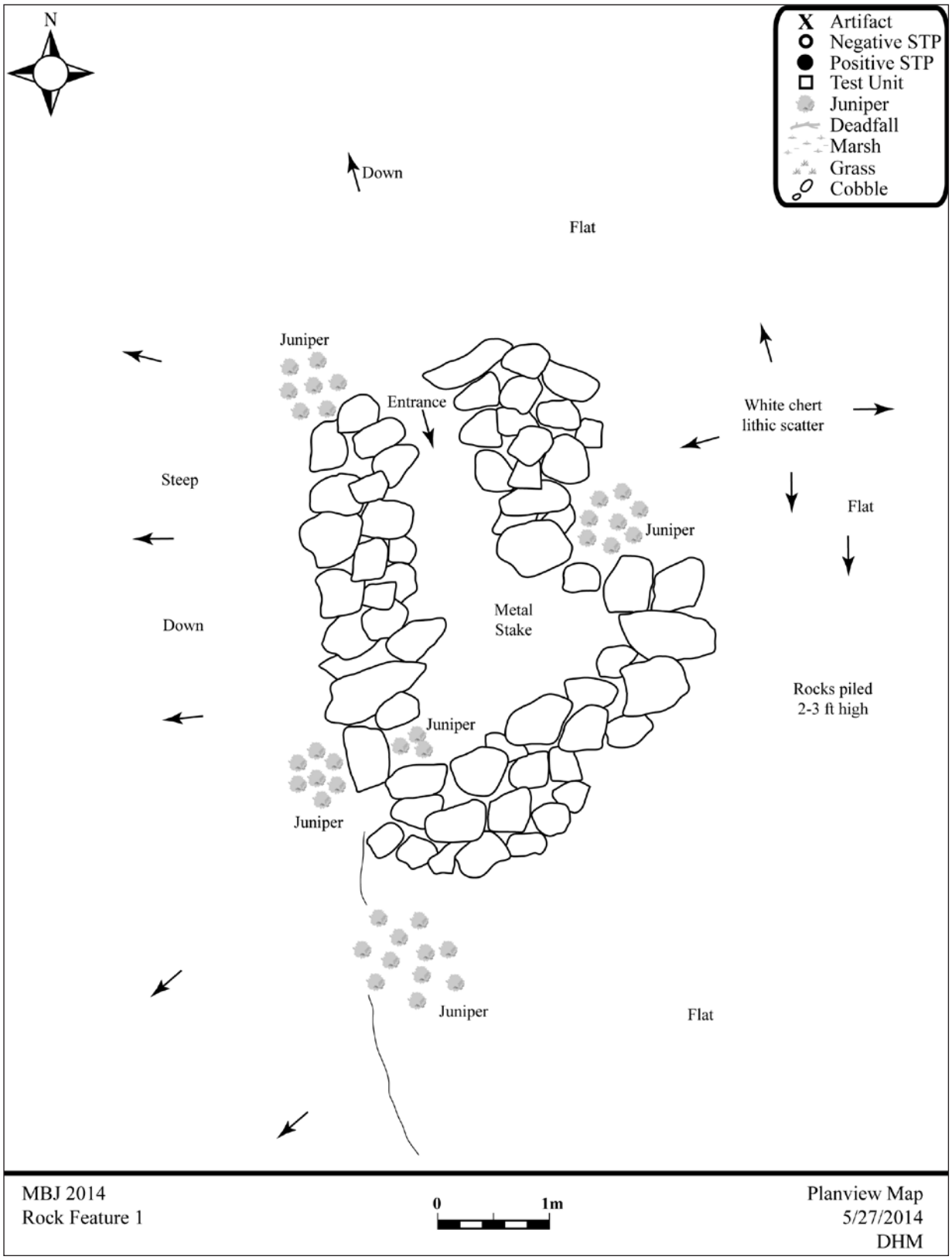

Figure 10. Sketch planview map of Rock Feature 1 (possible fasting bed) in Stone Circle Area 2.

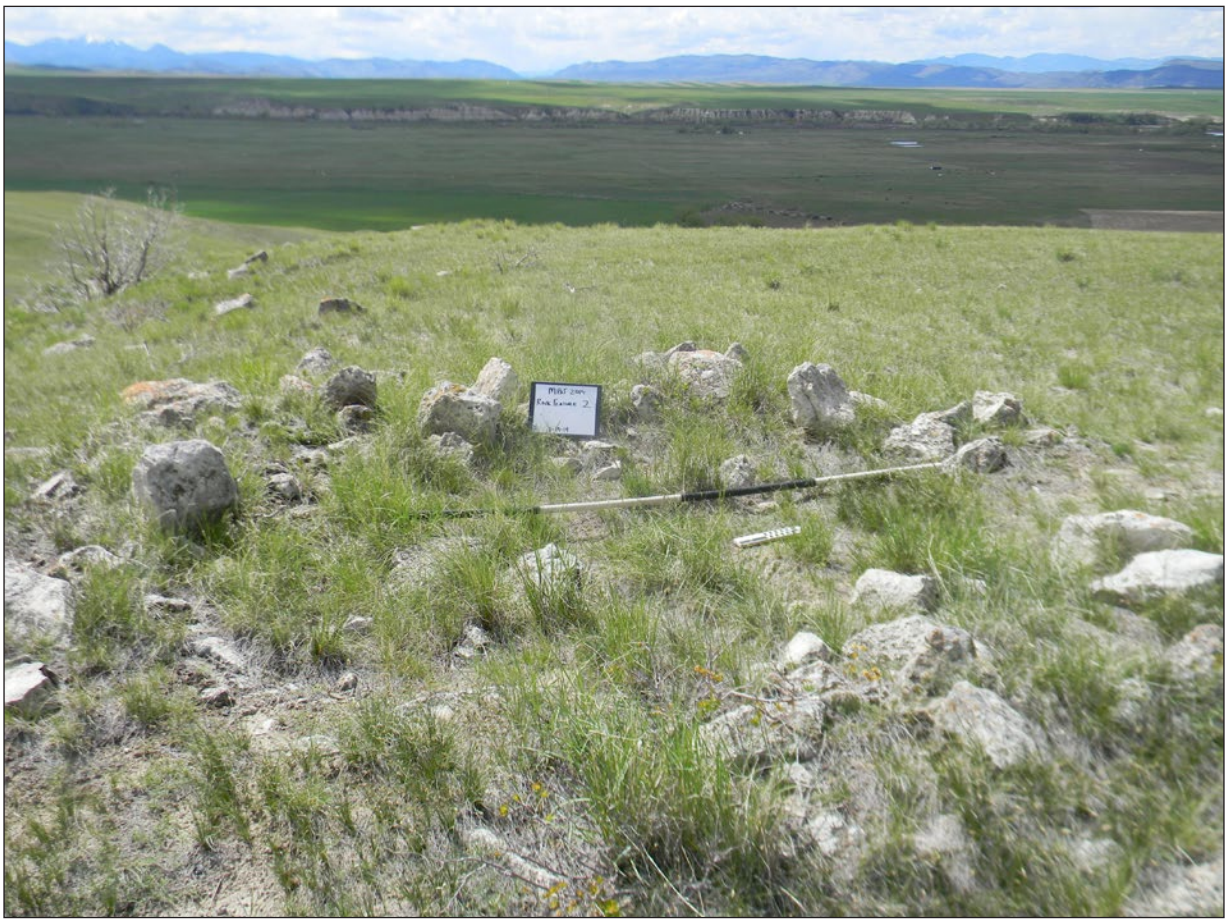

Figure 11. Rock Feature 2 (possible fasting bed) in Stone Circle Area 2. View northwest across Madison River Valley.

a ceremonial function, with an emphasis on use as possible sweat lodges (Taylor 1971). Lewis believed the rock features were the remnants of graves (Taylor 1971). Below, we discuss an alternative explanation, that the features are fasting beds.

For many regional Native American tribes, including the Shoshone and Crow, fasting beds are rock structures built to protect individuals from the elements during a multi-day fasting event. Fasting was an important cultural practice, for both men and women, throughout the history of these two tribes, both of which used Madison Buffalo Jump (Brien 2015). Fasting is a voluntary process that involves going without food or water for a set number of days, usually 3-4, in hopes of encountering a spiritual helper given by the creator; or the ritual is completed to fulfill a vow (Brien 2015). Fasts are carried out in special places with unique geological characteristics such as the summits of mountains, high points in the landscape, or near thermal features. After selecting a suitable location, the faster built a rock structure known by the Crow as an *Alaxape/bed*. The bed was either U-shaped, or in some cases in the shape of an oval depending on the preference of the faster. These fasting beds become much like family landmarks; extremely important places in the history of each family.

We interpret these two rectangular rock structures in the North Ridge area of Madison

Buffalo Jump as fasting beds. Their overall sizes match those of recorded fasting beds in Brien's 2015 Crow study. In addition, they are located on the edge of the high plateau with a vast panoramic view of the Madison River Valley below (see Figures 9 and 11). They were likely used on a different occasion than those of the associated stone circles, probably during a period in which the area was not used as an occupation area, but instead provided isolation for the fasting event.

Given the location of the structures at Madison Buffalo Jump, both in relation to the ridge edge, the panoramic view, and their architectural similarity to the fasting beds discussed by Brien (2015), it seems reasonable that these two rock features might have functioned as fasting beds. While we cannot determine cultural affiliation, it is known that both the Crow and Shoshone used such structures and possibly produced the ones at Madison Buffalo Jump. As discussed above, fasting is an important cultural practice for both groups, in all aspects of life, and thus was likely practiced for the momentous occasion of a large-scale bison hunt. Additionally, Brien's (2015) findings allowed him to confidently postulate that circle or oval shaped fasting beds are thought/appear to be reservation era (newer) beds. This age determination falls within the Late Prehistoric use of the lower occupation/processing area.

Stone Circle Area 3

Stone Circle Area 3 is located on the flat area of the Madison Buffalo Jump itself and contains seven stone circles (Stone Circles 60-66). At first glance, the stone circles present in Area 3 appear to be significantly larger than the other stone circles at Madison Buffalo Jump. However, the average size is equal to that of the overall average at Madison Buffalo Jump (4.9 m). Compared to the stone circles in Area 2, the number of visible rocks pertaining to the stone circles in this area are much fewer (likely due to thick grass); the average is only 34 rocks per stone circle, with a range from 10 rocks (Stone Circle 65) to 61 rocks (Stone Circle 60). Each stone circle in Area 3 contained a discernable doorway (Figure 12), though a placement pattern for these circles is less prevalent than the circles in Area 2. Though no exact direction stood out, all but one of the stone circles in this area exhibited a doorway situated towards the east-west horizon.

Three of the stone circles in this area lie adjacent to one of the more popular state park trails leading up to the jump overlook. These stone circles are much more "complete" than the others in Madison Buffalo Jump and also contain several rocks that are not buried, leading to the presumption that these circles were maintained and/or refurbished over time (possibly by park visitors). The remaining four stone circles in Area 3 are located off of the trail and consist of several rocks that are in a buried context and do not appear to be refurbished.

Stone Circle Area 4

Stone Circle Area 4, also referred to as the 'Lower Occupation and Processing Area,' is the most well-documented of any stone circle area at Madison Buffalo Jump (Taylor 1971). As part of the fieldwork conducted in 2014, UM remapped the distribution of the remaining visible stone circles in the area, counting a total of 32 circles (Stone Circles 40-59; 68-79). These are located in a dry creek bottom setting below the jump to the west. This area is interpreted as being the camp and processing area, and was a primary area of focus for most of the previous archaeological work at Madison Buffalo Jump, including numerous excavations conducted by Malouf, Napton, and Taylor (see previous discussion). The modern visitor pavilion is located up the steep hill immediately west of this occupation area.

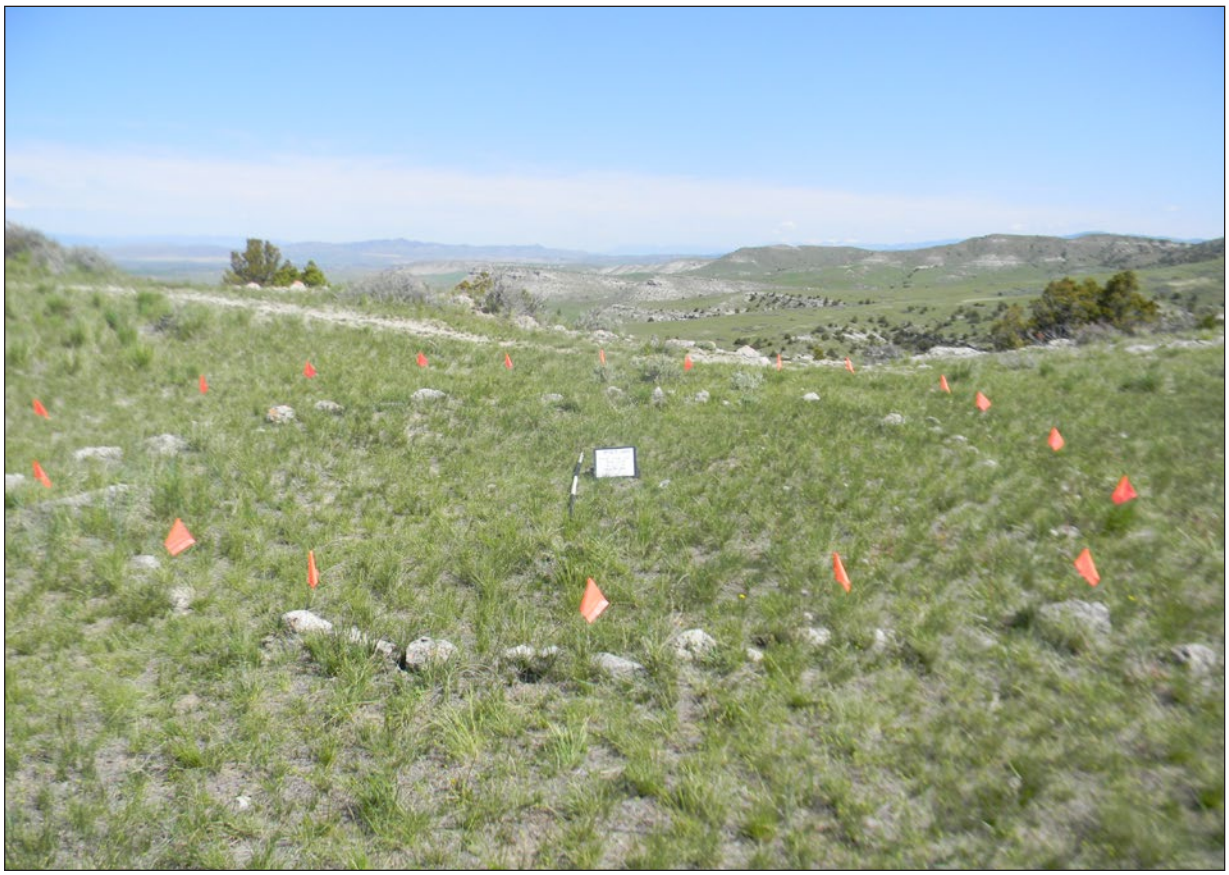

Figure 12. View north across Stone Circle Area 3 with example of modern refurbished stone circle.

The stone circles in Area 4 are very similar in size to each other, with the majority of the circles measuring ca. 5 - 5.5 m in diameter; the average diameter for the stone circles in area 4 measure ca. 5.1 m, making them the largest group in the park. A few of the stone circles measure larger than the average for the area; however, these circles also were likely refurbished at some point given their locations within a heavily visited area of the park. The variety in the number of rocks present and visible that constitute the stone circles in Area 4 are very similar to the stone circles in Area 3. The average number of rocks used for the circles in Area 4 equals 29; with a range from 11 rocks (Stone Circle 51) to 58 rocks (Stone Circle 58). When distinguishable, such as those in Area 2, the doors for the stone circles in Area 4 are generally present along the eastern edge of the circle.

Stone Circle Area 4 is adjacent to the primary creek drainage at Madison Buffalo Jump and flows from an area south of the jump in a northwesterly direction passing below the jump to the west; from here the creek continues west outside of the boundaries of Madison Buffalo Jump heading towards the Madison River. During the UM fieldwork, no water was observed in the creek, yet it is clear that water was present and did flow during the snow melt in early spring. Out of the 32 stone circles in the area, approximately 75 percent (24-26) are located on the terrace west of the creek, while the remaining 25 percent (6-8) lie to the east

and northeast of the creek.

Bison Bone Radiocarbon Dating Results

UM radiocarbon dated a bison bone fragment (Figure 13) from Stone Circle Area 4; its location is shown in Figure 14. This is the only radiocarbon date ever assayed from Madison Buffalo Jump. A significant portion of the creek-side was heavily eroded just below the west-side stone circles due to water running off the main hiking trail into the creek. UM documented this creek/trail blowout, and in the process collected two bone samples and one charcoal sample from the eroded terrace wall. One bone sample (FS-11 from our collection) was submitted for radiocarbon dating (Beta-38897). The bison pelvis fragment (Figure 13) was recovered 15 cm below surface and returned a calibrated radiocarbon age of A.D. 1650 (Cal B.P. 300) with a range of two sigma 95% probability dates, including: Cal A.D. 1525-1555; Cal A.D. 1630-1665); and Cal A.D. 1780-1795. The one sigma 68% intercept is Cal A.D. 1640-1660. The Late Prehistoric date coincides with obsidian hydration information Les Davis collected from Madison Buffalo Jump artifacts which suggest dates of use of between 670 and 1440 years B.P. The UM radiocarbon date supports the utilization of Madison Buffalo Jump during the end of the Late Prehistoric period, just prior to the Contact period (Davis and Brownell 2016).

Figure 13. Bison pelvis sample (FS 11) collected for radiocarbon dating by UM.

Stone Tool Manufacture Areas

While much of the prior archaeology at Madison Buffalo Jump documented the buffalo hunting cultural landscape, UM also recorded abundant evidence that the area was utilized by Native American hunter-gatherers for raw lithic material procurement and stone tool production. Numerous production areas are associated with occupation areas and stone circles, but UM also identified a small chert quarry, discussed below.

Chert Quarry

The primary areas of stone tool manufacture are located just to the southwest of Drive Line 2. This area is approximately 600 m west and downslope of the eastern state park boundary. The jump/nick point is 800 m northeast. White chert and various colors of petrified wood are present within the undulating slopes of the Madison Valley Formation deposits in

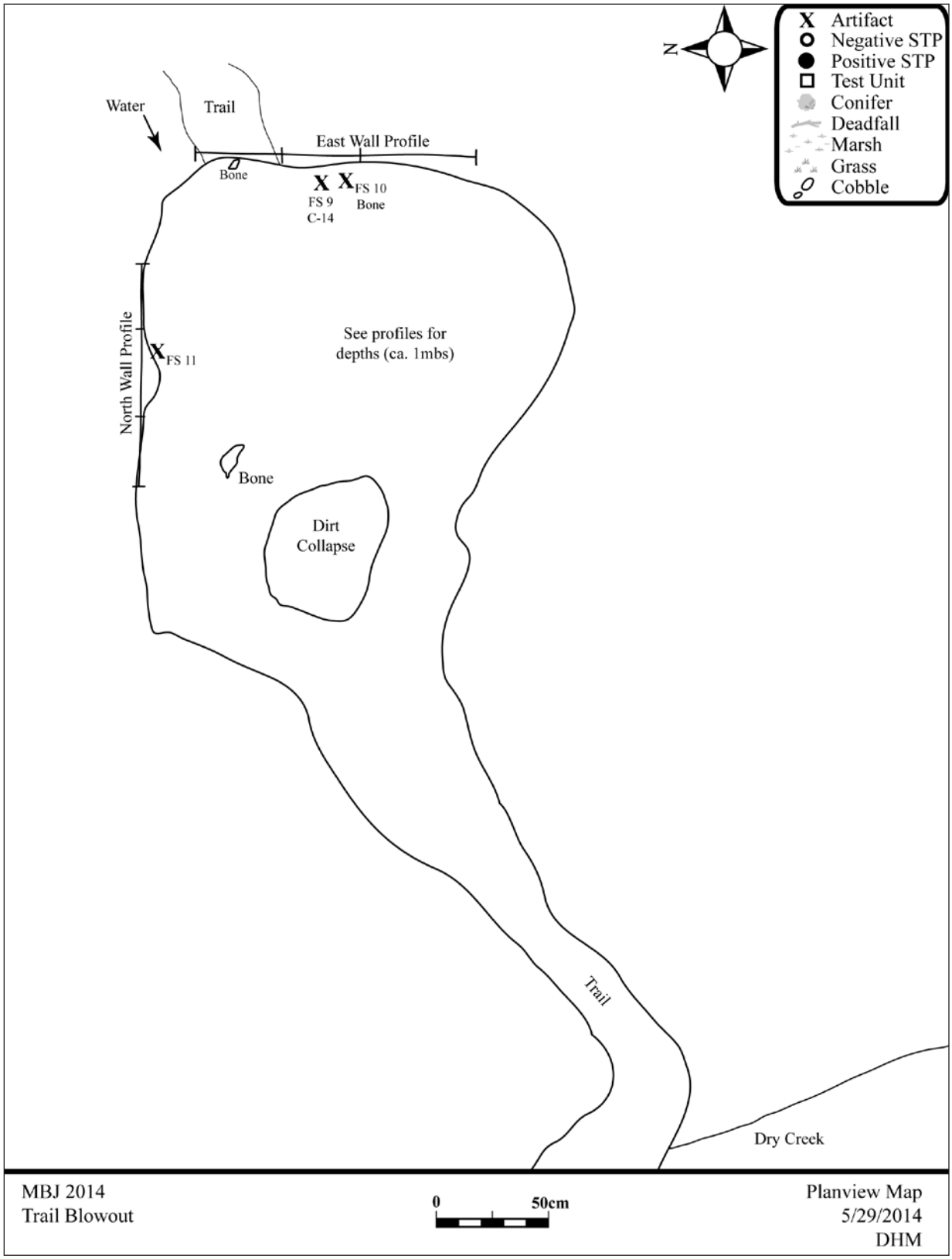

Figure 14. Sketch map of location of bone sample collected for radiocarbon dating by UM.

Figure 15. UM Crew member in one of the chert quarry pits with a 2-meter measuring stick.

this area. One major lithic manufacturing area contained three large pits that are either prehistoric quarry pits (Figure 15), or possibly the locations of modern/historic looters pits associated with the dense lithic concentration. The quarry area extends 43 m north-south by 43 m east-west, encompassing a total area of 1,849 square meters. In total, 179 white chert and petrified wood flakes were recorded from within the quarry area, though thousands more are scattered amongst the quarry pits. No diagnostic artifacts denoting a quarry age were identified in this area.

Non-Quarry Lithic Scatter Analysis

Besides the quarry, several additional lithic production areas exist throughout Madison Buffalo Jump. These areas include the top of the buffalo jump, the North Ridge, and the Lower Occupation/Processing area. Each of the four areas of stone circles also contains significant amounts of stone tool manufacture flaking debris, as well as some stone tools. Numerous flakes were identified directly adjacent to Stone Circle 1, with many more recorded just south of Stone Circle Area 4/Lower Processing Area, especially in the ravine/dry creek bed. Stone

Circle Area 4 is also the location of where an end scraper was found. This find, along with the copious amounts of bone fragments in the area, supports the claim that Stone Circle Area 4 was also the Primary Processing area following a kill event.

Stone Circle Area 2 also contained a sizeable number of flakes scattered throughout. These flakes, similar to the rest of Madison Buffalo Jump, were produced from either white chert or various colors of petrified wood. The largest concentration of flakes in this area was situated near Rock Feature 1 (possible fasting bed). The final area containing a high density of lithic artifacts at Madison Buffalo Jump is adjacent to Drive Lines 3 and 4 on top of the jump near the northern rim. This area covers most of the southern and western portions of the top of the jump, and encompasses approximately 35,000 square meters and consists of primarily white chert and petrified wood flakes, similar to the rest of the flakes identified at Madison Buffalo Jump. The flakes documented here were comprised overwhelmingly of white chert, with some petrified wood. With the quarry area so near to the top of the jump, and consisting of the same raw materials, it is highly plausible that the flakes on top of the jump were almost exclusively produced from materials collected from the quarry. This is also the portion of the park most densely covered with lithic debitage.

In total, 456 individual lithic artifacts were recorded by UM at Madison Buffalo Jump (not including flakes recorded from the quarry area). As discussed above, a large majority of the flakes identified at the jump were produced from white chert or petrified wood. Flaking material identified by UM includes chert (white and other colors), obsidian, orthoquartzite, and petrified wood (reddish, orange, grey/brown/tan, etc.). No diagnostic projectile points were identified at any of the lithic concentrations located within Madison Buffalo Jump.

Figure 16. Early Archaic Projectile point (produced from Cashman Dacite) collected by UM at Madison Buffalo Jump.

Early Archaic Projectile Point and Lithic Sourcing

Only one diagnostic projectile point was identified by UM during survey at Madison Buffalo Jump, a dacite Early Archaic side-notched projectile point (Figure 16). The point was found on the ground surface approximately 600 m southwest of the main nick point and slope area. The point was recovered on a terrace of a small creek covered by thick willows and brush. This point

is 44.4 mm long and 25.7 mm wide at its base (notch width of 16.2 mm), and measures 6.5 mm in thickness.

In addition to the Early Archaic projectile point, UM collected 14 dacite and obsidian flakes that were submitted for ED-XRF sourcing by Richard Hughes. Of the 15 total artifacts submitted for sourcing, seven were produced from obsidian and eight were produced from dacite. Five of the obsidian flakes were sourced to Obsidian Cliff in Yellowstone National Park, northwestern Wyoming, while the other two were sourced to the Bear Gulch obsidian quarry along the Montana/Idaho state line west-southwest of Madison Buffalo Jump.

Eight dacite artifacts were also submitted for ED-XRF sourcing. The Early Archaic point (FS 5) was sourced to the Cashman dacite quarry, along with two other flakes. As reviewed in Baumler (1997), the Cashman dacite source is located within the Madison River Valley area, approximately 48 km south of Madison Buffalo Jump. The remaining five dacite flakes were procured from unknown sources; however, all five appear to be more closely related to dacite from the Cashman quarry than either the Grady or Big Belt sources (Hughes 2014). Therefore, it is likely that one or more unidentified dacite sources lie within or near the Madison River Valley that is chemically similar to dacite from the Cashman source near Ennis.

Examining the material types of the artifacts sourced from Madison Buffalo Jump can reveal patterns in stone tool preference in the Madison River Valley, as well as trade/movement patterns. Due to the high density of naturally occurring chert and petrified wood, it is not surprising that the primary source for lithic manufacture observed at Madison Buffalo Jump is comprised of these local materials. However, the presence of both obsidian and dacite artifacts, each procured from multiple, different sources tells us that these more "exotic" raw materials were desired as well, despite the distance that was traveled to obtain them. Either these materials were acquired through trade with another group or tribe already residing in the areas where these materials naturally occur, or they were collected by the groups that utilized Madison Buffalo Jump during their migratory cycle between the Great Plains and the Rocky Mountains. Also, the fact that the sourcing completed by Richard Hughes (2014) provided details that multiple flakes came from an unknown dacite source, similar to that of the Cashman Quarry, suggests that an undiscovered (by modern peoples) dacite quarry is located nearby and may be a related variety of the Cashman dacite.

HISTORIC/MODERN CULTURAL FEATURES AT MADISON BUFFALO JUMP

In addition to the prehistoric cultural features and artifacts described herein and in Bachman (2016), UM also identified several historic/modern features at Madison Buffalo Jump State Park (Vest 2019). Historic finds at Madison Buffalo Jump State Park include three areas of inscriptions, representing both the modern and historical eras, as well as assorted historic/modern hearths and artifacts scattered across the park (Greer and Greer 1996). Of most importance, historical inscriptions were found carved into the limestone rock across the park. These historic inscriptions, sometimes referred to as historical "graffiti" (over fifty years old), can help tell us a story about those who came before; those who left their mark, announcing "We were here." If one is to fully comprehend the complete history of an area, interpretation of historical inscriptions plays a key role in understanding the use of the land over the last century (Urbaniak 2014). While we do not delve deeper into the

modern/historic inscriptions in the current paper, we encourage the reader to consult Vest (2019), who wrote his Master's thesis on the historic inscriptions found in Madison Buffalo Jump State Park.

SUMMARY AND CONCLUSION

Through a cooperative agreement with Montana FWP, the University of Montana conducted an archaeological inventory of the 640-acre Madison Buffalo Jump State Park in 2014. Copious amount of artifacts and features were recorded during the survey. Not only did UM identify a potential, previously undocumented, drive line, but also recorded locations for each cairn of the four drive lines at Madison Buffalo Jump. UM identified and mapped bison bone concentrations below the kill/nick point on the face of the jump, noting the increasing bone density further down the slope leading to the lower processing area along the creek. UM identified several areas of lithic artifact concentrations within the gathering basin above the jump, marking the locations of prehistoric stone tool manufacture, including one possible petrified wood/chert quarry. UM recorded the locations and planview-sketched 78 stone circles in four locations surrounding the jump. UM also interpreted two rectangular rock features in the North Ridge area of the state park as probable Crow and/or Shoshone fasting beds. UM recovered an Early Archaic projectile point produced from the Cashman dacite quarry near Ennis, Montana. Fourteen additional sourced obsidian/dacite artifacts were sourced to Obsidian Cliff (Yellowstone), Bear Gulch (Centennial Mountains), the Cashman dacite (Ennis), and an unknown dacite source likely located in the Madison River Valley or vicinity. UM also collected two bison bone fragments, including one bison pelvic fragment (FS-11) that returned a calibrated radiocarbon age of A.D. 1650 (Cal 300 years B.P.). This is the only radiocarbon date ever assayed for Native American occupations at Madison Buffalo Jump, confirming that the site experienced its most intensive use during the end of the Late Prehistoric period, just prior to European contact.

RECOMMENDATIONS

As illustrated in this paper, both prior work and the current work by UM collectively recorded the significance of the archaeological features and artifacts of Madison Buffalo Jump State Park, Three Forks, Montana. While UM contributed to and resolved some of the informational deficiencies regarding the Madison Buffalo Jump's past, much remains to be done regarding cultural resources at the park. Namely, UM confirmed the Late Prehistoric period of use of the buffalo jump and comprehensively mapped the archaeological features across the state park. However, UM concurs with the prior researcher recommendations that sub-surface testing could provide additional, valuable information regarding the Native American use of the state park in the past. Multiple areas such as the North Ridge, Lower Occupation/Processing Area, and Primary Bone Deposit still require test excavations in order to identify as many artifacts and diagnostic materials as possible. The precise age of the various Madison Buffalo Jump features remains unknown and the interrelationship of the archaeological features needs to be assessed in more detail as well.

Madison Buffalo Jump is rich in its record of Native American life and pre-contact bison hunting, as well as associated stone tool production and occupation. Upon completion of the survey, inventory, and analysis of Madison Buffalo Jump and its artifacts and features, it is clear that Madison Buffalo Jump State Park

should be preserved in its current state and carefully developed in order to provide a more complete picture of Native American and Euro-American use in the past.

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ARCHAEOLOGY OUTREACH AND EDUCATION BY ENGAGING AMATUERS[1]

NANCY M. MAHONEY

INTRODUCTION

AT ITS CORE, THE GOAL OF ARCHAEOLOGY education is to protect archaeological resources. Through agency programs and public presentations, we work to convey the relevance of the past, the ongoing significance of material remains for descendant communities, and an appreciation of the meaning and value of archaeological resources in the hopes that we instill an ethic of heritage preservation. Yet there is considerable informal education that occurs through interactions between professional archaeologists and engaged amateurs—defined here as a subset of the general public including avocationalists and collectors. These people already possess a vested interest in archaeology and often act to spread their passion among a wider community.

As professionals, we often employ what Bonnie Pitblado (2014:388) refers to as a "risk-avoidance" strategy that involves overlooking, or outright avoiding, interactions with amateurs—wary of the ethics surrounding collaboration with collectors. When the Society for American Archaeology (SAA) re-examined their statements on archaeological ethics, it was especially timely to address professional engagement with collectors as part of the society's mission to provide outreach and education. Shott and Pitblado (2015) assert that collaborating with responsible amateurs—even if they are legally collecting on private land—is more likely to foster ethical practices and preservation of archaeological resources. Similarly-minded archaeologists point out that because artifact collecting remains a legal and vigorously defended activity on private land, we lose much more than we gain by ignoring, marginalizing or chastising collectors (see LaBelle 2003).

This paper considers the ideas of Pitblado and others about the potential benefits of collaborating with amateurs and collectors and how these ideas might apply to archaeological work in Montana. An historical examination of the relationship between amateurs and professionals reveals declining involvement of non-professionals in regional and state archaeological societies since the middle of the last century. This declining involvement dramatically reduced opportunities for ongoing informal archaeology education with our most relevant constituents. The goal of a recent Montana State University field school in central Montana was to reinvigorate relations with collectors and landowners and to highlight the ways in which meaningful learning can occur when archaeologists engage with local collectors and landowners. This effort created opportunities for significant and lasting preservation impacts within those communities.

DRAWING THE LINE

When the SAA was established in 1935, the newly formed society saw itself as an organization that encompassed the interests of both groups (Griffin 1985; Guthe 1935, 1967). Archaeologists recognize that amateur curiosity and labor is integral to the development

1 A version of this paper was originally presented in 2019 at the 84th Annual SAA meetings in a session entitled "Archaeology Education: Building a Research Base" in Albuquerque, New Mexico.

and ongoing growth of the discipline. Amateurs find sites, share information, donate collections, analyze artifacts, participate in fieldwork, and often publish reports. Yet since the late nineteenth century, concern over looting and destruction of Puebloan sites in the American Southwest set these stakeholder groups at odds (Daniels 2012; Fewkes 1896; Goebel 2015; Judd 1929, King 1991; Nickerson 1962; Renfrew 2000). As archaeologists struggled to establish the discipline within academic institutions, professionals sharpened their critiques of amateur collectors and their detrimental impacts on heritage preservation. Continued criticism of non-professionals and amateur societies continued throughout the twentieth century as academics and museum professionals sought to establish dividing lines that restricted amateur access to archaeological resources (Bronitsky 1980; Ferguson 1972; Frison 1984; Guthe 1967; Judd 1929; Kelley 1963; King 1991; Mallouf 2000; Masse and Gregonis 1996; Patterson 1995).

During the 1970s, the growing field of credentialed archaeologists (academic, land management agency professionals, and cultural resource management firms) further marginalized collectors, and amateur societies began to divide or dissolve over pressures to adhere to non-collecting policies (Labelle 2003:115). However, in the last fifteen years many archaeologists are reconsidering the wisdom of denigrating collectors. A new generation of archaeologists expresses concern that marginalizing collectors not only contradicts professional ethical obligations of stewardship and public education, but also hinders accurate understanding of the archaeological record—a fact that is particularly true of Plains Indian sites (Hinsley 2000; Kinnear 2008; LaBelle 2003; Pitblado 2014; Seebach 2006). None of these authors discount or diminish the very real and ongoing destruction caused by looters. Instead, these archaeologists caution professionals not to lump all collectors together with pot-hunters, and to recognize that the majority of "low-end" collectors are engaging in legal, non-destructive collecting of artifacts on private land for their own enjoyment or edification, and not for sale in commercial or black markets (see Hollowell-Zimmer 2003).

Three key points emerge from research on the practice of artifact collecting in the United States: first, legal artifact collecting on private land continues to thrive and is unlikely to be abated through outreach and education; second, Plains archaeology depends on amateur collectors for the discovery and identification of key sites (LaBelle 2003; Pitblado 2014; Seebach 2006); and finally, surveys and ethnographies of collectors demonstrate that considerable overlap exists in the attitudes and motivations of professionals, avocationalists and collectors relative to heritage practices (Collwell-Chanthphonh 2004; Hart and Chilton 2014; Kinnear 2008). This last point highlights the need to engage with collectors and not leave them out of programming surrounding archaeological education and collaboration—particularly in states such as Montana—where there is an abundance of private land and not enough archaeologists.

My own research with collectors in Montana revealed a similar overlap in practices and motivations. Collectors in central and southeast Montana discuss artifact hunting as part of their identity within a broader community of interested amateurs and educators. Most of these collectors engage in non-destructive, legal collecting of surface materials on private land, and keep physical or mental records of where each item was found. None of these individuals buys or sells artifacts. The collectors that I interviewed all share information with each other (either informally or at gatherings),

but rarely report findings to professionals, who they complain fail to reciprocate by refusing to share information or access to collections. Finally, nearly every collector I encountered engages in educational outreach within their own communities—bringing their collections into local classrooms, or leading tours to well-known sites in the region. These collectors undertake substantial research to understand their own artifact collections, and they are anxious to share it with an audience that appreciates their work.

Colwell-Chanthaphonh (2004) is one of the few anthropologists who has conducted ethnographic research of artifact collecting and its effect on the heritage record. His intent was to explore "intimate episodes of collecting" in order to better understand the range of meanings that people experience within archaeological landscapes. Colwell-Chanthaphonh interviewed both newcomers and long-time residents of the San Pedro Valley of southeastern Arizona. In 2001 and 2003, he met with eighteen casual collectors who consider their personal engagement with archaeological landscapes and artifacts to be a significant aspect of their identity. Colwell-Chanthaphonh's interviews revealed that many of the collectors felt deep attachments to archaeological landscapes, harbored deep concerns about the widespread destruction of sites, and sought to safeguard archaeological remains for future generations. His research reminds us that archaeological remains serve multiple purposes and many stakeholders, but also demonstrates that collectors ascribe meaning and value to artifacts and ancient places that are far more similar to the concerns of professional archaeologists than they are to looters.

Collwell-Chanthanphonh's findings are supported by Patti Kinnear's research on artifact collectors on the Great Plains. Kinnear (2008) surveyed more than 300 attendants of regional Plains archaeological conferences and conducted in-depth interviews with a selected number of participants. Her analysis clearly demonstrates that there is more overlap in the motivations and attitudes of collectors when compared with other amateurs and professionals than either group imagined. Kinnear concludes that the existing oppositional perspectives are largely the result of "misperceptions, a lack of education, and a general breakdown in communication" among the groups.

Taking the issue a step further, Siobhan Hart and Elizabeth Chilton examined artifact collecting at the Pocumtuk Fort in Deerfield, Massachusetts, where archaeologists from the University of Massachusetts Amherst established a multi-year community collaboration project as part their undergraduate field school. Hart and Chilton (2014) encourage archaeologists to consider the impact of reframing artifact collecting as an act of "heritage practice" in itself and that it is a form of "meaningful social practice" that connects collectors to place and heritage. They assert that if future interactions between professionals, amateurs, and collectors are grounded in "core values of reciprocity, sharing, and mutual understanding," then it is possible to minimize mistrust on the part of each stakeholder group and "bridge the 'us and them' divisiveness of current relations" (Hart and Chilton 2014:2).

Most recently, Shott and Pitblado (2015) explicitly addressed the obligation to engage with collectors in the November 2015 issue of the SAA's *Archaeological Record*, which presented the results of a forum about "the pros and cons of collaborating with collectors." The authors assert that collaboration with responsible collectors is not merely practical, but *ethical*, because collaboration is equivalent to outreach and education, and is more likely to foster the

preservation of archaeological sites. They define "responsible collectors" as: 1) *non*-looters, or collectors engaged only in legal collecting on private land; 2) collectors who do not buy or sell artifacts for the sake of investment or profit; and 3) collectors who maintain reasonable documentary standards and willingly share information (Shott and Pitblado 2015:12). Pitblado (2014:386) argues that as a Paleoamerican archaeologist and director of Utah State University's Museum of Anthropology, she "collaborated in diverse ways with nonprofessional archaeologists, including some private collectors," which overall benefitted both professionals and the public. She substantiates her point with data showing that local collectors find the majority of Clovis-era archaeological sites (24 out of 30, or 80 percent), in part because Paleoindian sites are deeply buried and difficult to find, and a large majority are on private land and require landowner permission to access.

AVOCATIONAL ARCHAEOLOGY IN MONTANA

Montana archaeology has relied on amateurs perhaps longer than any other state in the lower forty-eight. Academic archaeological programs and state organizations were only established after 1950, and Montana was home to a handful of professionals throughout the 1970s. Literature reviews by myself and others (see Johnson 1972) reveal that up through the 1930s there were only a handful of reports on archaeological sites, and most of those were published by military officials who were only temporarily stationed in Montana.

Sustained archaeological fieldwork began in 1936 with the Montana State Archaeology Survey, funded with relief funds from the National Youth Association. The survey employed local amateurs and students in southeastern Montana, and led to the first formal excavations of sites near Glendive, Billings and Red Lodge under the aegis of the Works Progress Administration (WPA) (Schwab et al 1996; Urbaniak 2022). Both projects were initiated by H. Melville Sayre, an English professor at the Montana School of Mines in Butte. Sayre was passionate about archaeology, but lacked training and experience and thus, remained a highly educated amateur. He hired Oscar T. Lewis as foreman to oversee excavations first at the Hagen site, and later at Empty Gulch (Figure 1) (Mahoney 2023; Urbaniak 2022). Lewis originally came to Montana as a young cowboy and wolf hunter and in 1918 homesteaded 320 acres just southeast of Glendive. He was fascinated with local archaeology, and while riding the range Lewis would scout sites and collect artifacts. After years of drought and economic depression, Lewis was forced to abandon his ranch in search of relief work with the WPA. When Sayre met him in 1936, the former rancher had already discovered dozens of sites in southeast Montana (Mahoney 2023).

The WPA excavations were essentially run by amateurs until William Mulloy took over as a young graduate student in 1940. Mulloy supervised a final season of excavations, and worked closely with Lewis to collect data on several other significant sites in southeast Montana. Though Lewis kept a field diary and willingly shared his knowledge, he mostly refrained from publishing, likely due to his lack of formal education.[2] Mulloy took the lead on reporting, and swiftly completed a series of quarterly manuscripts for the WPA. Even after leaving the project, Mulloy continued to publish journal articles on additional sites that he and Lewis investigated during his time in Montana (Mulloy 1945; 1953; 1965; 1969; Mulloy and Lewis 1943; 1944)).

2 Lewis was author of only one small report in *American Antiquity* (1944) and second-author on two reports with William Mulloy in *American Antiquity* in 1943 and 1944.

Figure 1. Oscar Lewis (far bottom right) in 1940 or 1941, at Empty Gulch's Pictograph Cave near Billings, Montana.

POST-WAR ARCHAEOLOGY: CARLING MALOUF AND THE AGE OF AMATUERS

Formal survey and excavation projects ended in Montana in 1942, with the start of World War II and the conclusion of the WPA funding. Professional attention to Montana's archaeological record began again in the early 1950s when Carling Malouf was hired by the University of Montana (UM), becoming the only academically trained archaeologist in the state. Malouf was gregarious and tireless, and immediately sought out local amateurs and landowners for information and collaboration. He launched the *Anthropology and Sociology Papers* at UM to publish archaeological research, and initially the series relied heavily on amateur and student contributions. The Smithsonian River Basin Surveys also began in the 1950s and brought salvage archaeology to Montana, employing field crews comprised entirely of amateurs (Malouf 1981:4). Throughout the mid-twentieth century, archaeological practice in Montana remained very much an amateur endeavor.

Early in the next decade, Montana saw the emergence of several archaeological societies. The Billings and Milk River Archaeological Societies were established in 1958 and 1962 respectively, and the Montana Archaeological Society (MAS)—the only statewide organization, was incorporated in 1959. All three societies were managed and populated with a range of enthusiastic avocationalists, amateurs, and collectors. Members met regularly, held annual meetings, recorded and excavated sites, and published reports in local newsletters and regional journals, including *Plains Anthropologist*.

In Montana and across the United States, the practice of archaeology fundamentally changed with passage of the National Historic Preservation Act in 1966 and the subsequent rise of compliance archaeology on public lands (Patterson 1995). Professionals and graduate students began to outnumber avocationalists on projects, and land agencies ceased granting excavation and survey permits to amateur societies. Divisions within amateur societies emerged as some began to enforce non-collecting policies. These divisions solidified during the 1970s, reaching a head with the passage of the Archaeological Resources Protection Act in 1979, after which many local amateur societies dwindled and dissolved. The most dedicated avocationalists became contributing members

of the state society, the Montana Archaeological Society (MAS), but the majority of collectors and rural landowners reverted to informal local networks.

These growing divisions are especially relevant because the exchange of information between amateurs and professionals at society meetings was a robust form of informal archaeology education. One measure of the declining relations is the rate with which papers by amateurs were published in *Archaeology in Montana* (1958-present), the journal of the MAS. Although journal publications are not a direct correlate of amateur participation, these data do capture the degree to which amateur contributions were encouraged and valued, and serve as a proxy measure of the degree to which amateurs sought engagement with professionals and participated in relationships of reciprocity and mutual respect.

The decline of amateur papers in *Archaeology in Montana* reflects the dwindling involvement of collectors as much as it does the growing participation of academic, cultural resources management (CRM), and agency professionals (Table 1). Yet the decreasing participation of amateurs also reflects the shift in *where* archaeology was taking place because most of the field work took place on public lands (primarily BLM, Forest Service, and Park Service). The shift to public lands meant that rural landowners and amateur collectors found fewer opportunities to develop relationships with professionals seeking field sites which resulted in decades of social distancing. Today, professionals are less welcome on private lands, which is concerning, because privately owned property comprises over two-thirds of Montana's land area.

The increased protection of sites on public lands came at the expense of understanding the rest of the archaeological record, and to some degree impeded amicable professional/amateur relations. Today, the Montana Archaeology Society is comprised primarily of professionals and graduate students, with only a handful of amateurs. Now, few meaningful opportunities exist for informal education through avocational engagement. The same is true of formal archaeology outreach and education programs–most of which take place on public lands and in conjunction with state and federal land management agencies. Given this situation, perhaps it is time to consider the future direction of MAS and its outreach activities.

BERGSTROM BISON KILL SITE: OUTREACH AND ENGAGEMENT

In 2018, MSU was contacted by a landowner in central Montana that had a bison kill site on his ranch. David Bradley wanted to know if the university would consider coming out to excavate, and perhaps involve school kids and members of his church. He was especially concerned, because though the site had been surface collected for years by his friend James Bergstrom who found the site, it was becoming heavily impacted by community members who frequently came out to dig for points, leaving large stretches of the site's bone bed exposed. Mr. Bradley felt that unless the university were to take an interest,

AIM PUBLICATION YEARS	1958-1969	1970-1979	1980-1990
Total # of Published Papers	120	97	121
Total # Amateur Papers (including co-authorship)	72	40	22
Percentage of Total Papers by Amateurs	60%	41%	18%

Table 1. Decline in percentage of articles by amateurs published in Archaeology in Montana between 1958 and 1990.

he would struggle to turn down requests to dig at the site. After visiting the site and discussing logistics, Dr. Mike Neeley decided to run a small MSU field school in May of 2019.

Mr. Bradley's ranch is located near the dead center of Montana, outside the small town of Garneill. All around him are private ranches, most of which contain archaeological sites known only to locals. His neighbors were wary of his decision to involve the university, fearing that archaeologists, federal agents, or tribal representatives would want to appropriate their land and/or their artifact collections. Dr. Neeley and I saw the project as an opportunity to get to know interested members of the community, to build trust and good will, and to invite them to visit the site and participate in artifact excavation and screening (Figures 2 and 3). The open invitation allowed us to engage directly with local landowners and collectors who were interested in our activities at the site.

One of our first tasks was to ask Mr. Bergstrom for any information he could recall regarding site stratigraphy and artifact distribution. We decided to officially name the site after him (the Bergstrom Bison Kill) and to keep him involved in the project. Eventually Mr. Bergstrom loaned us his entire artifact collection—allowing us to document the hundreds of Avonlea and Besant points he recovered from the bone bed. He also asked for reading recommendations, letting us know he wanted more information because he frequently brought his stone tool collection into local classrooms and would share what he knew about pre-contact sites.

During the field season, Mr. Bergstrom was a frequent visitor to the site. He became an ambassador in the community, letting others know about the field school and that we welcomed visitors. I further involved Mr. Bergstrom in a training session of the Montana Site Stewardship Program for volunteers interested in monitoring and protecting archaeological resources. As part of the training, the volunteers worked with Mr. Bergstrom's artifact collection to learn how to document projectile points from

Figure 2. Students from Judith Gap School visit the Bergstrom Bison Kill excavations. Photograph courtesy of Mike Neeley.

Figure 3. Volunteers and students from MSU excavate a unit at the Bergstrom Bison Kill. Photograph courtesy of Mike Neeley.

private collections, so that data might be shared among amateurs and professionals alike. By the end of the summer, many of the local landowners reached out to us, letting us know about sites located on their property.

CONCLUSION

Our project was the first step toward building relationships with a community that was highly suspicious of the motives of archaeologists. The MSU field school brought meaningful archaeological education to a region where all cultural resources are located on private land. I would encourage others to engage in similar opportunities in an effort to forge positive interactions with interested avocationalists and collectors. In many ways, it felt as if we had reopened a chapter from Montana's archaeological past, where decades ago, professionals, students, collectors and landowners could comfortably mingle and share information. In this sense, lessons learned from the past could be helpful in guiding us and members of the MAS into the future.

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STANDING SHOULDER TO SHOULDER—ROCK ART AT MONTANA'S WATER SKIPPER AND OWL CANYON SITES

LAWRENCE L. LOENDORF
DAVID A. KAISER

THE WATER SKIPPER SITE (24GV332) is a newly recognized rock art site in Golden Valley County, located a few kilometers from the Owl Canyon site (24WL402) which is known for its exceptionally well-preserved shield bearing warrior (SBW) rock art figure. Owl Canyon, which is situated in Wheatland County, was considered a single panel site (Conner 1962) until another pictograph panel was found recently with DStretch image enhancing software which adds a new dimension to the site. The new site and new panel are described in the following article together with some insights about these new discoveries.

WATER SKIPPER SITE

The Water Skipper site is located on private land in the southern part of Golden Valley County about 25 kilometers southwest of Ryegate, Montana. The site sits on the west facing wall of a shallow canyon. A small spring fed stream was flowing in the bottom of the canyon when the site was recorded in early October 2023. It had enough water to support water skippers in the small pools that formed along the stream course.

Large Ponderosa pine trees grow in the canyon bottom along with Douglas fir, limber pine, and Rocky Mountain juniper. The understory includes western snowberry, skunk bush, and grasses like blue grama and side-oats grama. The paintings are located on what is thought to be Fort Union formation sandstone at the top of a steep canyon wall. The canyon side retains sufficient soil to support a dense stand of snowberry bushes along its upper border. These bushes and other vegetation currently block any view of the paintings from the canyon floor.

The Fort Union sandstone is exposed in a discontinuous pattern along the rim of the canyon walls, where some large chunks have eroded, falling away onto the steep canyon. The canyon walls remain about five meters high at the site, but the surface is in poor condition with spheroidal weathering and pot-lid fracturing, some of which damaged the paintings. It is likely other paintings were once present at the site but are now lost to erosion.

The rock art consists of a single panel with two SBWs drawn with a red ochre crayon (Figures 1a and 1b), made by mixing a pigment with animal fat and allowing it to solidify before applying the design to a rock wall. The figures show only their head and legs extending beyond the shield perimeter (Figure 2). The head of one of the figures is now largely eroded, the other has a small round head with a roach hairstyle. The legs of both figures are impacted by erosion. One has a wide, thick leg, while the other appears to have much thinner limbs. The wide leg on the right figure is fringed, possibly indicating a garter or knee band. Both warriors appear to have gender indicated by the illustration of a phallus, but details are unclear due to erosion.

Both SBWs hold large circular shields

Figure 1a. SBWs at the Water Skipper Site.

Figure 1b. DStretch yre of the same image showing greater detail.

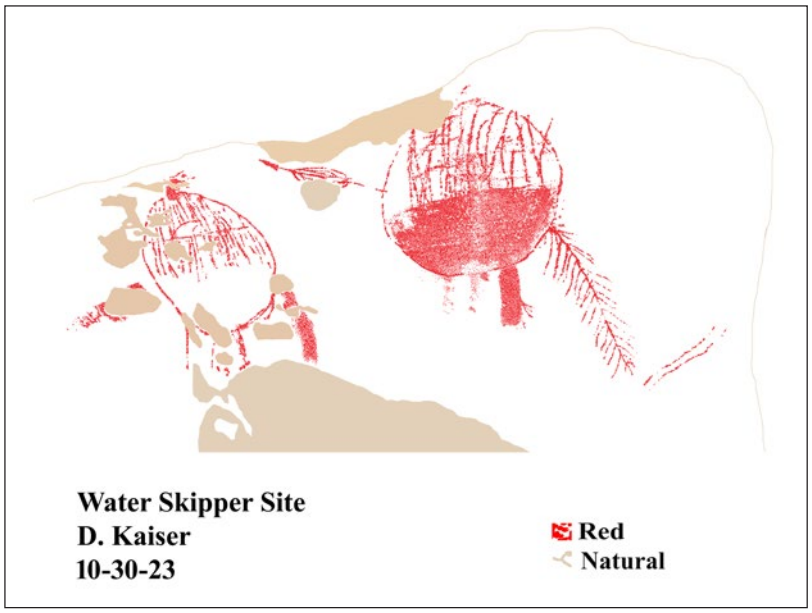

Figure 2. Photo-tracing of the Water Skipper site.

covering most of their bodies, emblazed with geometric shield heraldry. Each shield design is roughly spilt horizontally, with the lower half of one filled in solid red, while the other is left blank. The top half of each consists of a cluster of vertical lines, but more closely spaced on the left figure which also appears to have an arc design in the upper half of the shield. The right figure shows a long, two-sided feather bustle hanging from the lower edge of the shield. At the same position on the other shield hangs a wide, slightly curved object, possibly an animal medicine bundle.

Both figures have weapons protruding out from the shields. One holds a long spear at about the 10 o'clock position, with a triangular point. Along the shaft the spear has an oval flag with nested curved lines inside. The weapon of the other warrior is badly damaged by a spall. Pointing downwards at about 8 o'clock, it appears somewhat short and wide. This could be a club, the flag of a no longer existing spear, or another weapon all together. The figures are not engaged in combat, but face the same direction, presented as a pair displaying their weaponry, heraldry, and accoutrements.

Several elements in these images confirm these figures to be part of the Bear Gulch rock art style (Figure 3). SBWs in the Bear Gulch Style exhibit a suite of unique attributes that are rare in other styles (Kaiser et al. 2010; Keyser and Kaiser 2014; Keyser et al. 2012). These details include feathered shield bustles and bundles as well as weapon flags, as seen on the Water Skipper figures. While occasionally found at other sites, the oval weapon flag is the most common banner shown in the Bear Gulch style imagery. Likewise, the roach is the most frequently depicted hairstyle. Shields displaying bisecting shield heraldry are also most common amongst Bear Gulch style imagery (Keyser et al. 2012:354). Many Bear Gulch style figures are finely incised or crayon drawn, as the SBWs are here.

The SBWs at Bear Gulch (24FR2) and nearby Atherton Canyon (24FR3) are the largest collection of this motif on the Plains with more than 1000 examples. The vast majority of these being classified as Bear Gulch style imagery. Surprisingly, however, this style seemed to be located almost exclusively in these two canyons. These two sites located close to Lewistown, Montana are within a few kilometers of each other. Numerous other sites with SBW figures are known in Montana and neighboring Alberta, and Wyoming, but these do not contain any Bear Gulch Style shield warriors (Keyser and Poetschat 2014).

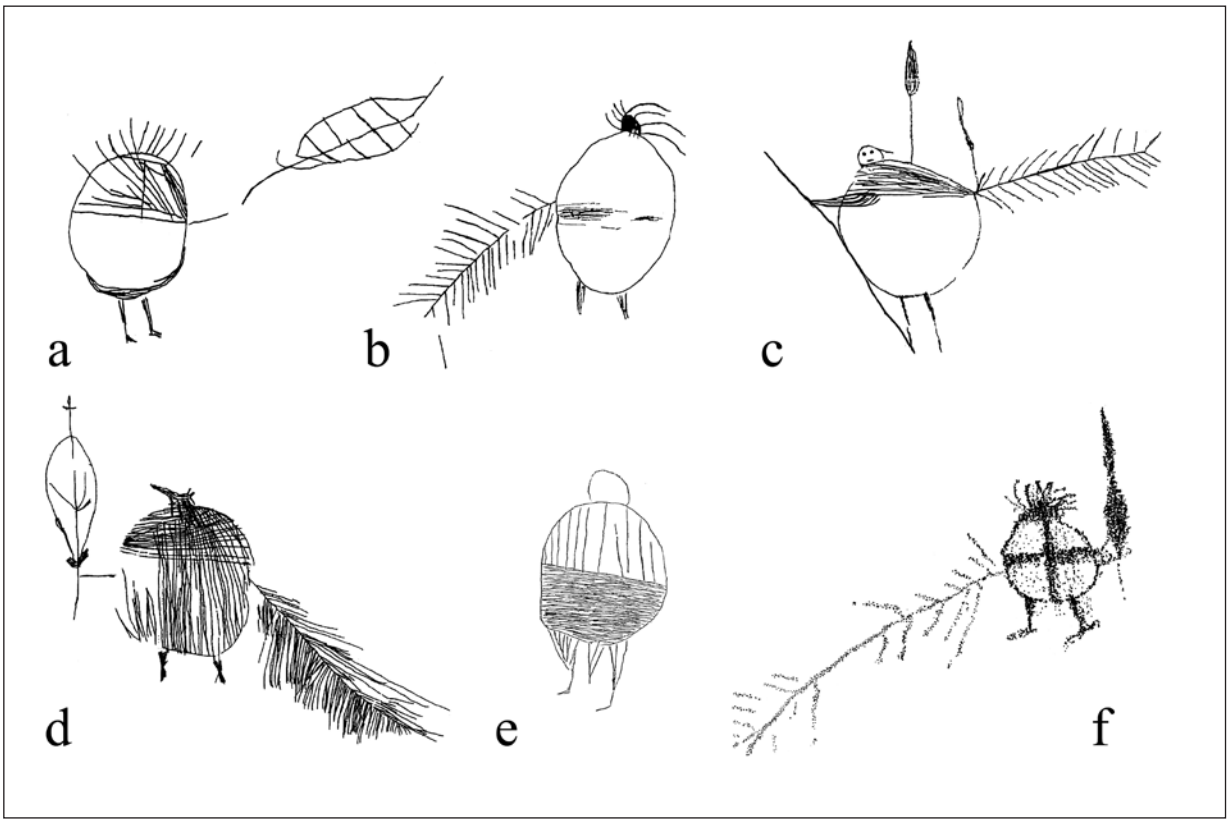

Figure 3. Examples of Bear Gulch style SBWs. Note the weapon flags, bustles, roach hairstlyes and bisected shield designs; a, c, d, and f Bear Gulch site; b and e Atherton Canyon.

Significantly, before the discovery of the Water Skipper site, only two other possible Bear Gulch style shield figures were identified in Montana outside of their type sites. One, at Steamboat Butte (24YL576), holds a spear with a large quillion-barbed metal point and a spade-shaped flag along the shaft (Figure 4) (Keyser and Poetschat 2014:175). It also appears to wear a wolf hat headdress, common to Bear Gulch warriors (Figure 3, d). This wolf-hat along with the weapon flag tentatively identifies this SBW as a Bear Gulch style figure (Keyser and Poetschat 2014:64, 175). However, this image is superimposed by the image of an elk, the front legs of which impact the warrior's head, perhaps giving the false impression of a wolf hat headdress. Close inspection in the field is necessary to determine if this really is a Bear Gulch style figure wearing a wolf hat. The other possible candidate for a Bear Gulch style image is at Tuma's Rock (24RB1010), located in Rosebud County. This incised figure has a horizontally split shield, carries a spear with an oval flag on its shaft and displays a roach hairstyle (Figure 5). While rare, these traits are found elsewhere in Plains rock art, so were not considered enough for positive classification without further supporting evidence (Keyser and Poetschat 2014:66, 184).

The limited distribution of the Bear Gulch warriors is more complex, especially when considering those that have been dated. Although the dates are few and from dissimilar sources, the figures were likely produced between the late 1400's and the early 1700's or 200 to 300 years apart (Keyser et al. 2012:175-210). There

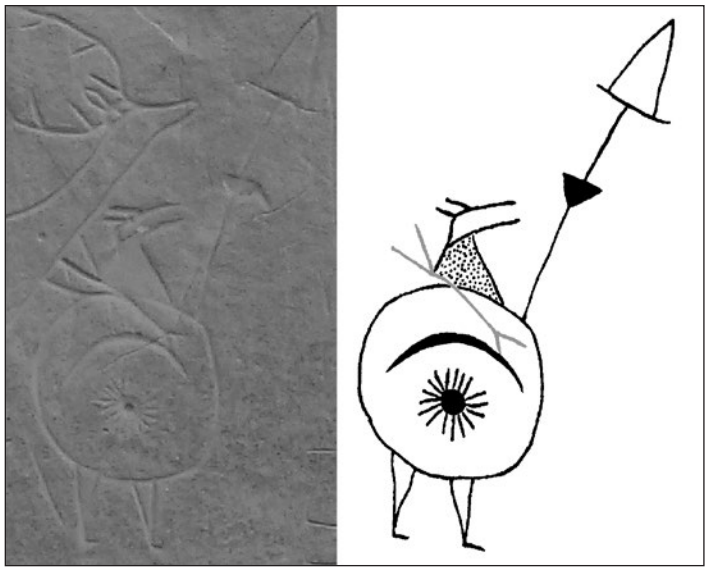

Figure 4. SBW with a possible wolf hat at Steamboat Butte could be Bear Gulch style. Image courtesy of James Keyser.

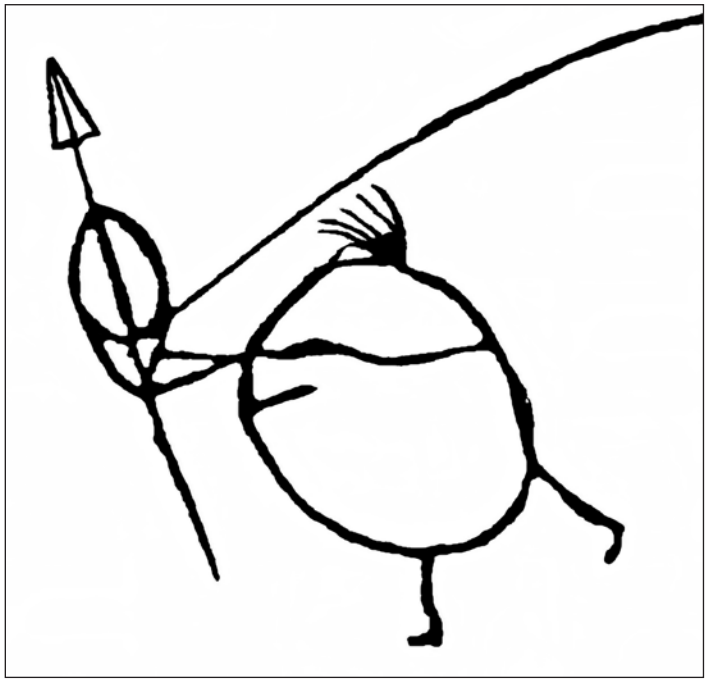

Figure 5. Possible Bear Gulch style shield figure at Tuma's Rock. Image courtesy of James Keyser.

is no evidence for a prehistoric village near the site that spans this time, and it is more logical to believe groups of hunters visited the site, perhaps annually, or at least periodically through the centuries. The area is an excellent terrain for buffalo hunting with breaks that offer opportunities for jumps and drives. If the people at Bear Gulch were carrying shields and displaying their powerful objects, they were likely outsiders who came to the site while buffalo hunting or otherwise making a pilgrimage to this special site. However, the images at the Water Skipper site show that these people also left their marks elsewhere on the landscape.

OWL CANYON SITE

The Owl Canyon site (24WL402) is located about 10 kilometers to the northeast of Water Skipper. The Owl Canyon painting of a SBW in red and black is recognized as an impressive example (Figure 6), partly because the figure is painted on the underside of sandstone ledge where it has been protected from the elements, but it is also because the figure includes important decorations on the shield (Conner 1962; Keyser and Poetschat 2014:165).

The shield, which is nearly solid red in color, features black and red fringe and a human skull-like face in is center. Small pairs of rectangles are set in the cardinal directions around the interior of the shield. The top of a round head sticks out above the shield and a lance or a spear is poking out from behind the shield at about eleven o'clock. The figure includes straight legs with feet that point in the same direction. It stands about 35cm tall.

This excellent example of a SBW image was originally reported by Stuart Conner (1962). Conner's publication was only a few years after Wiliam Mulloy (1958) defined the SBW motif in

Figure 6. Main SBW at Owl Canyon. The figure faces down which has helped to preserve it in excellent conditon. Photograph by Lawrence Loendorf.

his report on Pictograph Cave. For sixty years, the Owl Canyon shield warrior was thought to be the only painted figure at the site. However, the landowner remembered seeing other smaller SBWs when he was young, but no sign of them was observed through the years although a dozen archaeologists visited the site (Figure 7a). This changed when Loren Harr took a DStretch photograph with his phone on a visit to the site in 2022. He captured a group of small red painted SBWs that are not visible to an unaided eye (Figure 7b). Harr guided Loendorf to the site in 2023, so he could get more extensive photography.

Nineteen shield warriors and two unarmed humans, are visible with DStretch (Figure 7b and Figure 8). On the left, one of the humans without a shield is very thin while the other has a thick body with wide shoulders. No arms are visible on either figure, but the larger human appears to have modelled calves. All the shield figures appear almost identical, with about ten in good enough condition to show clear details. They show round full body shields, half-round bucket-like heads without necks, and two straight legs with plantigrade feet below. None include arms nor do any hold visible weapons. Most of the shields appear undecorated, but at least four of them display a diagonal line across the shield. This is likely simple shield heraldry, however on two of these examples this line extends beyond the shield perimeter. The line may therefore be a kind of rubout indicating a defeated enemy or loss of one's own party, or it could depict some kind of bustle or bundle hanging from the shield, as is sometimes seen in this exact position.

Those figures whose feet can be seen, including the two non-shield bearing images,

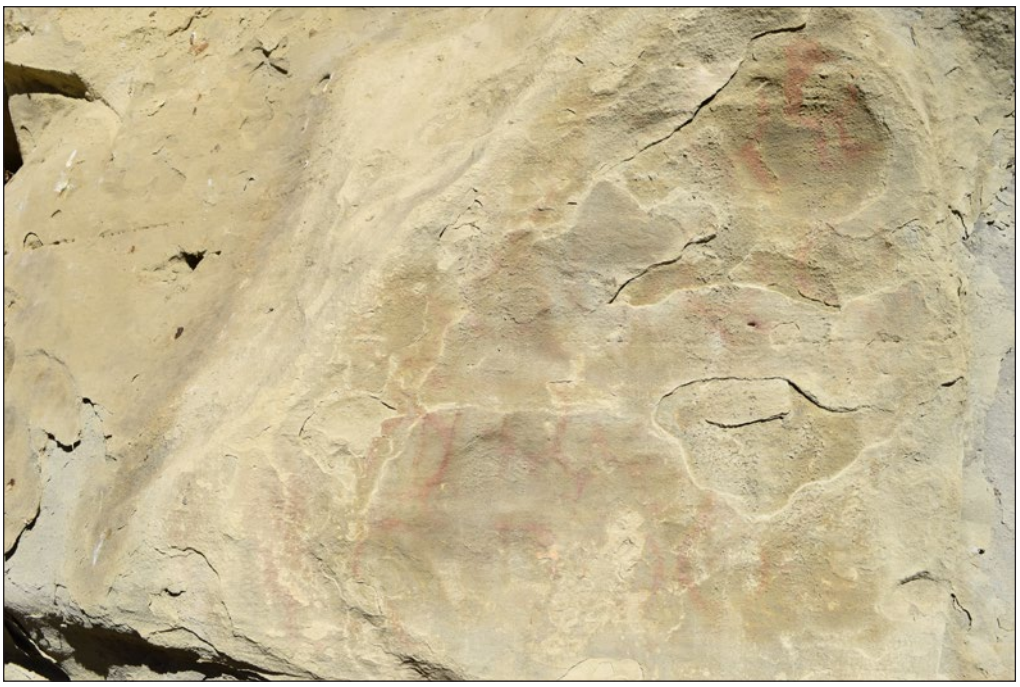

Figure 7a. Sandstone wall at Owl Canyon with pictographs.

Figure 7b. DStretch yre revealing details that cannot be seen with the naked eye.

show feet pointing to the right as though they are marching in that direction. They appear as if they are a gathering of warriors prepared to march off to war. Unfortunately, there is not enough detail in these simply painted images to determine style or ethnic origin.

DISCUSSION

Groups of SBWs, sometimes referred to as a phalanx, are found at other rock art sites across the intermountain west (Keyser and Poetschat 2014:92-94). Examples include petroglyphs and pictographs with large groups of figures as well

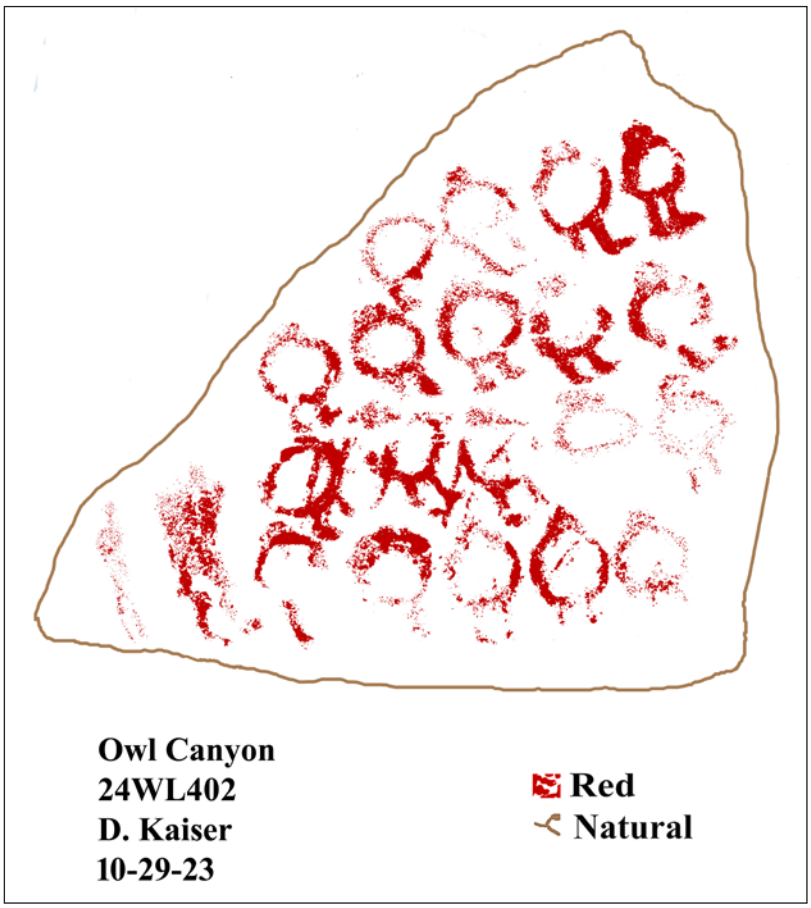

Figure 8. Photo tracing of the phalanx at Owl Canyon.

as smaller clusters or lines of figures. These are single file or groups in marching order, including about 40 examples of SBWs in rows or phalanxes at the Bear Gulch site (Figure 9) (Keyser et al. 2012:249-254).

There is no strict definition for how many SBW figures need to be illustrated side by side to constitute a phalanx nor is there a requirement that they all are the same SBW style. Jim Keyser, who has written more about this topic than others, uses three as his base number to make a phalanx (Keyser and Poetschat 2014:24). This seems reasonable when of the same style, but sometimes three shield warriors that are side by side could represent one warrior putting his image on the wall and two others who came along later to add their figures in acts of bravado. Different styles of SBW figures in a row, can be found, for example, at the Wold site (48JO3) where there are seven or eight side by side (Loendorf 2017:7-16). These include the Castle Garden style, the Timber Creek style, and an unknown style. They might represent a phalanx of allied warriors, or a row of warriors showing off their medicine for others.

A group of SBWs like those at Owl Canyon, that are clearly all contemporaries make a strong case they represent a phalanx. The larger question at Owl Canyon is whether the group of small warriors is associated with the larger SBW. There is no evidence to prove they were made at the same time and in fact, the two panels are about seven or eight meters apart and around a corner in the cliff face. There is no way to tell if the group of small warriors were on the wall before the more elaborate SBW. This question aside, some sites do exist where similar small red outline SBW figures are found in groups.

Perhaps the site with figures most like Owl Canyon is 24RA506 or the Blue-Eyed Child site (Keyser and Knight 1976; Keyser and Poetschat 2014:160-161; Ward 1973). Found in Ravalli County, Montana the site exhibits eleven SBWs with one nearly obscured by mineral accretion (Figure 10). The figures exhibit parallel line bodies that show through their shields and continue as long legs with plantigrade feet, all pointing in the same direction. They include round heads,

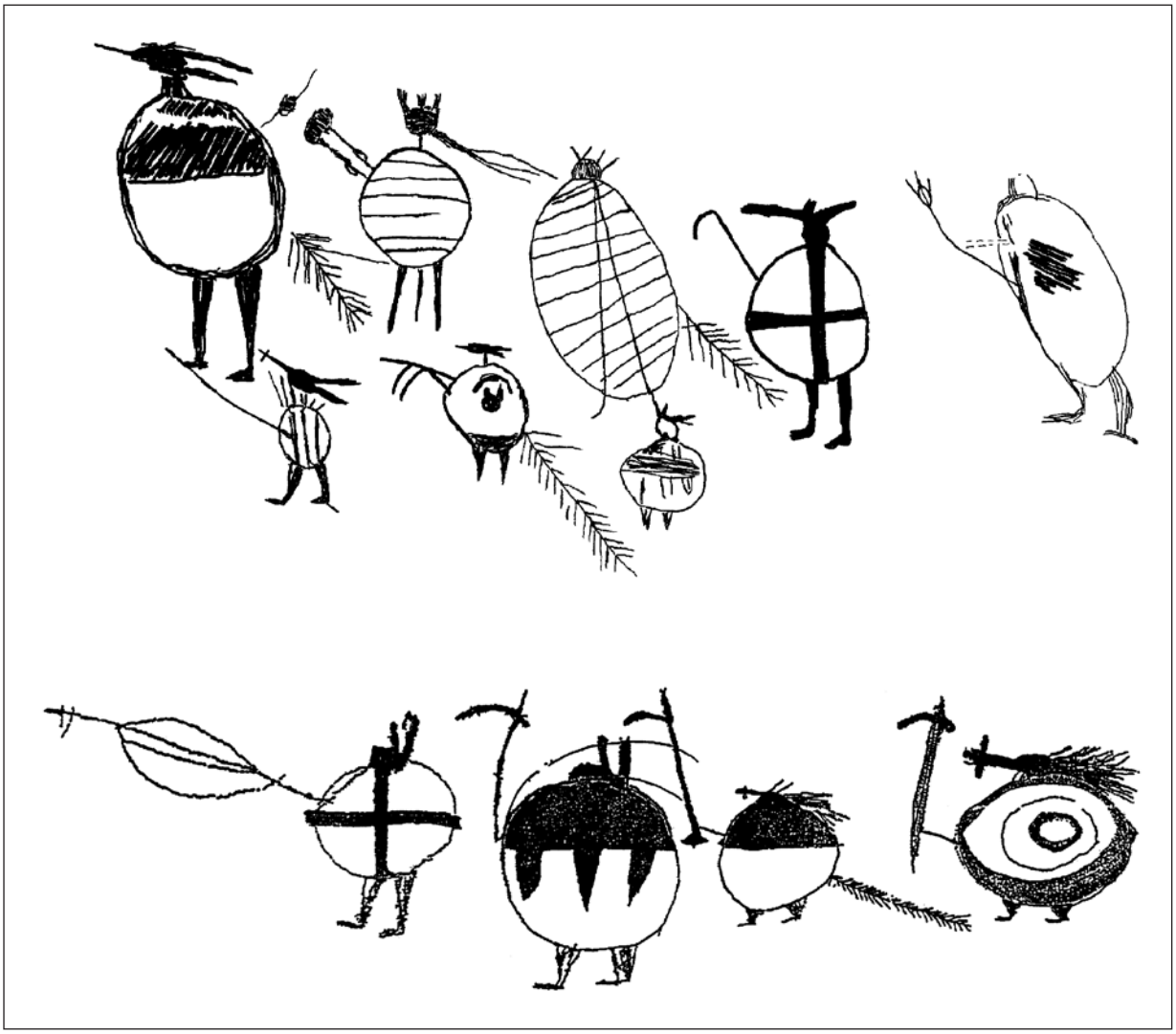

Figure 9. Phalanxes of SBWs at Bear Gulch.

two of which have horned headgear. None carry weapons. An unarmed human figure with one arm raised is positioned at the rear of the phalanx, while another with two arms raised stands in the middle of the SBWs. These figures differ from Owl Canyon with longer legs and bodies that show through the shields.

Red painted figures in a contiguous row with attributes much like the Owl Canyon figures are also found at Pass Creek Cave (48JO1708) in Johnson County, Wyoming (Figure 11). Although the bodies of the warriors show through the shields on the Johnson County figures, they carry outlined shields with no other weapons (Keyser and Poetschat 2014:94). They are similarly accompanied by non-shield holding human figures.

A line of SBWs is painted at the Bonner Spring site (no assigned number) north of Fort Collins, Colorado (Gilmore et al. 1999). Six shield warriors in this panel include four with see-through shields and two with solid body shields (Figure 12). Again, another unarmed figure accompanies them at the rear. Two warriors

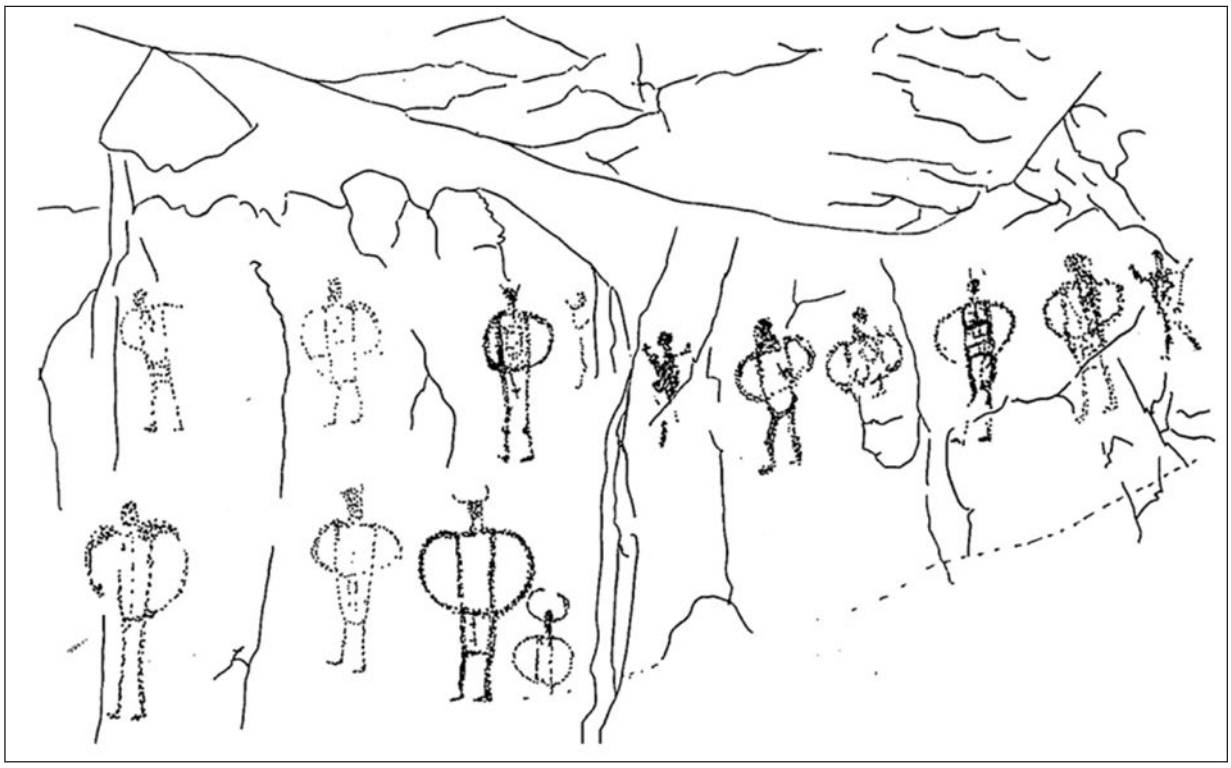

Figure 10. Pictographs at the Blue-Eyed Child site showing a phalanx of warriors. Image courtesy of Carolynne Merrill.

Figure 11. Phalanx of SBWs at Pass Creek Cave in Wyoming, DStretch ybr, greyscale. Image courtesy of James Keyser.

carry lances pointing behind them as if slung over a shoulder, including the most prominent one. Their feet are oriented in the same direction as though they are marching single file.

Technically, a phalanx is a dense grouping of warriors that carry shields with the second, third and fourth rows pushing those in the front toward the battle. This definition fits the Owl Canyon group better than several others which appear to be marching warriors as though they are headed down a trail toward a battle or participating in a ritualistic display. These formations differ somewhat, but any large group of shield warriors shown side by side is designed

Figure 12. A line up of six SBWs and an unarmed human at Bonner Springs, Colorado (Gilmore et al 1999).

to display dominance through numbers.

The figures without shields in all these phalanxes, including Owl Canyon, might be depicting a participant in a ceremonial display by the warriors using their weapons as a demonstration of power. However, it could also be explained by the 1787 recollection of Saukamappee, a Cree warrior, who described warfare between groups with full body shields. He told how, "Our shields were not so many, and some of our shields had to shelter two men" (Tyrell 1916:329). Such unshielded warriors are illustrated in battle scenes at several rock art sites.

CONCLUSION

While clearly warrior art, the images at Water Skipper and Owl Canyon, as well as these other phalanx depictions are not narrative, in the sense that the figures are not interacting, engaging in battle, or otherwise changing their state in any way. It is more a depiction of Ceremonial style art, an art primarily of display, either to supernatural forces or to declare to friends or foe their power, either individually or as a collective group.

The new rock art panel at the Water Skipper site importantly shows, for the first time, clear evidence of the distribution of Bear Gulch style SBWs outside of the area where this style was originally recognized. Owl Canyon, likewise, shows additional patterns of the ceremonial display of a phalanx of warriors in communal activity.

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A SUMMARY OF EXCAVATION RESULTS AT THE SKULL HEARTH SITE (48CA214) IN SOUTHERN CAMPBELL COUNTY, WYOMING

GENE MUNSON

INTRODUCTION

THE SKULL HEARTH SITE (48CA214) lies 38 km (24 miles) southeast of Wright, Wyoming within the eastern Powder River Basin of northeast Wyoming (Figure 1). It is situated immediately north of the border between Converse and Campbell counties within the North Antelope Rochelle Mine area owned by Peabody Powder River Mining, LLC, Gillette, Wyoming. The North Antelope Rochelle Mine is the largest coal mine in the world. Archaeological data recovery work at the Skull Hearth site, conducted in 2010-2011 as a part of a larger cultural resource mitigation project, preceded coal mine expansion (Munson 2014a).

ENVIRONMENTAL SETTING

The Skull Hearth site lies at an elevation of 1,410 to 1,420 m on a northwest-to-southeast-trending landform at the junction of McQuest Draw and a smaller side drainage (Figure 2). Antelope Creek, a major tributary of the Cheyenne River, is located about 2 km farther downstream. The landform containing Skull Hearth is comprised of a bench with relatively shallow soils and a terrace remnant with very deep soils. The site also extends from the top of this relatively flat bench down the face of the coulee created by the McQuest Draw drainage channel.

Much of the site lies on the 10-to-20-degree northeast-facing slope of the bench/terrace remnant on the west side of McQuest Draw, and offers excellent protection from winds blowing out of the west. For purposes of more easily locating the various excavation blocks within the overall site area, this part of the site was labeled Station 1 (S1). The top of the bench/terrace remnant, located about 15 m above McQuest Draw, was labeled Station 2 (S2). Thus, the variously located excavation blocks (and their associated cultural features and aboriginal occupations) are discussed herein as S1-B9, S2-B4, and so forth (see Figure 2).

The McQuest Draw drainage channel cut a vertical bank at the north end of the site. The 11 m high bank consists entirely of stream-laid deposits. These soils were probably deposited during the Holocene since there are no gravel outwash channels typical of Late Pleistocene deposition. What are likely Pleistocene gravels lie below 30 to 40 cm of Holocene deposits in the portion of the landform where block S2-B4 was placed (Figure 2). Paleocene Fort Union Formation sandstone and shale outcrops are exposed in McQuest Draw and the smaller side drainage.

The bench/terrace area is eroding and deflating. Exposed on- and off-site sandstone outcrops provided slabs for the fire hearths built and used by hunter-gatherers at the site. Nearby off-site clinker outcrops--metamorphosed rocks that were altered by the heat of burning coal beds—also provided other hearth building materials. The gravel capping a low ridge southwest of the site also gave the site's inhabitants ready access to knapping-quality pebbles and cobbles, including silicified wood, gray orthoquartzite and dark maroon quartzite,

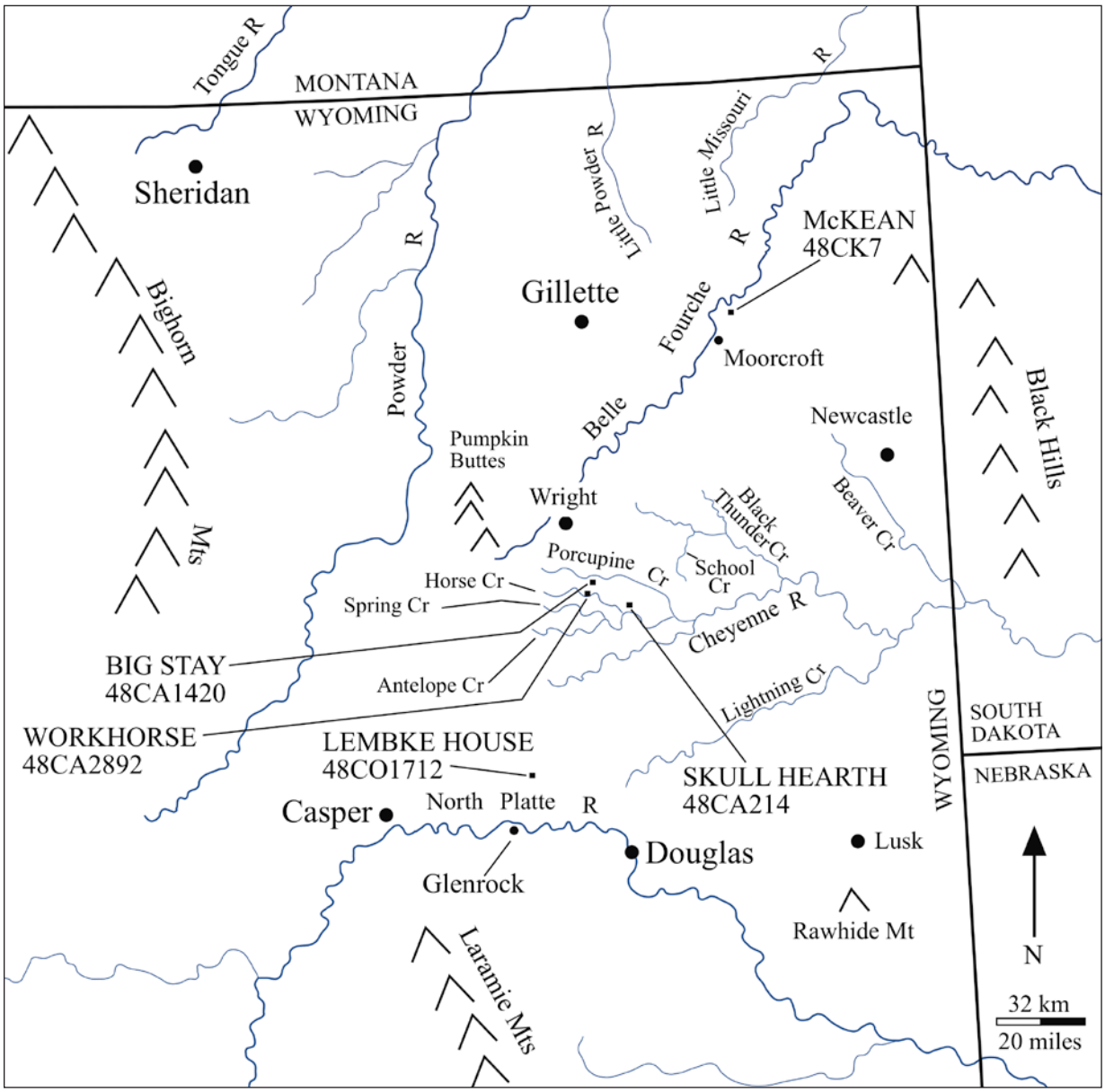

Figure 1. Overview map showing the Skull Hearth site (48CA214) and other local sites with house pits. All sites no longer exist and thus locational information is provided.

which is commonly called *ironstone*. Chert-chalcedony cobbles are rare.

Small pools of water in McQuest Draw likely provided water for the site inhabitants. The pools are seasonal and most reliable during the spring season. On-site vegetation is composed of greasewood (*Sarcobatus vermiculatus*), big sagebrush (*Artemisia tridentata*), fringed sagewort (*Artemisia frigida*), plains prickly pear (*Opuntia polyacantha*), needle-and-thread (*Stipa comata*), blue grama (*Bouteloua gracilis*), green needlegrass (*Stipa viridula*) and western wheatgrass (*Agropyron smithii*).

Soil samples from thermal (hearth, roasting, charcoal) features within the Skull Hearth house pit yielded birch (*Betula* sp.) pollen.

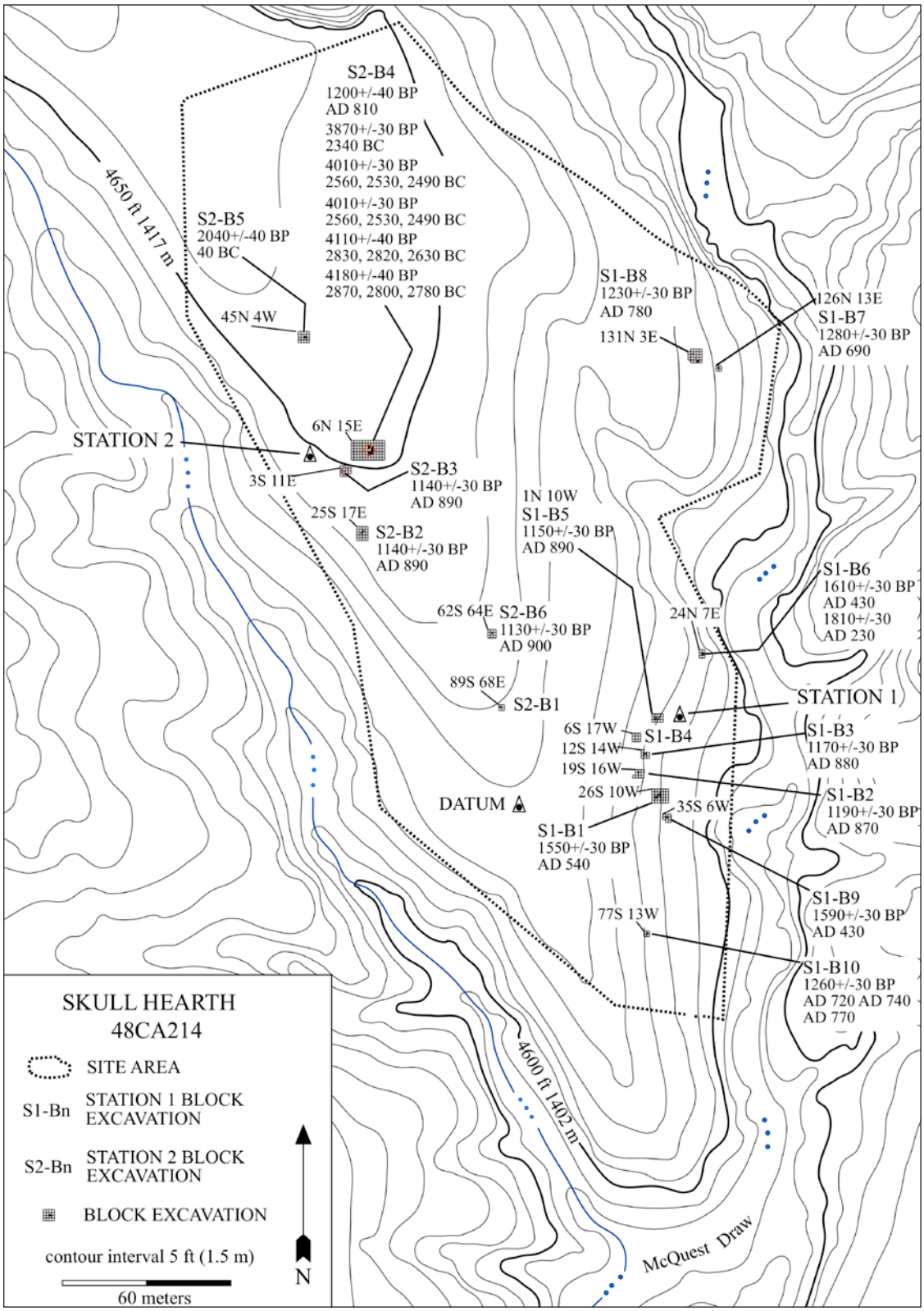

Figure 2. Site contour map of the Skull Hearth site (48CA214). Site no longer exists.

These palynology data tentatively suggest that standing water was present in Antelope Creek and possibly in McQuest Draw some 4,000 years ago. Phytolith analysis further suggests that cool-season C^3 metabolism grasses dominated, with C^4 metabolism grasses being rare. Therefore, the climate at this time was cooler and moister compared to today's climate (Cummings et. al 2013).

CULTURAL CHRONOLOGY

The cultural chronology used here is a modified version of Frison's (1978; 1991) widely known Northwestern Plains chronological system. My modification specifically focuses on the last 2,000 years of prehistory. I reconsider the timing of Late Plains Archaic period to the Late Prehistoric period transition and divide the latter into Late Prehistoric I and Late Prehistoric II time periods. In this modified chronology, the Late Plains Archaic extends from around 3,000 to 1,650 years ago, the Late Prehistoric period I ranges from 1,750 to 750 years ago, and Late Prehistoric II from 750 to 350 years ago.

Frison (1991) suggested the Late Prehistoric period began around 1,450 years ago and showed few cultural changes or divisions until historic times. However, based on the results of the excavation and analysis of over 75 archaeological sites in the eastern and northwestern Powder River Basin by the author and other archaeologists, there are, in fact, some significant variations in the material culture, settlement patterns and associated radiocarbon dates, making this modified chronology appropriate. It should also be noted that there is at least a 100-year overlap between the Late Plains Archaic and the Late Prehistoric I periods in this region.

Within the Late Prehistoric I periods, a local cultural manifestation arose which I term the Thunder Basin phase (Munson 2015, 2022). The term *phase* as used here follows the definition by Willey and Phillips (1958):

> . . . an archaeological unit possessing traits sufficiently characteristic to distinguish it from all other units similarly conceived, whether of the same or other cultures or civilizations, spatially limited to the order of magnitude of a locality or region and chronologically limited to a relatively brief interval of time (1958:22).

This phase terminology should not be confused with its most common usage by Northwestern Plains researchers; for example, the Besant phase or Pelican Lake phase. In fact, these phases are based almost entirely on projectile point styles. The Thunder Basin phase is not a *projectile point culture*. Instead, the Thunder Basin phase is characterized by a diverse material culture with a limited geographical range and temporal extent.

With this phase definition in mind, the Thunder Basin phase is characterized by a variety of mundane and unique cultural remains, including 1) small-diameter cylindrical pit hearths/ovens; 2) clay-filled pits; 3) fired clay objects that portray zoomorphic heads; 4) basket hopper mortars; 5) gaming pieces of both stone and shell; 6) heavy reliance on locally available tabular quartzite cobbles for tools, 7) a variety of dart- and arrow-sized corner-notched and side-notched projectile points; and 8) a heavy reliance on intermediate and small mammals for food. This variation in material cultural readily stands out when compared with other Late Prehistoric I occupations in the Montana and Wyoming portions of the Powder River Basin. However, it is not known at this time what came before and or after the Thunder Basin phase. The Thunder Basin phase pertains

to one of the Late Prehistoric period occupations at the Skull Hearth site, as described later in this paper.

HOUSE PIT DEFINITION AND DESCRIPTION

Aboriginal semi-subterranean features in Wyoming are variously referred to as pit houses, pithouses, house pits and housepits. Sometimes within the same discussion of these features, researchers use some combination of terms (e.g., Kornfeld et al. 2010). Moreover, Patrick Light (1998), citing Harrell (1989) and Waitkus et al. (1988), states that the term pithouse implies that the Wyoming semi-subterranean features are similar to the well-known pithouses found in the American Southwest.

However, Wyoming (and Plains) subterranean houses are generally shallow dish- to bowl-shaped depressions that lack any evidence of a covering superstructure, in significant contrast to the well-defined house pits of the American Southwest (see Kornfeld et al. 2010; Waitkus and Eckles 1997). On the Northwestern Plains, a depression and post molds are typically the only physical remnants of subterranean structures. However, post molds *are* suggestive of a long-vanished, post-and-beam structure covered by some combination of poles, earth, woven mats, hides and sandstone slabs. House pits without any evidence of interior or exterior post molds were no doubt covered in some way, since their purpose was to provide protection and refuge from inclement weather, heat and incessant prairie winds.

Whatever their original depth, excavated house pits were usually augmented with a dirt berm, using the excavated soil. Thus, the larger the pit, the greater the berm. The berm was piled evenly around the pit or sometimes piled on the pit's upwind side. It is possible that perishable windbreaks were also constructed on the upwind side outside of the pit, resulting in some evidence of external post molds depending on the size of the organic materials used.

The absence of post molds at some sites may be due to the fact that a perishable or removable domelike structure was placed over the pit, not unlike a sweat lodge. The framework was covered with hides, brush or mats. Using Pawnee Indian housing as an analog (e.g., Murray 1974; Wedel 1936), dome lodges were a popular type of structure used by some Plains Indian tribes prior to the acquisition of the horse. The dome lodge frame was light and could be readily transported by dogs. The use of light superstructures made out of readily available materials possibly explains the absence of post molds and other structural evidence at some house pit sites in Wyoming and across the Plains region.

EXCAVATED HOUSE PITS IN THE POWDER RIVER BASIN

For comparative purposes, this section briefly summarizes house pit excavation data gathered to date within and adjacent to this area of the Powder River Basin, primarily in advance of energy and other developments.

Four sites with house pits have been excavated in the eastern Powder River Basin (Figure 1). Three sites are located within a 6.4 to 9. 6 km (four- by six-mile) area and include the Workhorse site (48CA2892) (Munson 2009); Big Stay site (48CA1420) (Munson 2010); and the Skull Hearth site (48CA214) (Munson 2014a), all excavated by the author. The fourth is Lembke House site (48CO1712) (Lippincott 1998), located about 48 km (30 miles) south of the other house pit sites. In addition, a house pit at the McKean site (48CK7) was excavated several decades earlier (Kornfeld and Frison 1985; Kornfeld et al. 1995). The well-known McKean site is located on the western margin of the Black Hills uplift (Ekerle 1995) and adjacent

to and east of the Powder River Basin.

Lembke House (Lippincott 1988) is the first reported house pit in the Powder River Basin. Road construction partially destroyed the feature. It comprises the remnant of a dish-shaped charcoal-stained pit measuring 3.2 by 2.7 m, and was about 0.5 m deep. The oval- to rectangular-shaped pit contained a central shallow basin hearth surrounded by three deep, circular basin-shaped features and several possible perimeter post molds.

Radiocarbon dates obtained from the charcoal fill in the central hearth indicate the house pit was occupied between 3,520 years B.C. and 2,570 years B.C. (calibrated dates were not included in the original report) (Lippincott 1998). Based on the Beta Analytic data sheet attached to the original site form, the intercept age of 3,520 years B.C. date yielded a calibrated radiocarbon date of 4590+/-70 years B.P. (Beta-70930). The 2,570 B.C. intercept age calibrates to 4190+/-70 years B.P. (Beta-70931).

A single anvil stone and a chert flake were recovered from the Lembke house pit floor. Protein residue analysis of the anvil stone tested positive for bear antiserum. Six micro flakes were also found within the thermal feature fill, along with lower limb fragments of pronghorn or deer, and other small, unidentifiable bone fragments. Thermal feature fill comprised sagebrush (*Artemisia* sp.), greasewood (*Sarcobatus* sp.) and charred seeds of local plants (species of plants not provided by the investigator). Pollen analysis of the anvil stone yielded pine, sagebrush, greasewood, members of the sunflower family, and grass pollen.

The Workhorse (48CA2892) house pit lies on a T_2 terrace on the north side of the Horse Creek (Munson 2009). The pit was probably a natural depression modified and then occupied by the Indigenous inhabitants of the site (Albanese 2008). The basin-shaped depression measured 2.8 m north to south by 4 m east to west, and was .65 m deep (Figure 3). The house was mostly oval in shape, although its north side was more or less straight in plan view. No post molds were found within or outside of the pit.

Horse Creek contained standing water during our July to August, 2007, excavations, suggesting the house pit was on the floodplain when it was occupied aboriginally. In fact, the soil profile within the depression clearly showed overbank soil deposition, indicating yearly overflows or intermittent flooding over longer intervals of time. This overbank flooding resulted in the thermal features within the house pit being stacked on top of each other with varying amounts of soil separating them.

Radiocarbon dates were obtained from ten of the twelve thermal features within the house pit. Unfortunately, the depth of the features did not necessarily correlate with their age. For example, three of the four deepest features yielded younger dates than the shallower ones, which may be due, in part, to the burning of older wood in the upper features. The calibrated radiocarbon dates ranged from 4170+/-40 B.P. (Beta-240919) to 4540+/-40 B.P. (Beta-240926) (intercept ages of 2,890 B.C. to 3,340 years B.C.).

Like Lembke, artifact recovery here was sparse: two McKean Complex projectile points (one point in three parts), two pieces of grinding stone, a mano, a bone needle/awl, 11 pieces of lithic debitage, and fragmentary mammal bone of various sizes (species not yet identified).

The Big Stay house pit (48CA1420) lies at the end of a low east-to-west trending finger ridge near an ephemeral drainage. This unnamed drainage joins Porcupine Creek about 0.3 km north of the site. The single house pit measured 3.2 m diameter and was 0.5 m deep. Its basin-shaped depression was filled with charcoal-stained soil (Figure 4). The house pit and thermal feature pits were dug into the

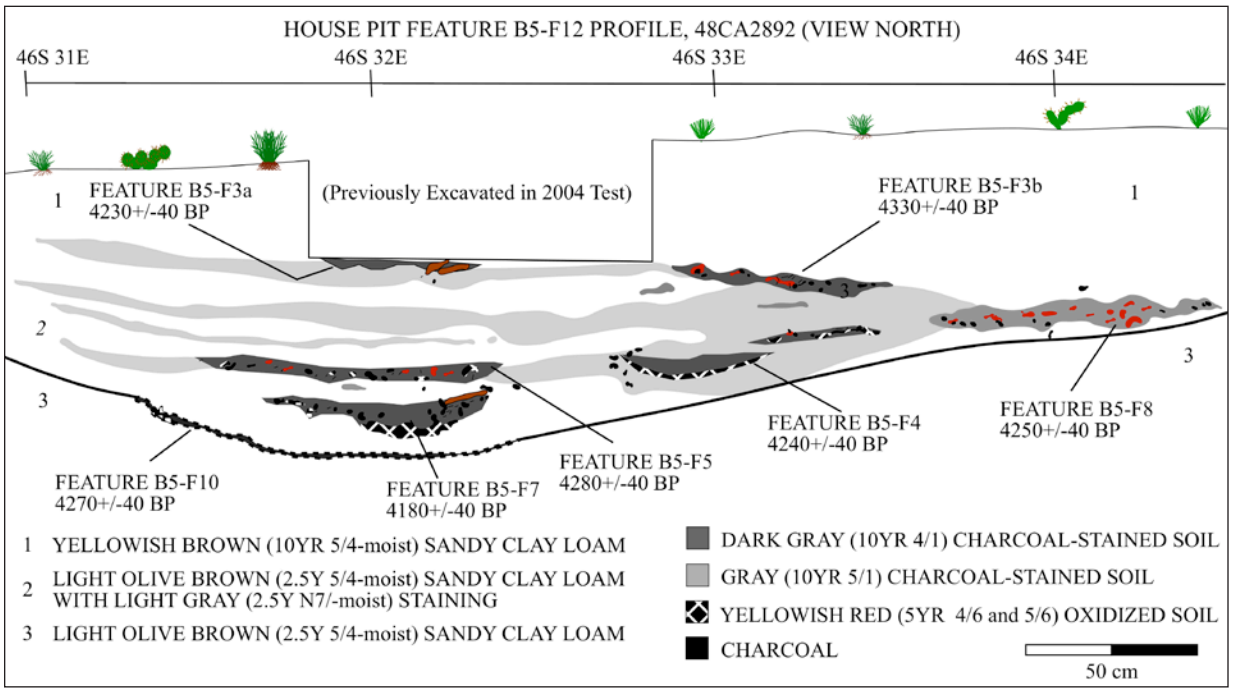

Figure 3. Profile of house pit at the Workhorse site (48CA2892).

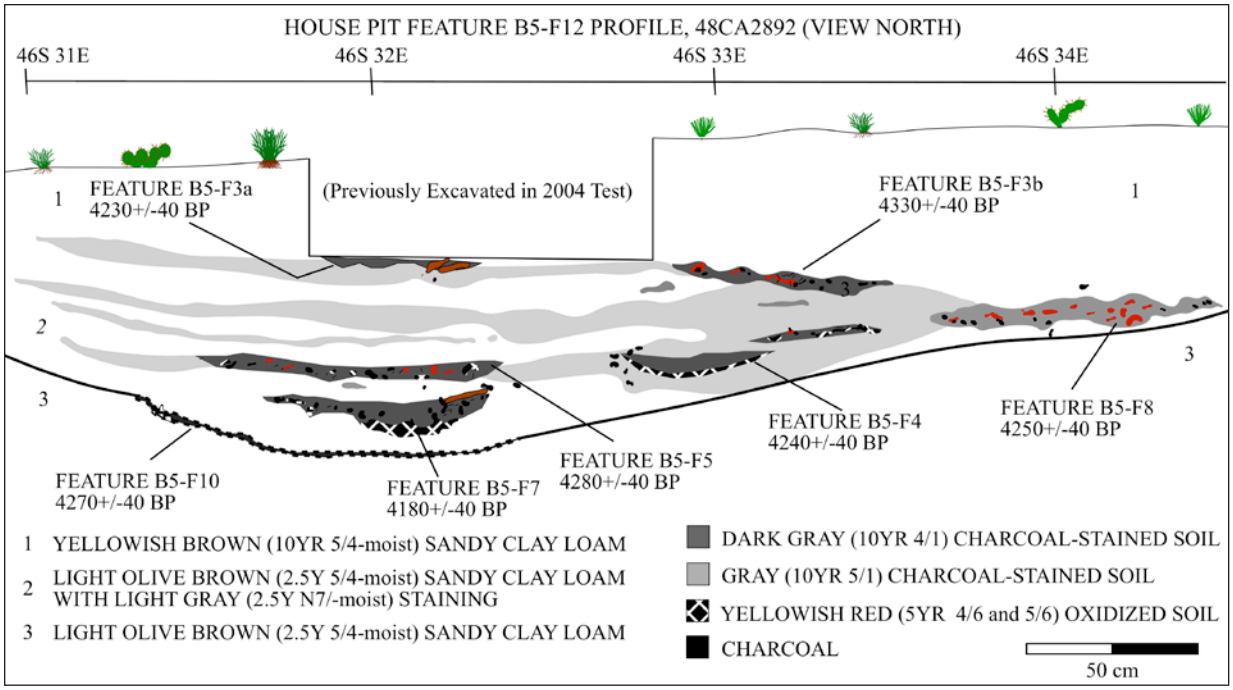

Figure 4. Profile of house pit at the Big Stay site (48CA1420).

soft, underlying sandstone bedrock, some 40 to 50 cm below the surface. No post molds were found within or outside of the pit.

A cluster of seven thermal features were excavated within the central portion of the depression. Four features surrounded a surface hearth. Three of these features were small-diameter cylindrical pits and another dish-shaped pit hearth with a centrally located cylindrical pit. These features were possibly used for some combination of hearths, ovens and/or storage.

Only thin and scattered spots of oxidized soil lined the walls of these pits. The surface hearth overlay a pit hearth that probably contained a cylindrical pit. However, burrowing animal disturbance made it difficult to determine its exact original shape. The seventh feature, another hearth/oven with a small-diameter cylindrical pit, lay 30 cm to the northwest of the feature cluster. This pattern of a centrally located surface hearth surrounded by pit hearths/ovens/storage was repeated outside of the house pit. This same pattern is also present at other local sites dating to around 4,000 years ago, including McQuest View (48CA3590) (Munson 2014b) and Skull Hearth (48CA214) (Munson 2014a).

Radiocarbon dating of three pit features within the house yielded calibrated radiocarbon ages of 3980+/-40 years B.P. (Beta 241642), 4030+/-40 years B.P. (Beta 241641) and 4150+/-40 years B.P. (Beta 241644), suggesting intermittent use of this house feature for some 270 years. However, all three dates were derived from charcoal, so it is possible that this age span reflects the differences in the ages of the wood being burned (the "old wood problem"). It is still possible that the house pit was intermittently reused over this length of time, although the argument against such reuse is that the features are not separated by intervening layers of soil as would be expected with intermittent use. It is also possible that any soil that filled in the bottom of the pit was cleaned out prior to reuse.

Artifacts recovered from the Big Stay house pit include a dart-size projectile point fragment, unifacially modified flake knife, biface fragment, pieces of metates, a mano, 39 pieces of lithic debitage, large- to small-sized unidentified mammal bone, pocket gopher (*Thomomys* sp.) bone, and jackrabbit (*Lepus* sp.) bone.

A cluster of six thermal features lay just adjacent to and west of the house pit. Four of the calibrated radiocarbon dates ranged from 3770+/-40 years B.P. (Beta-241639), 3910+/-40 years B.P. (Beta-241640), 3980+/-40 B.P. (241638) and 4180+/-40 years B.P. (Beta-233317). Here again, this 410 year time frame suggests multiple occupations over time. However, this idea is somewhat negated by the fact that the features were all located at fairly similar depths, with the feature having the oldest radiocarbon date being the shallowest by as much as 11 cm.

In addition to the six thermal features, another cluster of three thermal features was found adjacent to and northwest of the house pit. This cluster comprised a centrally located surface hearth with a hearth/oven located on the north side and a hearth/oven located on the south side, and small-diameter cylindrical pits similar to those within the house pit. The hearth/oven south of the surface hearth yielded a calibrated radiocarbon date of 4130+/-40 years B.P. (Beta-241643). Another hearth with a small bowl-shaped pit was located 1.5 m northeast of the house pit while a pit oven filled with fire-cracked sandstone rock was excavated 2 m northeast of the house pit. Neither feature yielded organic remains suitable for radiocarbon dating.

The various artifacts recovered outside of the Big Stay house pit include a Late Prehistoric I Avonlea projectile point, an arrow-size corner-notched projectile point, a Gatecliff Split Stem projectile point, cobble scraper, projectile point preform fragment, unifacially modified

flake scraper, metate fragment, a mano, lithic debitage, large- to small-sized, unidentified mammal bone, and pocket gopher bone.

Some artifacts and radiocarbon-dated features do not easily temporally align. The Avonlea point and a corner-notched arrow-size point were recovered adjacent to the 4130+/-40 year B.P.-dated cluster of three features (all situated from 18 to 22 cm below ground surface) northwest of the house pit. The Avonlea point was recovered from the 10-20 cm level and the corner-notched arrow size point from the 0-10 cm level. Because these depth differences are so small, it proved impossible to separate artifacts associated with Late Prehistoric I occupation from the Middle Plains Archaic occupation.

A Gatecliff Split Stem-like point recovered 2 m northwest of the house pit is interpreted to be part of a tool kit used by the inhabitants of the Big Stay house pit. The point is a Great Basin and Plateau style point associated with ca. 5,000- to 3,300-year old radiocarbon dates. Sandstone bedrock within the excavation unit containing this point was 30 to 40 cm deeper than the sandstone underlying the house pit. The fact that the point was recovered some 40 to 50 cm below surface suggests that soil deposited 4,000 years ago followed the natural contour of sandstone bedrock.

Finally, the McKean site (48CK7) is located adjacent to and east of the Powder River Basin on the western margin of the Black Hills uplift (Figure 1). William Mulloy (1954) first excavated the site but did not identify housing features (Ekerle 1995). The house pit was discovered when the site was revisited by Wyoming archaeologists in 1983 (Frison 1991:100; Kornfeld and Frison 1985; Kornfeld et al. 1995). The house pit comprises a large charcoal-filled basin. Charcoal from a thermal feature within the house pit yielded an uncorrected radiocarbon date of 3790+/-140 years B.P. (RL-1860).

SKULL HEARTH EXCAVATIONS

The Skull Hearth site (48CA214) was occupied intermittently by Plains Indian hunter-gatherers from around 4,180 years ago to 1,130 years ago (Figures 5 and 6). Based on the evidence derived from various excavation blocks, the five major episodes of occupation encompass the Middle Plains Archaic, Late Plains Archaic and Late Prehistoric I periods. To reiterate, excavation blocks labeled "S1" lie on the McQuest Draw slope and coulee while blocks labeled "S2" are located on top of the terrace/bench remnant bordering the north and west sides of the deep coulee (Figure 2).

The first occupation episode took place on the bench portion of the site (S2-B4) during the Middle Plains Archaic period, around 4,180 to 3,870 years ago. The Skull Hearth house pit is associated with this occupation, as described further below.

Some 2,040 years ago, near the end of the Late Plains Archaic period, the site was again occupied by hunter-gatherers in the area of S2-B5 on the bench north of but fairly close to the Middle Plains Archaic occupation and house pit.

Occupations 3 to 5 all occurred during the Late Prehistoric I period. For the first time both the bench and coulee portions of the site were inhabited by hunter-gatherer groups. The earliest (3) occurred at the beginning of the Late Prehistoric I around 1,810 years ago, as based on the evidence derived from S1-B6 in McQuest Draw coulee and the adjacent drainage channel. The fourth episode occurred around 1,550 to around 1,610 years ago in the area of S1-B1-F1, S1-B6 and S1-B9, also located in the McQuest Draw coulee. The latest occupation episode occurred around 1,130 to 1,320 years ago at S1-B7-8, S1-B10, S2-B2-B4 and S2-B6. Both the bench and coulee portions of the site were occupied.

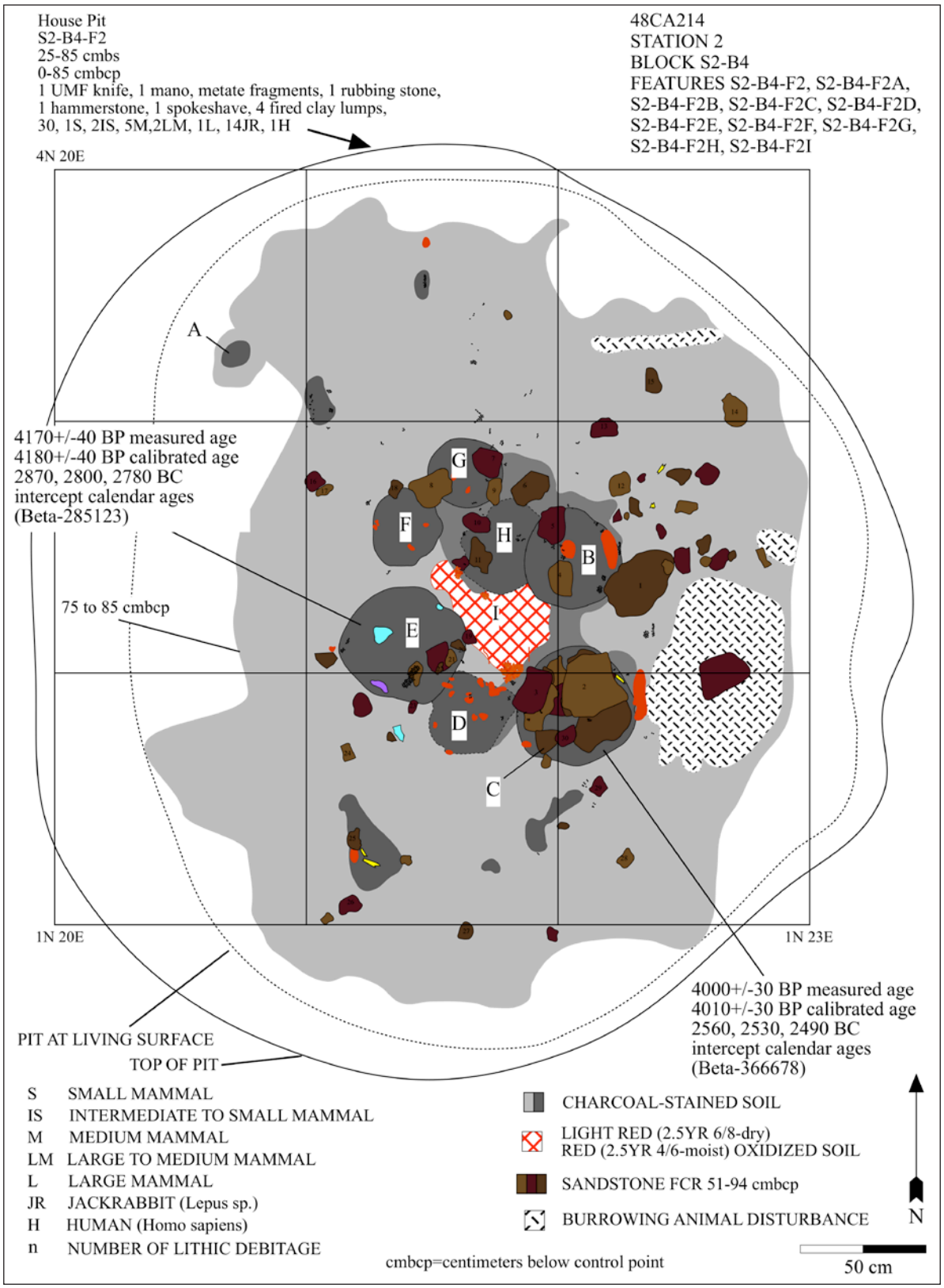

Figure 5. Planview of house pit feature S2-B4-F2 at the Skull Hearth site (48CA214).

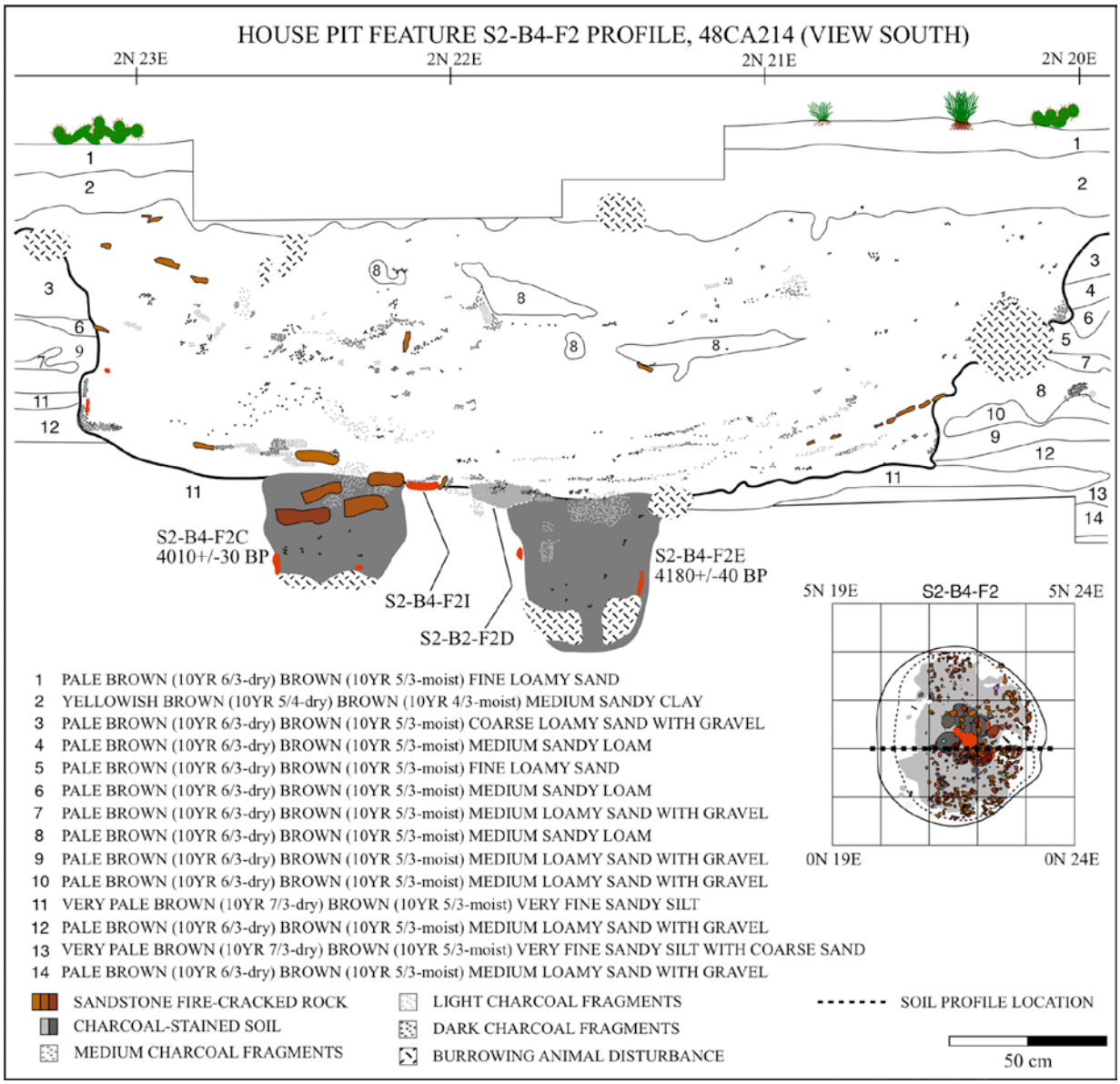

Figure 6. Profile of house pit feature S2-B4-F2 at the Skull Hearth site (48CA214).

Middle Plains Archaic

The single Middle Plains Archaic house pit excavated at the Skull Hearth site is located on top of the bench/terrace portion of the site (S2-B4). A Late Prehistoric I Thunder Basin phase hearth/oven was located just 2.7 m to the southwest and at the same depth as the house pit, suggesting an erosional anomaly took place at some time prior to the Late Prehistoric I occupation.

The Skull Hearth house pit is a circular depression measuring 3.8 m north to south by 3.5 m east to west. Its bowl-shaped depression is 0.85 m deep (Figure 7). During its construction, the excavated soil was likely placed around the pit, leaving a sizeable earth berm. It is also possible that the pit was originally deeper. The berm and pit are now diminished due to erosion and infilling. In fact, one erosional unconformity

Figure 7. Photo of house pit feature S2-B4-F2 at the Skull Hearth site (48CA214).

resulted in a 1,200-year-old Late Prehistoric I thermal feature being located at the same level as the 4,000-year-old house pit.

The charcoal-stained soil, fire-cracked rock and occasional areas of fire-reddened soil found in the house pit fill may be a consequence of the site inhabitants depositing refuse on top of the berm, followed by erosion and berm collapse. The pits wall was not uniform and varied from fairly straight to expanding curvilinear to undulating walls, clearly indicating that erosion and soil slumping occurred before and during the filling of the pit with soil. The bottom of the house pit was filled with a lens of fine sandy silt. I suggest this was an intentional choice since fine sand probably made a more comfortable floor than the gritty sand and gravel lenses above it.

Nine thermal features were contained within the house pit (see Figure 7). Seven surrounded a central surface hearth. The thermal features exhibited a variety of pit shapes. Three were bowl-shaped pits, one a barrel-and-cylinder-shaped pit, one a basin-shaped pit, one a dish-shaped pit, and one a regular frustum-shaped pit. Two pits had thin and spotty oxidized soil on the wall of the pits. This

presence of oxidized soil suggests they served as hearth/ovens, or were places where hot coals were stored overnight for starting the fire in the morning. The rest of the features are classified as charcoal-stained-soil-filled pits. Only one contained two small fragments of fire-cracked rock. If these features once served as ovens, then the fire-cracked rock was removed by the site's inhabitants.

Only two of these features yielded cultural material. One contained a fired clay lump and a jackrabbit bone fragment, and one contained one intermediate mammal bone fragment. Such a limited amount of artifacts suggests that these features were not used for refuse disposal other than possibly ash from the central surface hearth.

One small charcoal-stained pit was excavated some 0.8 m northwest of the cluster of features. Unfortunately, burrowing animals heavily damaged the pit, although it looked like a small cylindrical pit. It was partially filled with sagebrush charcoal. The function of this feature, like the other charcoal-stained-soil-filled pit features, is unknown. Perhaps hot coals were stored in the small pit for later starting a fire.

Sagebrush charcoal from two hearth/oven features yielded calibrated radiocarbon dates of 4180+/-40 years B.P. (Beta-285123) and 4010+/-30 years B.P. (Beta-366678). The difference between the two dates is 170 years. At two standard deviations, the dates are clearly not the same. It is therefore possible that these dates are from two different occupations, or they may be the result of burning older wood in the feature, which would yield older dates. Charcoal from the upper fill in the house pit yielded a calibrated age of 4110+/-40 years B.P., straddling the two dates from the hearth/oven features.

The variety of artifacts recovered from within the house pit include a unifacially modified flake scraper, a mano, cobble scraper, rubbing stone, tabular cobble hammerstone, four fired clay lumps, a spokeshave, 30 pieces of lithic debitage, three broken cobbles, and small, medium and large mammal bone. Identified bone includes jackrabbit (*Lepus* sp.) and a single proximal end of a middle human phalanx. The recovery of a phalanx from a human hand is puzzling. It is impossible to know whether the removal of a portion of a finger was accidental or intentional.

Three Middle Plains Archaic features were located outside of the house pit. One was a large fire-cracked rock scatter that contained spots of charcoal-stained soil. Charcoal from the feature produced a calibrated radiocarbon date of 4010+/-30 years B.P., (intercept ages in calendar years of 2,560 B.C., 2,530 B.C. and 2,490 years B.C.) (Beta-364062). The feature was located on the east side of the house pit and likely is where house pit refuse was dumped.

Some artifacts found within the feature may not be associated with the occupation of the house pit. An arrowhead-sized, corner-notched point from the feature is similar to the type associated with the Late Prehistoric period I Thunder Basin phase. In addition, a Thunder Basin phase hearth/oven was found in the same block excavation as the house pit and at the same depth. Artifacts that clearly belong to this feature and Middle Plains Archaic occupation include a cobble scraper, spokeshave, chopper, mano, metate, unifacially modified flake scraper, lithic debitage, broken cobbles and an intermediate sized mammal bone fragment. A small charcoal-filled pit was located within the fire-cracked rock feature.

What was probably the remains of a surface hearth and a small charcoal-stained-soil-filled pit was located on the west side of the house pit. Charcoal from the feature produced a calibrated radiocarbon date of 3870+/-30 years B.P. (intercept age in calendar years of 2,340 years B.C).

(Beta-364063). This date is well outside of any of the other radiocarbon dates from the house pit or from the feature on the east side of the house pit. Thus, this date could be derived from some unknown contamination of the charcoal or from a later occupation.

Late Plains Archaic

The Late Plains Archaic occupation of the Skull Hearth site was apparently brief, perhaps just an overnight stay by a group of hunters. No tools or bone tools and only 30 pieces of lithic debitage were recovered. However, a rock-filled basin-shaped hearth yielded a calibrated radiocarbon date of 2040+/-40 years B.P. (40 B.C.) (Beta-295511), placing the occupation near the end of the Late Plains Archaic period.

Late Prehistoric I

Twenty-one features were associated with the Late Prehistoric I component. All were thermal features. There were nine pit hearth/oven features, including six pit hearth features, one small oven or heat reservoir feature, two small dump features and three fire-cracked rock cluster features.

Ten of the thermal features are typical of the Thunder Basin phase with its characteristic cylindrical or nearly cylindrical pits (they probably became less cylindrical through use). Feature S1-B1-F1 dated to A.D. 540, placing this feature a little before the Thunder Basin phase (however, the burning of old wood may have affected the date). In fact, the emphasis on medium-size mammals for food and the recovery of an associated Besant-like point raises the possibility the feature is not part of the Thunder Basin phase component at the site. However, a Besant-like point and medium-size animal bone were associated with a Thunder Basin small diameter, cylindrical hearth at 48CA3030, located 2 km west of 48CA214. Charcoal from this hearth dated to around A.D. 680 (Munson 2002), supporting the inference that Feature S1-B1-F1 is indeed associated with the Thunder Basin phase.

The Late Prehistoric I component at Skull Hearth comprises 21 lithic tools, including a stage I biface, stage II biface and probable knife, two possible biface knife fragments, two complete endscrapers, an endscraper fragment, unifacially modified flake scraper, utilized flake scraper fragment, three tabular cobble scraper fragments, two point preform fragments, two point fragments, a Besant point, two unifacially modified flake knives, utilized flake knife, hammerstone, and an abrader or mano. Two temporally-enigmatic specimens are a probable Late Prehistoric I corner-notched arrow point fragment recovered adjacent to Middle Plains Archaic age charcoal and a Late Prehistoric II side-notched point discovered on the ground surface.

The 21 fired clay specimens associated with the Thunder Basin phase comprise three fired clay figurine fragments, seven fired clay objects that do not look like fired clay lumps or figurines or figurine fragments, five pinch pot sherds and six fired clay lumps. One bone tool and an awl were also recovered from the Late Prehistoric I component. The bone awl, made from a pronghorn-size metacarpal proximal shaft fragment, was recovered from Feature S2-B3-F1.

Possible stone beads were recovered from S1-B6 and S1-B8 (see Figure 2). Both are small tubular concretions with broken ends. They do not show polish or other modifications. Beads made from small concretions were recovered elsewhere in the Powder River Basin, for example at the No Ring site, 24BH148 (Munson 2018). They often show polish especially on their ends.

Three gaming pieces recovered from Skull Hearth are made from freshwater mussel shell and a small tabular concretion (from Features S2-B2-F1 in S2-B2 and Feature S2-B4-F1 in

Figure 8. Photos of two gaming pieces (made from a tabular concretion and shell) found at the Skull Hearth site (48CA214). Artifact on right measures 8.1 mm in length by 5.9 mm in width; artifact on left measures 15.7 mm in length by 10 mm in width.

S2-B4, see Figure 2). One of the shell gaming pieces and the concretion gaming piece exhibit incised lines on one face (Figure 8). The other shell gaming piece includes no incised lines but does have a natural ridge that runs down the center of one face. This ridge may have been used to mark one face instead of using incised lines. These are the first gaming pieces recovered in association with the Late Prehistoric I Thunder Basin phase. In addition, small fragments of freshwater shell were recovered from S2-B2 and are likely the waste from making the gaming pieces.

The Late Prehistoric I component yielded 1,615 bone specimens from S1-B3, S1-B4, S1-B7, S1-B10, and S2-B1. S1-B1 contained by far the most bone specimens, with 1,031 bone fragments. Pronghorn (*Antilocapra americana*) bone was recovered from S1-B1 and S2-B3, likely representing one individual.

Twenty-four jackrabbit (*Lepus* sp.) specimens were recovered from S1-B1-6. They likely represent one individual from each of the five blocks. The majority of the 487 unidentifiable, intermediate-sized mammal fragments are from a rabbit-size mammal.

Large mammal bone was only recovered from S1-B1 and S1-B9. In S1-B1, six of the specimens were tooth fragments and six were mandible fragments. All likely came from the same individual. At S1-B9, a complete bison coxae yielded a date of 2,100 radiocarbon years B.P. A nearby hearth dated to around 1,600 years ago.

Some 122 large- to medium-sized, unidentified mammal bone fragments were recovered from S1-B1, S1-B9 and S2-B2, and are part of the first Late Prehistoric I occupation of the site. Another 923 medium-size mammal bone came

from S1-B1, S1-B6, S1-B8, S1-B9, S2-B2, S2-B3 and S2-B4. The majority are pronghorn-sized. The presence of adult and juvenile sizes suggests that at least two individuals were butchered and consumed at the Skull Hearth site.

One burned bone specimen from S1-B5 is from an intermediate- to small-sized, unidentified mammal. S1-B5 and S1-B8 each yielded unburned Richardson's ground squirrel (*Urocitellus richardsonii*) bone. Another 12 specimens from S1-B8 were from a ground squirrel-size mammal, possibly from one individual. S1-B9 had one humerus fragment. The two specimens from S2-B2-4 are mouse- to ground squirrel-size bone. Whether the unburned bone from these small mammals reflects natural mortality or human predation and consumption is unknown.

SUMMARY

Ancestral Native Americans intermittently occupied the Skull Hearth site from ca. 4,180 to 1,130 years ago during the Middle Plains Archaic, Late Plains Archaic and Late Prehistoric I periods. Of significance, the Middle Plains Archaic occupation is represented by a house pit. Relatively few house pit occupations are known from the Northwestern Plains, particularly in Montana. The succeeding Late Plains Archaic occupation apparently was very brief and is represented by a single hearth and few associated artifacts. In contrast, the Late Prehistoric I period is represented by at least three habitation episodes by hunter-gatherers and a plentitude of thermal features.

A variety of thermal features—hearths, roasting ovens, charcoal pits—characterize all but the Late Plains Archaic occupations. In particular, the cluster of small pit features around a central surface hearth at the Skull Hearth house pit is repeated at other local sites dating to the same Middle Archaic time period, including McQuest View (Munson 2014b) and Big Stay (Munson 2010). However, at McQuest View, the house pit is not associated with these thermal features, although erosion probably removed most of the feature except for the house pit floor. Two thermal feature clusters at McQuest View also lacked central surface hearths, but here again erosion may be a factor. Other thermal feature clusters at McQuest View were excavated on the eroding ridge face immediately below the lip of the ridge. At Big Stay, one thermal cluster was clearly within a house pit and one cluster lay adjacent to it. That these thermal feature clusters are found both within and outside of house pits suggests that this is a local Middle Plains Archaic cultural trait.

Like the Middle Plains Archaic feature clusters, small-diameter hearths/ovens are temporally diagnostic of the Late Prehistoric I Thunder Basin phase. The presence of fired clay objects that are only found in association with the Late Prehistoric I period Thunder Basin phase small-diameter hearths/ovens adds support to when these features were constructed.

The house pit feature (S2-B4-F2) on the terrace/bench was the most important find at the Skull Hearth site. It was discovered as the result of a gradiometer survey, as were the thermal features at the site (Jones 2008, 2009). Unlike the later occupations at Skull Hearth, the house pit likely represents an extended stay by hunter-gatherers. It is also possible that the house pit was reused over a period of years. Erosion likely destroyed any internal (or external) post molds that may have existed within or outside the house pit—a situation probably not unique to this ancient house type.

The Late Plains Archaic occupation was clearly brief, as indicated by a single, rock-filled pit hearth and a few pieces of lithic debitage. It may be the product of a hunting party stop-over

or a single family's limited stay. The hunting party or family band camped some 30 m north of the Middle Plains Archaic house pit. Whether they were aware of its presence is impossible to know, though lithic and other materials might have been salvaged from the long-abandoned house site.

The three Late Prehistoric I occupations, including the Thunder Basin phase, also spanned brief periods of time—perhaps several days or a few weeks, although people no doubt returned more than once as indicated by the numerous thermal features. This inference of repeated use is also suggested by the comparative thicknesses of the oxidized soil lining the walls of the pit/oven hearths suggesting reuse, not on amounts of artifacts left behind. A greater representation of large- to medium-sized mammals at these blocks indicates an emphasis on larger prey animals during the earlier Late Prehistoric I occupations. The burned, smaller mammal bone may have resulted from natural causes (prairie fire) or comprised a part of the site inhabitants' diet.

The Skull Hearth site attests to the importance of data recovery and reporting of archaeological properties now demolished by coal lands development. Fortunately, the potential to find archaeological sites similar to Skull Hearth remains high throughout the Power River Basin regions of Wyoming and Montana. Such research will eventually shed more light on the construction and use of house pits by ancestral Plains Indians during the Middle and Late Plains Archaic periods, the Thunder Basin phase, and various topics pertaining to the Late Prehistoric Period in the Powder River Basin and the Northwestern Plains.

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