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Airport Rings: Stone Circle Archaeology In Yellowstone National Park

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AIRPORT RINGS: STONE CIRCLE ARCHAEOLOGY IN YELLOWSTONE NATIONAL PARK

By

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AIRPORT RINGS

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Written by Michael C. Livers &
Douglas H. MacDonald

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CHAPTER 1. INTRODUCTION

By Douglas H. MacDonald and Michael C. Livers

YELLOWSTONE VALLEY : 400 B.P. The Native American family quickly built their shelter, hurrying to put up the hide structure in the midst of a brutal winter storm. They had been busily hunting and gathering as they nervously watched the black clouds roll in from the west over the Devil's Slide, where the great bear had won victory over the devil, pushing him back into the earth. The men had been in the uplands hunting for deer, pronghorn, elk, and bison, while the women and children had been collecting drift wood for camp fires from the banks of the Yellowstone River. As soon as the black storm clouds inched over the Devil's Slide, the men knew they had to hurry home. The women rose up out of the valley and climbed the steep slopes to their favorite camp spot, the place we call Airport Rings (Photograph 1, Figure 1). Here, beginning as long as 4,500 years ago, Native American families built stone circles to hold down the edges of their hide shelters which today we call tipis. The setting of the campsite was ideal, providing a high rocky ridge to one side, a fresh stream to its left,

Photograph 1. Excavations and Setting of the Airport Rings Site, Yellowstone National Park. View North.

and a steep downslope to the Yellowstone River to its front. It was protected on all sides and had a beautiful panoramic view of the wide Yellowstone River Valley as it stretched northward into the Plains.

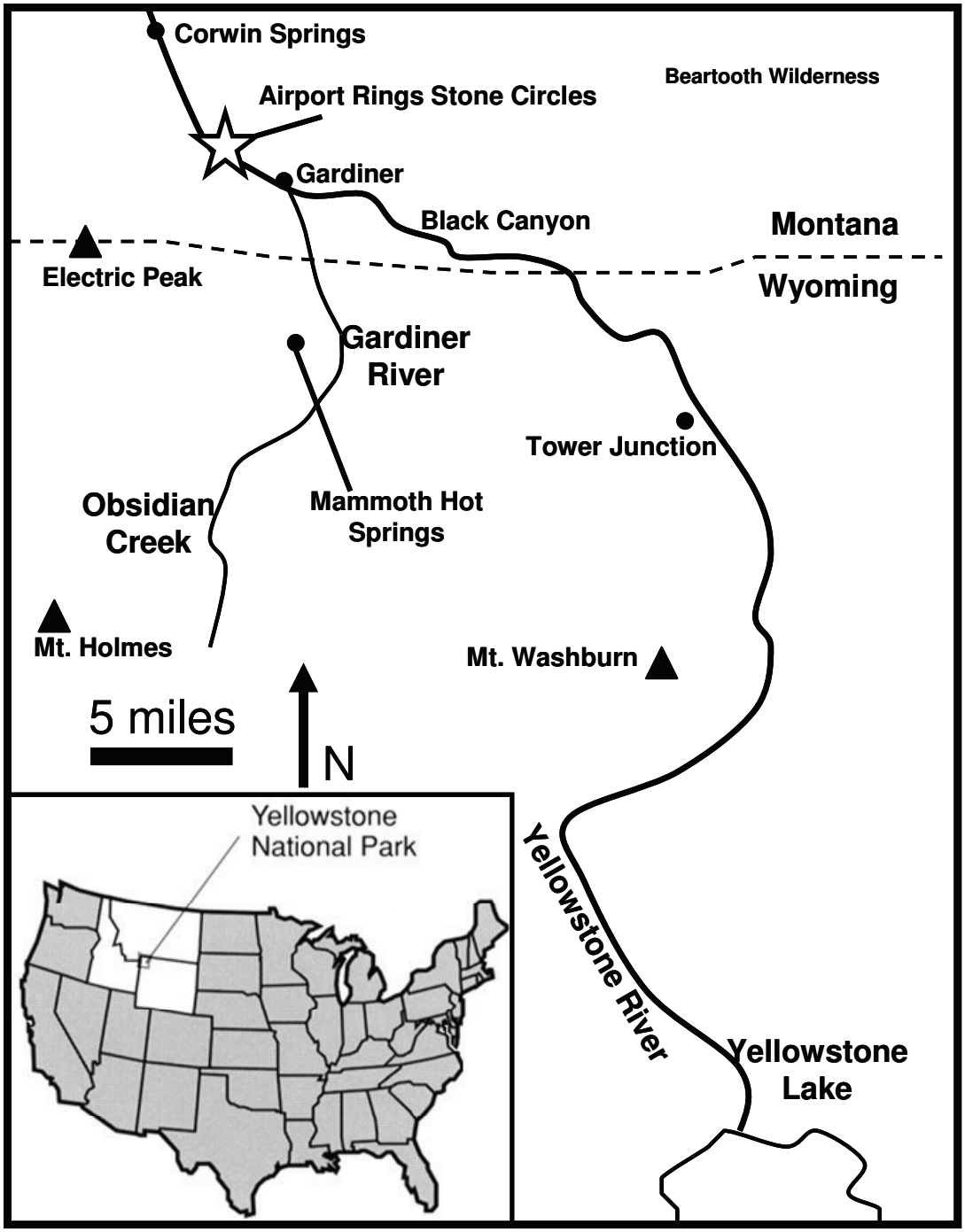


Figure 1. Project Location.

But, on the day of this winter story, about 400 years ago, this family was struggling to beat the winter storm that was rolling in toward them. There was no snow on the ground yet, but they knew it was coming. They had spent much of the summer and early fall in the uplands of the Yellowstone Plateau, but were now returning to the lowlands of the Yellowstone River for the winter. The wind whisked up blowing dust around them in a vortex. The women began to assemble the poles for the structure and they saw the hunters inching closer toward them from the upland hunting grounds below Sepulcher Mountain northwest of the hot springs. By the time the men got there, the snow was percolating from the sky. The family quickly collected 20 or so large rocks they would use to hold down the edges of the hide lodge. They gathered them in a circle about 30 feet across. They then raised the wooden poles and tied them together snugly as the women laid the hides on the wood structure and the men pushed the rocks over the bottom edges of the hides. The entire process took about an hour and by the time they were done, two inches of snow covered the ground.

The family quickly went inside the lodge and started their fire, hoping to warm themselves after their bitter cold tepee raising. The rest is history, or rather, prehistory. Left as rocks. Left as fire pits. Left as bone and stone. Left for us, the University of Montana, to find some 400 years later. We found it alright. This volume presents the results of our archaeological excavations of the Airport Rings site, as well as an overview of the entire prehistory of stone circle use in the northern portion of Yellowstone National Park and the upper Yellowstone River Valley near Gardiner, Montana.

In the end, the excavations of The University of Montana in the summers of 2007-2008 collected a great deal of information by which to understand the lives of the people that built stone circles in this beautiful northernmost portion of Yellowstone National Park. We hope you enjoy this report, which is the end result of a lot of hard work, sweat, and a few tears.

Project History

Cultural Resource Management (CRM) is the process of regulating archaeological resources on federally related projects. Any construction, building, or federal public works projects must go through a federally mandated oversight process when the project involves federal funding, lands or permits. The federal policies guiding this oversight process are based on laws detailed in the National Historic Preservation Act passed in

was going to have any effect on the recorded resources. Taking the recorded field information into account, our researchers evaluated the various historic and prehistoric resources in need of protective measures from future projects in the area, such as the re-seeding project. Airport Rings (24YE357) was one of the many sites recorded during the initial two-year inventory and evaluation process. Although the site was not in the proposed disturbance area for the re-seeding project, 24YE357 was found eligible for listing on the National Register of Historic Places and was tested for its research potential.

During the 2007 field season, the MYAP team focused on the area bounded by the Old Yellowstone Road on the east and the Yellowstone River on the west, between roughly the Gardiner High School and Reese Creek, which is the northern boundary of Yellowstone. In 2008, we finished surveying between the Old Yellowstone Road and the foothills, finishing 3000 acres of survey for the park. Among the 47 prehistoric archaeological sites we found during the project, the Airport Rings Site was one of the most impressive.

As shown in Figure 2 and Photograph 2, Airport Rings and the overall project area is located adjacent to the Yellowstone River in Park County, Montana. Between the two MYAP field seasons in the Boundary Lands—2007-2008—The University of Montana field teams surveyed a total of 2,757 acres, including 2,057 in 2008 and 700 in 2007. MYAP worked at a total of 47 sites and collected 9,979 total lithic and historic artifacts, including 2,725 lithics and 7,254 historic artifacts.

Photograph 2. Project Setting. View North. The Devil's Slide and the Yellowstone River are in the Background.

Acknowledgements

Many people contributed to the success of the MYAP excavations at Airport Rings. Graduate student Michael Livers was the primary author of this report, which serves as his Master's Degree Professional Project. Assistant Professor Doug MacDonald was the second author and editor of this volume, with contributions by University of Montana students Lester Maas (background research and co-field director), Laura Kurz and Helen Keremedjiev (data entry). John Douglas, Steve Sherriff, and Elaine Hale provided peer review comments on this report.

The initial season of the MYAP benefitted from numerous individuals and organizations who contributed time and funds toward project success. Christine Whitacre and the Rocky Mountain Cooperative Ecosystem Study Unit (CESU) of the National Park Service provided essential funds toward project completion, as did the UM Office of the Vice President of Research and the Department of Anthropology. Ann Johnson and Elaine Hale of YNP provided remarkable guidance and patience in project establishment and the initial season's success is due to their assistance. Various members of the UM faculty provided guidance in the establishment of the field school, including Linda McLean, John Douglas, Anna Prentiss, and Kelly Dixon. Brenda Covington and Lester Maas (UM graduate students) provided countless hours on the project.

Photograph 3. 2007 MYAP Field School participants. Photo taken from top of ridge facing southeast. YNP Corral Operations and Field School Project Area are seen in the distance.

Field school students participating in the 2007 MYAP project included Emily Darrell, Wilena Old Person, Meg Tracy, Robert Peltier, Jason Plainfeather, and Katrina Johnson from UM. Students from other universities included Robert Hairston-Porter and Travis Wardell (College of Charleston, South Carolina); C.J. Truesdale (University of Wyoming); Michael Livers (University of North Dakota); and Leia Hays (Western Carolina University).

UM students participating in the 2008 MYAP project field school (Photograph 4) included Seth Bates, Nathaniel Scherr, Penny Tollefson, Gerad Smith, Amber French, Raymond Ford, Chris Kirkpatrick, Sherry Nugent, Justin Ferryman, and Jordan McIntyre. Montana State University was represented by River Lovec and Jacob Adams, while the University of Tennessee was represented by Kristen Lewis.

Photograph 4. 2008 MYAP Field School Participants. Photo taken at northern end of project area facing northwest.

Thanks also to our visitors and guest lecturers during the field school, including Walt Allen of the U.S. Forest Service, Jim Truesdale, Steven Sheriff of The University of Montana Department of Geosciences, and Gilbert Quintero (and family) of the Department of Anthropology. Radiocarbon dating was conducted by Beta Analytic, Inc. (Miami, Florida), while Linda Scott Cummings and Kathryn Puseman of PaleoResearch,

Inc. (Colorado) conducted ethnobotanical identification of 24YE357 feature contents. Richard Hughes conducted XRF analysis of selected igneous materials from the project area. Funds provided by Ann Johnson of YNP assisted in the latter two studies. Special thanks to Mary Hektner for her help in locating the HRC Rings Site (24YE0204) and for providing project funding through her wonderful Boundary Lands reseeding project.

The remainder of this report provides details of our investigations of stone circle use in Yellowstone National Park and the upper reaches of the Yellowstone Valley, including background history, methods of research, and the results of our excavations in 2007-2008.

CHAPTER 2. ENVIRONMENT, PREHISTORY, AND PRIOR RESEARCH

by Michael C. Livers, Douglas H. MacDonald, and Lester E. Maas

This chapter provides overviews of regional geology, climate, flora & fauna, prehistory, and prior archaeological research near Airport Rings. These sections provide an overall context for presenting the results of archaeological research in Chapters 4 and 5.

Geology, Physiography, and Hydrology

The Upper Yellowstone River Valley sits in an intermediate zone between the Northern Great Plains and the higher-elevation Intermountain Zone of the Rocky Mountains. This Intermountain region is defined as encompassing not only the entire Rocky Mountain range, but also many of the adjacent basins and plateaus with a broad elevation range anywhere between 4,200 and 12,500 feet (1300-3700m) (Madsen and Metcalf 2000).

The Boundary Lands project area is within the Montana portion of the Yellowstone Plateau physiographic province, a high-elevation, geologically-active uplift. Located mostly in the northwestern portion of Wyoming with some parts in Montana and Idaho, the Yellowstone Plateau was formed through a series of volcanic eruptions and lava flows between approximately 2.1 million and 70,000 years ago during the Pleistocene. The volcanic activity is well-evidenced by the numerous geysers, hot springs, and mud pots of which the closest is at Mammoth Hot Springs, Wyoming, located approximately 12 miles south of the project area.

While the Rocky Mountains surround the river valley on all sides, the valley proper and the project area are in a High Plains setting, dominated by sagebrush and short-grass prairie. Several south-north-trending streams traverse the project area as they descend from the slopes of the nearby Sepulcher Mountain (elevation 9,646 ft. above mean sea level) and Electric Peak (elevation 10,969 ft. amsl) toward their confluences with the Yellowstone River northwest of Gardiner. The elevation of the MYAP area ranges between approximately 5,150 and 5,430 ft. amsl, much lower than the majority of the Yellowstone Plateau proper which averages 8,000 ft. amsl.

The Pinedale Glaciation was the last glacial period in Yellowstone. Although separate from the North American ice shield, the Yellowstone Plateau glacial icecap covered almost the entire Yellowstone area with a relatively flat mantle of ice that began melting as the climate warmed around 14,000 B.P. and was virtually gone by 12,000 B.P. (Hale 2003). Glacial flood deposits from the Pinedale Glaciation are poorly to moderately sorted boulder-rich gravels and sand, including gneiss and basalt boulders greater than three feet in diameter.

Airport Rings is located in the Gardiner Basin, which represents the lowest and driest portion of Yellowstone National Park (Gardiner 2005). Precipitation averages slightly over 10 inches annually, with 33 percent of the total received from March through June. Snowfall averages around 40 inches annually, but is patchy and intermittent and seldom persists throughout the winter months (Gardiner 2005) unlike the higher elevations within the park where snow can still be as deep as several feet into late spring.

The terrain around Airport Rings is predominately sloping alluvial fans with a notable Holocene age landslide (Pierce 1973) located within the southern third of the project. The primary streams of the project area, from north to south, are: Reese Creek, Stephens Creek, Landslide Creek, and an unnamed creek drainage located within 600 ft. of the Heritage Resource Center. Each of these streams has its origins in springs and spring run-off in the mountains to the west. The streams run west-to-east and feed the Yellowstone River.

Damming of the Yellowstone River about 10,000 years ago (Gardiner 2005) due to a landslide at Yankee Jim Canyon approximately 10 miles north of the project area inundated the floor of the Gardiner Basin with water and formed a temporary lake lasting several thousand years. Lake beds reached an altitude of about 5,200 feet and are made of brown to tan beds of silt and clay (Gardiner 2005). The clay-rich sediments deposited within this lake are responsible for the lowest parts of the broad flat valley-floor within the Gardiner Basin (Gardiner 2005).

Climate, Flora and Fauna

Based upon pollen samples in the southern portion of YNP, the present ecozones (sage brush steppe, montane conifer forest, and alpine tundra) were established sometime during the Late Pleistocene to Holocene transition between 10,500 and 9,000 B.P. (Whitlock 1993). These same samples also show a spike in steppe-dominating grasses between 7000 and 5000 B.P., suggesting a maximum dryness in the area

occurring during this time. By 5,000 B.P., environmental conditions similar to today prevailed across the northern Plains, including Yellowstone. Known as the Medieval climate optimum or anomaly (Bettinger 1999), the Late Holocene dates to approximately 1,000 – 600 years ago; this was the period of occupation of three of the stone circles at the Airport Rings Site. This warm-dry period is marked by reduced distribution of pine when compared to other Holocene periods.

Whitlock's (1993) work with pollen samples indicates the plants responsive to warmer and drier climates tend to disappear across a majority of the greater Yellowstone region, but not in the northern section. The consequences of this being that much of what today is coniferous forest was then subalpine meadowland, which also contained considerable amounts of sagebrush. While the amount of grass was considerable, it was not as great as the Holocene peak around 2,500 years ago.

Historic homesteaders in the area created many different irrigation systems in order to successfully attempt crop growing during their tenure, evident of the many irrigation ditches and reservoirs created across the Boundary Lands. Without water or rainfall, few if no agricultural plants would survive in this region, a factor noted by Frison (1991) in addition with too few frost-free days for why prehistoric agriculture never developed in the area.

Current surface vegetation within the project area consists predominantly of a sagebrush grassland community, with some stands of sagebrush are up to eight feet tall, signifying the relatively dry unchanging nature of the area. The Gardiner Basin contains many of the species typical of the middle Rocky Mountains but also harbors species more commonly encountered in the short grass prairie of the Great Plains to the east as well representative species from the Great Basin to the west. A common shrub in the area, spiny hopsage, is a typical component of the Great Basin flora but is a rarity in Montana. Wyoming big sage, coupled with bluebunch wheatgrass, prairie junegrass, and Sandberg's bluegrass, make up the understory community of the lowest elevation of the Gardiner Basin (Gardiner 2005).

With the exception of Reese Creek in the northern portion of the current project area, the Yellowstone River in the portions of the project area has very few cottonwoods. The adjacent slopes of the drainages are open woodland with limber pines, Rocky Mountain juniper, Douglas-fir, and squawbush. There are little or no stream side meadows, but immediately adjacent to the river are water birch and willows (Gardiner 2005).

Various exotic plants dominate the relatively flat areas between the landslide deposits and the alluvial fan deposits, which represent almost a century of homesteading and cultivation. These exotics include such species as desert alyssum (usually forming large patches), summer cypress, Russian thistle, annual wheatgrass, fanweed, littlepot falseflax, flaxseed, cheat grass and Japanese brome with patches of crested wheatgrass scattered amongst the fields (Gardiner 2005).

Yellowstone has a diverse ecosystem, which is currently home to many large mammals; bison, elk, moose, big horn sheep, deer, antelope, grizzly and black bear, mountain lions, coyotes, and wolves. In addition to these varied large game species, a variety of birds and other small animals are also present in the region. The patterns may have been different in the past; Frison (1991: 334) observes from his work in northwest Wyoming that there were very few bison roaming the higher elevations during the entire Holocene and fewer antelope numbers in the area until the Late Archaic period. There has been some debate on the availability of various ungulates (specifically elk, bison, and mountain sheep) during more distant prehistoric times (see Frison 1978; Cassells 1983; and Wright 1984).

Antelope, or pronghorn, hunting has occurred in the Yellowstone region since the Paleoindian period (Frison 1991) and more than likely occurred in the Boundary Lands, evident of the many pronghorn noticed in the area during both field seasons. These pronghorn were caught on several occasions during the early morning hours on the flats

Photograph 5. Frequent Camp visitors, Bison scares off Elk several yards northeast of the project camp site at Eagle Creek Campground.

of the project area before they worked their way up into the foothills and higher altitude benches in the area. Faunal materials recovered from the Eagle Creek Site only a few miles to the northeast of the Boundary Lands included pronghorn, canid, elk, and bison remains indicating these were hunted in the past 500 to 1200 years (Jackman 1997). Several elk were also noticed as far down as the edge of the project flats during the second summer of the project and around our Eagle Creek Campsite just one mile north of Gardiner. A male bison also frequented the campsite during the early morning hours, apparently unaffected by the human presence because he was found most mornings grazing directly outside of unsuspecting campers' tents.

The wide variety of flora and fauna would have provided prehistoric peoples with a range of potential subsistence sources, some of which have been identified within the archaeological record (Haines 1977; Janetski 1987; NPS 1993, 1999; Hunt 1993; Cannon et al. 1994; Davis et al. 1995).

Heavy snow in the uplands of the Intermountain region make, "mid range latitudes uninhabitable during winter" meaning a group "must make base camp in adjacent valley foothills or mouths of canyons" (Madsen and Metcalf 2000: xi). With the assurance of wintering camps at lower elevations and widely accepted idea of restricted movement in the winter (see Larson and Francis 1997), it is logical that habitation of the upper portions of the Yellowstone Plateau by prehistoric peoples would probably have been seasonal due to the heavy winter snows that blanket most of YNP and surrounding areas. Seasonal habitation of an area is an idea that is supported by both ethnographic accounts and comparisons discussed in chapter three.

Snowfall during the fall, winter and spring months causes animal migration to lower elevations generally beginning in October to areas with less than two feet of snow accumulation (Osborn 1993). A study observed animals unable to maximize feeding potential without a significant energy loss as the cause for the move to lower wintering elevations, a model that is applicable across all upland areas of the Rocky Mountains (Osborn 1993). The current project is within portions of the winter range of bison, elk, mountain sheep, deer, and antelope, which extends down-valley along the river to Livingston, MT, where the Yellowstone River exits the mountains (YNP 1997). This winter range for large ungulates would have provided productive hunting activities during the winter months for prehistoric and historic peoples as well as providing sheltered areas for winter camps due to the limited snowfall in the area compared to the nearby mountains.

Plant seasonality ties in with expected land use patterns. "Plant cover is obviously almost always likely to stand in relation to culture. It largely expresses climate; it tends heavily to determine the fauna; and it enters directly into subsistence, besides as times affecting travel and transport" (Krober 1969: 351). Within the Upper Yellowstone Valley, the plant cover is poor compared to other Intermountain regions like the higher elevations within YNP (Whitlock 1993). It is no surprise then that intermountain area research points to a trend of seasonal variation in resource availability causing rounds of domestic mobility related to subsistence and procurement strategies of these resources (Hale 2003; Kelly 2007; Madsen and Metcalf 2000). This is similar to other parts of the world where the actual loci of hunting, fishing, agricultural and gathering activities radically shift during seasonal weather extremes (Roy 1982).

Prehistory

For the sake of the interested reader, we provide a brief summary of the prehistory of the area, including a specific review of stone circle use; additional information can be found in MacDonald (2007) and Maas and MacDonald (2009). "Prehistory" or "prehistoric" are the terms used in this report to simply note the period of events occurring before the time of written historical records and are not intended to be used for the interpretation of cultural development. Following Hale (2003), we organize the following culture history into six chronological periods, including Paleoindian, Early Holocene, Middle Holocene, Late Holocene, Contact or Protohistoric, and Historic. The Upper Yellowstone River Valley has been in constant use over thousands of years by hunter-gatherer populations. This is evident from very important sites within the valley such as the Carbella buffalo jump (24PA302), showing stratified occupation going back more than 6,000 years, the Myers-Hindman Site (24PA504) (Lahren 2006: 152-153) dating to over 7,000 years of continuous occupation, and finally, to the north of the valley, the only Clovis age, Paleoindian burial discovered in North America, the Anzick Site (24PA506) (Lahren 2006: 96-101).

The Yellowstone River provides a natural corridor or conduit for the migration of animals and people following resources along the valley (Davis et al. 1995; Hale 2003). It should come as no surprise that all of the regional prehistoric societies occupying the interior of the park were hunter-gatherers as well (Davis et al. 1995). Within the interior of the YNP, sites like Osprey Beach (Shortt 2001) detail the continued use of the upland areas of the park since the Late Paleoindian period. Understanding the use of the

upland regions of the park by the same cultural groups living on the Plains come with its challenges. Life in the valley is different from that of the upland interior in many ways. This is evident by the changes in site types from the surrounding valleys into the uplands. One form of cultural remains left behind by early inhabitants that changes with the transition from the valley to the interior are stone circles, or the remains of tipis, the mobile hide structures so popular among Plains Native Americans over the last 3,000 years. Such structural remains are virtually non-existent in higher elevations of the Yellowstone ecosystem, but are more common at lower elevations of the park, such as the current Boundary Lands project area.

The tipi is an animal hide and wood pole structure commonly found on the Great Plains in great numbers. The construction of this structure consists of cured animal hides sewn together and then stretched around a group of long wooden poles erected by lashing the poles together at a central point creating a conical structure (Brasser 1982; Dooley 2004; Kehoe 1960; Malouf 1961). Not all of the conical hide structures used by Native Americans were tipis and not all stone circles were left behind from tipi use. Other forms of conical structures exist in the archaeological record such as wikiups, a conical timbered lodge of all wood poles with rocks sometimes recorded around the bases of structures still standing in the region (Conner and Halverson 1969; Mulloy 1965). These all-wooden structures are located throughout the park and have been recorded much more often than stone circles in YNP (Malouf 1958).

The use of conical lodges, the types used, and the presence of rocks around the base is highly variable across the greater Yellowstone region. Distinguishing the differences between the use of stone circles and conical lodges is an interesting task this volume addresses. Understanding the history of the tipi and its use relies on three important sources. Ethnographic informants as well as historical sources provide a link between recent tipi usage and the possible usage of tipis before European contact. Coupling these first hand accounts with the prehistoric site assemblages is the only way anthropologists studying these Native American groups are able to link actions throughout the various occupation events occurring over thousands of years.

Archaeological evidence for the origination of tipi use on the Plains is found in the northwest High Plains, even though many working with stone circles thought tipi technology developed in the eastern plains (Brasser 1982: 311), probably a result from the earliest ethnographic accounts coming out of this eastern Plains region. Ted Brasser provides a list of dates associated with stone circles gathered from several

decades of archaeological investigation from the Greater Plains region. His work provides a list of dates thought to be associated with stone circles ranging from the Paleoindian period (9000 B.P.) all the way up to historic use in the 20th century based on ethnographic accounts and radiocarbon C-14 dates.

Paleoindian Period (12,000 to 8,000 years ago)

During the Paleoindian Period, many archaeologists have had trouble classifying the nature of economic and social land use in the intermediate areas between the Plains and Rocky Mountains. Based on the archaeological evidence available from this period it remains unknown if prehistoric groups used these regions similarly or differently (Hofman 1997). Frison (1992) argues a separation occurred between the ways different groups utilized the region—Foothill/Mountain versus Plains—at least up until the Paleo-Archaic transition around 8000 B.P. After this time, Frison believes there was a disappearance of a separate hunter-gathering tradition in the Intermountain area and a strictly large scale, communal bison hunting tradition on the Plains.

The differences between these two traditions are linked to variations in mobility as well as other social and economic factors discussed more in the next section. Frison (1992: 337-338) suggests prehistoric Plains groups utilized a vast majority of the open Plains and Intermountain basins, while the Foothill/Mountain groups remained isolated at higher elevations. The Foothill/Mountain-Plains separation is evident to Frison based on the differences in artifact technologies recovered in the different areas. After this period of prehistory there is no clear-cut separation between the patterns of land use in the archaeological record. The lack of distinguishing factors concerning land use after this transition period could be the reason why very few in depth archaeological investigations have taken place in the region. In fact, most archaeologists pay little attention to transition areas in the region (Larson 1997) unless there happens to be a “worthy” site such as a Paleoindian period site or a buffalo jump. As a result, not only are there many questions pertaining to specific use of the greater Yellowstone area that have gone unanswered, but the lack of research has also created a knowledge gap cutting across all periods of prehistory in the area.

In general, little is known about the use of shelters by Paleoindian groups in Yellowstone and vicinity (Hofman and Graham 1998). There is currently no substantial evidence to conclude that skin covered lodges similar to tipis were used by Paleoindians; however, there is a possibility that stone circles or “tipi rings” do exist from

this period and have yet to be discovered. The most widely accepted elements of Paleoindian life were their organization into small, mobile bands that left evidence of short-term habitation. While they were considered big game hunters, they were occasionally orientated to a broad spectrum of hunting and gathering (Butler 1986; Chatters and Polotylo 1998; Frison 2001; Frison, Toom, et al. 1996; MacDonald 2009; Stanford and Day 1992).

The earliest known occupation in the Yellowstone region is the Clovis culture, radiocarbon dated from 11,500 to 10,900 years ago. Clovis hunters utilized projectile points that are long, finely crafted lanceolates with retouched edges and a flat, or slightly concave or convex proximal end that is sometimes rounded. Fluting at the proximal ends is another characteristic of the Clovis Complex projectile points. Percussion flaking initiated at one margin and terminating at the opposite margin is characteristic of Clovis and can be seen in both their biface performs as well as their projectile points.

Few Clovis points have been recovered within park boundaries. The 2007 MYAP team recovered a Clovis point fragment from the ground surface approximately one mile north of Airport Rings along the Yellowstone River (MacDonald 2008). However, the point was likely secondarily deposited at the site, either from upland slopes or by later site occupants via recycling. The second-most proximate Clovis point recovered was from the construction of the Gardiner Post Office, approximately 0.5 mile south of the current Boundary Lands project area (Janetski 2002). Approximately 70 miles north of the project area, the Anzick Clovis Cache yielded a wealth of data regarding Clovis burial and cache behavior in the northern Plains (Lahren 2006).

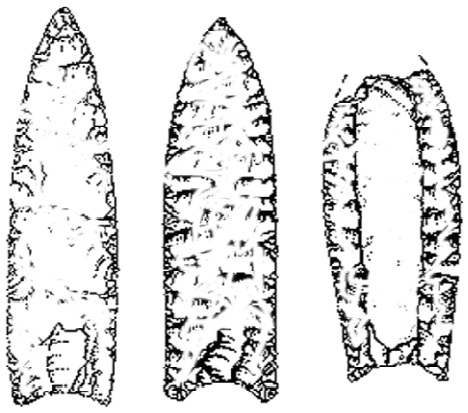


Figure 3. Clovis, Goshen, and Folsom Projectile Points (from MacDonald 2009).

As with Clovis, the Folsom complex is rare in YNP and this portion of the Yellowstone River basin. The Folsom cultural complex dates to approximately 10,800 to 10,300 years before present, and the culture is characterized by a subsistence pattern oriented toward bison hunting (MacDonald 1999, 2009; Hill 2007). While most Folsom sites with faunal remains yield bison, excavations conducted at the Indian Creek (Davis and Greiser 1992) and MacHaffie (Davis 1997) sites in Montana (north of the current project area) indicate a broad subsistence base for Folsom individuals in the Rocky Mountain

foothills, confirming recent research by Hill (2007). A Folsom point found in the Bridger-Teton forest south of Yellowstone was sourced to Obsidian Cliff, indicating that Folsom individuals clearly entered the park to collect stone (Cannon et al. 1997). An unfluted Folsom or Plainview point, geochemically similar to stone from Obsidian Cliff, was recovered during archaeological excavation on the shores of Yellowstone Lake (Hughes 2003a, b). The Folsom component of the Indian Creek Site also yielded obsidian sourced to Obsidian Cliff in YNP (Davis and Greiser 1992).

Folsom culture persisted in Montana and the Great Plains until approximately 10,200 years ago. At that time, archaeological data indicate that individuals ceased to use Folsom points, in favor of Agate Basin and Hell Gap stemmed lanceolate points and, subsequently, a variety of other unfluted point types. Agate Basin and Hell Gap archaeological components are mostly focused south of Montana, persisting until approximately 9,500 years ago. As of the writing of this manuscript, no archaeological sites in Montana have yielded Agate Basin or Hell Gap archaeological components. Nevertheless, several Agate Basin and Hell Gap style points have been collected across the state, suggesting a sizable presence. Agate Basin projectile points are elongated lanceolates with narrow, tapered bases and straight-convex blades. Hell Gap points are similar, but typically have square stems.

While no Agate Basin or Hell Gap sites have been excavated in Montana, several sites in mountainous areas of Big Sky country have yielded Late Paleoindian archaeological components that post-date Agate Basin/Hell Gap, but with somewhat similar projectile technology. These upland sites may be culturally linked to those cultural complexes, but with slightly different technology due to the contrasting prey types in the mountains (sheep, pronghorn, etc…) compared to the Plains where the focus was on bison.

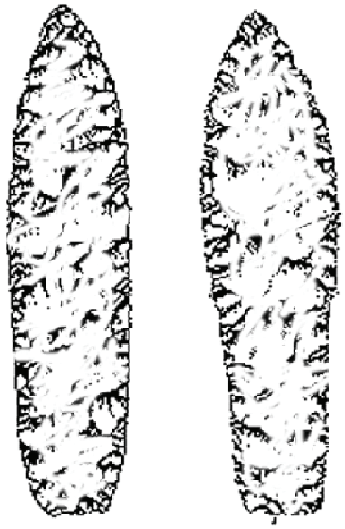


Figure 4. Agate Basin (left) and Hell Gap (right) projectile points.

Among the most important of these remote upland sites are the Indian Creek site, the Black Bear Coulee site near Dillon and the Barton Gulch site south of the popular Virginia City historic area. The Mummy Cave Site in northwest Wyoming also is an important site with its earliest components dating to the Late Paleoindian period. Few data are available for the Agate Basin/Hell Gap components at Indian Creek, thus we do not discuss it further here. However,

abundant archaeological data are available from Black Bear Coulee, Barton Gulch, and Mummy Cave.

As with Agate Basin and Hell Gap, the Cody Complex is not well defined in Montana. The Cody Complex persisted in the northwestern Plains between 9,500 and 8,000 years ago. Cody sites generally are associated with bison hunting with stemmed lanceolate projectile points, including Alberta, Eden, and Scottsbluff varieties. Each of these point styles is a cultural descendent of Agate Basin/Hell Gap style points, as represented by the fine bifacial flaking and use of high quality lithic materials in their manufacture. Another diagnostic attribute of Cody Complex sites is a beveled cutting tool called a Cody Knife, one of the most interesting knife forms in the prehistory of the Plains. The Cody knife is essentially an Alberta projectile point resharpened to an asymmetrical blade, useful in bison processing and other cutting activities.

An important nearby Cody Complex site is Osprey Beach in Yellowstone National Park. With the exception of Mammoth Meadow in Montana, most Cody Complex sites are in the lowland Plains. However, Osprey Beach is at an elevation of approximately 8,000 ft. amsl and yielded protein residues from a variety of game, including bison and rabbit. Excavated by the Museum of the Rockies (Bozeman, Montana; Shortt 2002), with Brian Reeves and Ann Johnson of Yellowstone National Park, the Yellowstone Lake beach front site contained stemmed Cody points of the Alberta and Scottsbluff varieties, Cody knives, sandstone abraders, as well as a wide variety of food processing tools. No radiocarbon dates were assayed on the assemblage however, but it clearly is of Cody Complex cultural affiliation. It is one of the few high elevation Cody Complex sites, but clearly indicates that these early Native Americans were more than just bison hunters.

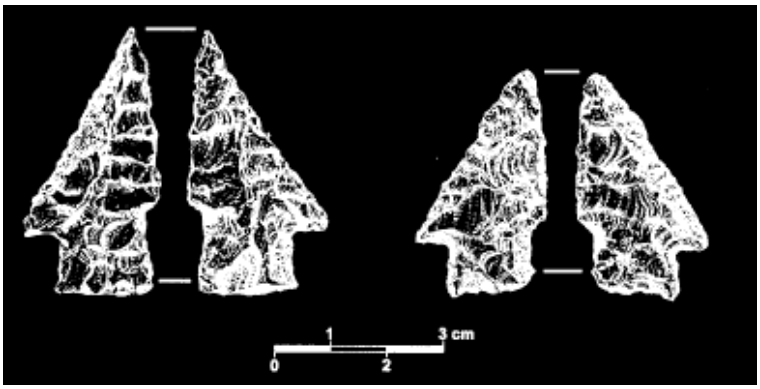


Figure 5. Cody Knives from the Osprey Beach Site, Yellowstone Lake, Wyoming. Courtesy of Yellowstone National Park.

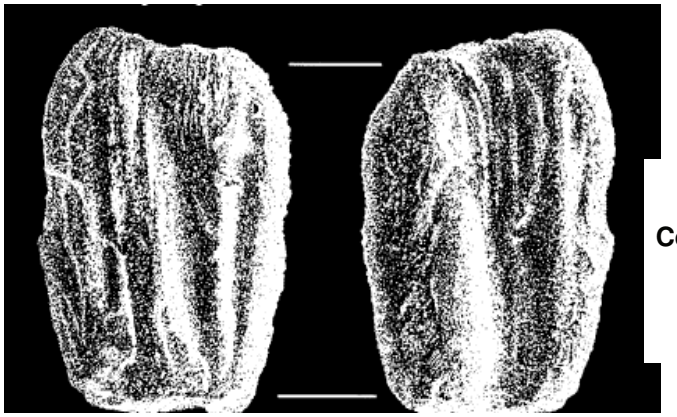


Figure 6. Sandstone abraders from Osprey Beach, Yellowstone Lake. Courtesy of Yellowstone National Park.

The record of Paleoindian occupation in Montana is limited, but the existing data points to a diverse subsistence pattern between approximately 11,000 and 8,000 years ago. Sites like Mammoth Meadow, Black Bear Coulee, Barton Gulch, Indian Creek, and MacHaffie provide data for upland adaptations dating back 10,900 years. Other sites are best characterized as classic Plains bison kill sites, including Mill Iron which is among the oldest sites in the state. Finally, sites like Anzick, north of Livingston, indicate that Montana was among the earliest places occupied by Clovis peoples in the Plains and Rockies. There, a 2-year-old girl was buried with more than 100 spear points, bone rods, and red ocher stained items, providing crucial data on early ceremonial behavior in the Americas. With the additional data from nearby Wyoming and vicinity, the Paleoindian archaeological record of the northwestern Plains and Rockies is rich and provides insight into the lives of Montana's earliest peoples.

Early Holocene Period (8,000 to 5,000 years ago)

The Early Holocene is marked by various fluctuations of climatic conditions, including the warm and dry period known regionally as the altithermal which resulted in the extinction of *Bison antiquus* and the evolution of the modern *Bison bison*. In addition to bison, an essentially modern suite of fauna were present during the Early Holocene, including as elk, moose, mule deer, pronghorn, mountain lion, wolf, coyote, fox, beaver, weasel, wolverine, marmot, rabbit, and squirrel (Good and Pierce 1996).

Sometimes referred to as the Corwin Springs Subphase (Reeves 2006), the Early Holocene is characterized by both continuity and change. This period of time is indicated by a broad based foraging and hunting strategy coupled with a small group mobility similar to the Terminal Paleoindian. Seasonal mobility patterns classified the

Archaic period dependant upon resource availability during different times of the year (Spangler 2000: 55). Diagnostic elements of the Early Holocene, such as grinding tools and stone filled roasting pits, increased in frequency and from their first appearance during the Late Paleoindian (Frison, Toom, et al. 1996; Hofman and Graham 1998).

Within the Yellowstone region, hunter-gatherers increased their dependence on plant foods and small game such as marmots, grouse, and rabbits. This trend marked a noticeable decline in the quality of lithic technology, with a greater concentration on local sources (Frison and Mainfort 1996; Larson 1997). Pit houses and cave habitations sites suggesting continuity of use, although seasonally intermittent, beginning in the Early Holocene have been found in areas adjacent to YNP but not in Yellowstone itself (Butler 1986; Frison 1991). It was also during this time and the grasslands surrounding Yellowstone were used for bison jumps, though at this time no known jumps exist within the park boundaries (Reeves 1978).

Middle Holocene Period (5,000 to 1,500 years ago)

Encompassing what is generally referred to as the Middle Plains and Late Plains Archaic (or Middle Prehistoric) periods, this era is characterized by more varieties of projectile points on the Northwestern Plains, including several with bifurcated bases such as Oxbow and McKean. Variations in a number of other categories such as technology, social and economic organization, as well as settlement strategies during this period should be expected due to the nature of short term and long term changes (Hofman 1997). These seasonal and yearly changes likely affected where different cultural groups lived, the territory boundaries they exploited, the duration of their occupations, as well as the extent of their social networks. Unlike the anthropological predecessors of the 1960s and 70s, beliefs of an overly incapable, or unintelligent, “Man the Hunter” during prehistory, the archaeological record points to another interpretation of the prehistoric image. The Middle Holocene was not a “simple” time for these prehistoric peoples full of unknowns and assumed generalizations associated with “Man the Hunter” era notions (Hofman 1997). The archaeology of the Plains details a lasting occupation with technological advances ranging throughout the Holocene

Middle Holocene Material Culture

Oxbow projectile points mark the end of the Early Holocene and the beginning of the Middle Holocene, dating regionally to approximately 5,000 to 3,000 B.P. The Oxbow is

characterized by a concave, bifurcated base and notched sides and is thought to be the precursor to the McKean Complex.

There is some debate as to the relationship between Oxbow and McKean, with suggestions of reuse of Oxbow points by other cultures (Melton 1988), the development of McKean out of the Oxbow (Brumley 1998), as well as other suggestions for the origin of the Oxbow-McKean relationship (Reeves 1983). Chronologically, sites with McKean projectile points overlap with Oxbow between approximately 5,000 and 1,500 B.P. The local representation of the McKean tradition is, according to Reeves (2006), the Hayden Valley Subphase. Reeves (2006) describes this subphase as being "characterized by the McKean Lanceolates (least common), Duncan Stemmed, Hanna Stemmed, Hanna Corner Notched, and Mallory points."

Pelican Lake projectile points (3,000 to 1,500 years ago) replace the McKean Complex (Frison 1991) and indicate a substantial increase in bison hunting, using techniques of the pound and jump (Foor 1982, Reeves 1990), widespread use of circular shelters outlined by stone, and basin-shaped rock-filled hearths several feet wide (Dyck and Morlan 2001). Pelican Lake projectile points have deep corner notches near the base and create a "tanged" or pointed shoulder. The base is usually rounded but can be flat. Referred to as the Lamar Valley Subphase by Reeves (2006), some Pelican Lake points are quite small, around the size of arrowheads made during the Late Holocene. Pelican Lake points are considered Middle Holocene, as the adoption of the bow and arrow marks the beginning of the Late Holocene (SAS 2007) though Reeves (2006) notes that the Lamar Valley Subphase encompasses a variety of styles and types.

Along with the change in projectile points, rock filled (roasting) pits, sandstone grinding tools, beveled edge side-notched knives, and concentrations of stone circles are other cultural hallmarks of the Middle Holocene (Frison 1991).

Middle Holocene Stone Circles

The period of original adoption of a skin-covered lodge being held in place with rocks, left in the archaeological record as stone rings, is unknown. Irwin-Williams, et al. (1973), suggest in their report of Early Archaic or Paleoindian occupations in the Hell Gap area of southeast Wyoming, that the discovery of a structure containing nine rocks at the Frederick phase level of the excavation (6400-6000 B.P.), was similar enough in arrangement to compare with the stone rings found on the Plains. General assumptions about the age of stone circles are that these remnants of prehistoric domestic sites were the result of technological adaptations of prehistoric groups sometime during the Late

Archaic period (Frison 1991). A majority of stone circle sites located on the Plains are concentrated in Montana, Wyoming, North Dakota, and Alberta, Canada (Brasser 1982), meaning it should be no surprise that some of the oldest verified stone circle sites are located in this area. Archaeologists compiling known dates from the sites in this concentrated region have concluded that stone circle formation was most prevalent after 2,000 B.P. (Dooley 2004) as the result of shifting subsistence strategies mentioned below.

Stone circle sites older than 2000-3000 B.P. exist in the archaeological record but are few in number. Two stone circle sites worth mentioning, predating these dates, are the oldest recognized stone circle sites on the Plains and the oldest dated stone circle sites in Montana, both excavated by John Brumley. The Cactus Flower Site (EbOp-16), first discovered in 1969 during a survey for the Canadian military on the Suffield Military Reserve in southeast Alberta, maintains the oldest accepted date for any stone circle site, with radiocarbon dates and diagnostic artifacts indicating site occupation during the McKean phase (Brumley 1975). An intensive excavation between 1972 and 1974 uncovered deeply buried deposits along the South Saskatchewan River exhibiting, "Distributional patterns of cultural materials around hearth areas in two of the Old Channel Lake occupations…possibly indicative of habitation structures. Such structures may have been quite similar to the wood-framed skin-covered tipis used by historic people in the area" (Brumley 1975: 96).

Even though direct evidence of tipi use, such as rock rings, was not present, other researches have noted similar artifact patterning suggesting tipi use without the presence of rocks. Several ethnographic accounts provide background support for the idea of a tipi being used without rocks to hold down the skin cover edges. Kehoe (1960) notes in his ethnographic account that sometimes the Blackfoot Indians would use chunks of sod and other objects, like logs or personal belongings, to hold down the edges of the tipi when stones were not readily available. Hoffman (1953: 5) also provides an ethnographic account from a few Lakota Sioux who said that they never used rocks to weigh down their tipis; rocks were only used during religious or ceremonial purposes.

Although inferences may be made associating deposits with a portable tipi like structure, Brumley's dates from the excavation level do not correlate to this site being the oldest possible stone circle site. Based upon Brumley's data, the radiocarbon dates for the site go back to 4,130$\pm$85 B.P., with this date coming from a sample two

occupations levels below the probable partial ring. The date associated with the hearth possibly associated with the stone circles is more recent: 3,615±95 B.P. (Brumley 1975). Even when cross-referencing relative stratigraphic data, point typology, and obsidian hydration dates, Brumley's absolute dates do not go beyond the relative dates associated with the McKean phase. In fact, the point chronologies suggest an almost strictly McKean phase with McKean lanceolate as well as Duncan and Hanna points which Brumley uses to place the occupation range from 4200 B.P. to 3600 B.P. (Brumley 1975: 95). Most archaeologists conducting tipi ring studies since this excavation have associated the relative beginning date 5000 B.P. for the McKean phase, as the date for the Cactus Flower Site, thus the reason for the site's acceptance as the oldest tipi ring site.

A similar date, actually coming from a single occupation event inside an intact ring, is from the oldest stone circle site in Montana. This site (24BH2317) in Big Horn County, Montana was first discovered, recorded, and tested for its archaeological potential in 1984 by Steve Aaberg (1984). Brumley and Ken Dickerson (2000) returned to excavate the site in 1998 during a Bureau of Reclamation project for the proposed enlargement of the Tongue River Dam and opening the area to public access. During the investigations, the crew fully excavated one of the eight stone circles at the site, uncovering a central hearth allowing the ring to be dated using radiocarbon C-14 dating. Unfortunately, the excavation did not turn up any projectile points with which to support the radiocarbon dates. Dates from a charcoal sample taken from the bottom of the hearth came back with an uncalibrated AMS date of 3940± 60 B.P. and a one sigma calibrated date of 4275-4430 B.P. (Brumley and Dickerson 2000: 61). Brumley concludes in the report summary that this date is associated with the occupation of the stone circle by people during the latter part of the McKean phase (ibid.).

The Airport Rings site (24YE357) exhibits several of the characteristics noted within this period. Even though it is difficult to accurately associate buried cultural materials with surface materials, the excavations at Airport Rings uncovered a partially slab lined, rock filled roasting pit inside one of the rings correlating with the beginning or time immediately before this period. As well as the radiocarbon C-14 date gained form the hearth sample, point chronologies consistent with the Oxbow tradition make the Airport Rings hearth, as far as what information is available from the literature, the earliest date for a hearth found within a stone circle by several hundred years.

Late Holocene Period (1500 to 500 years ago)

The Late Holocene period is indicated by a fairly dramatic increase in stone circle use, as well as the innovation of the bow and arrow, resulting in a decrease of projectile point size. Reeves (2006) notes that this time of transition, which he calls the Late Precontact Period, is separated into three subphases, including: the Black Canyon subphase ca. 1600-1200 years (which correlates with the Avonlea Horizon); the Tower Junction subphase ca. 1600-800 years ago (an overlapping time frame of the Avonlea, but more representative of the Unita Phase); and the First Blood subphase ca. 800-300/200 years ago. Reeves refers to the latter as the local representation of the Ahvish Phase or Old Women Phase.

Intermountain pottery, though not as pervasive as the new weapon technology, appears in the region and is found throughout the Canadian provinces, Wyoming, Montana, Utah, Idaho and southern Colorado (Frison et al. 1996). Various types of prehistoric pottery were utilized in Montana, with both Shoshone (Intermountain) and Crow varieties being the most common. Other types of pottery, including Avonlea, were prevalent in northern Montana, but are rare to non-existent in the Yellowstone Valley.

The Late Holocene indicates the widespread use of communal bison kills as well as evidence of pronghorn and sheep trapping. Large numbers of bison drive lines and associated jumps, some with pounds and capture corrals and others without, are located adjacent to YNP to the north and west (Arthur 1966a; Davis and Wilson 1978; Frison 1991). Large aggregations of domestic stone circles are also evident regionally in the area, located mainly along the river valleys and often close to bison drives.

Stone circles are found in various locations in Yellowstone, but only singularly or a few clustered together, indicating seasonal use of the area by small groups of foragers. Archaeological studies of stone circles indicate increased tipi use by Late Archaic people using Besant projectile points (ca. 2300-1300 years ago). Dates associated with reference material tend to dismiss or inadequately address the stone circle sites during this period. During an archaeological survey in North Dakota from the late 1990's, over 1,000 stone circle sites were recorded with only 26 projectile points found in association (Dooley 2004: 111). Based on sediment and charcoal samples sent for radiocarbon dating, as well as relative point chronologies, the associated age range for stone circle use in this case was generally confined between 2000-1000 B.P. (Dooley 2004). Dooley

(2004) notes that all of the points found from within the rings were of the Besant phase, also supporting the notion that tipi use was most prevalent during this period.

The old conceptions of tipi rings, concerning the possible lack of artifacts, are probably still to blame for this seemingly lack of interest for Late Prehistoric stone circle sites. A majority of stone circle investigations conducted over the past several decades have simply surveyed the ground surface, with little to no subsurface testing. Considering an archaeologist's concern caused by a lack of artifacts, surface collected projectiles points from the Late Prehistoric period may allow researchers to believe the site is not very important. It appears that Late Prehistoric sites are deemed relatively unimportant in terms of research potential compared to the research potential of Paleoindian sites. In terms of prehistoric Plains archaeology, the trend seems to be the older a site is (i.e. Paleoindian), the more potential it holds to answer those seminal questions regarding early site occupants. A similar theme applies to contact and historic period sites in terms of peaked interest from archaeologists, probably due to the ability to use written references to substantiate varied hypotheses of the land's first human inhabitants.

Based on ethnographic data, large communal gatherings (e.g. summer aggregation for group resource acquisition and ceremonial purposes) were likely a hallmark of the Late Holocene archaeology of the region. Kehoe (1960) notes that the Blackfoot used stone circles during communal gatherings in the summer resulting in the formation of large camp circles. Sometimes these communal gatherings had more than 100 lodges during a single encampment (Banks and Snortland 1995; Oetelaar 2006). The only issue with this archaeological interpretation is the counter idea that these sites with hundreds of rings could be the result of multiple or annual visits to the location (Deaver et al. 1999; Dooley 2004; Oetelaar 2006). A perfect example of this is discussed in Light's 1984 University of Montana master's thesis concerning spatial patterning of tipi rings.

Light (1984) compares the Pilgrim Site (24BW675) to several other previously recorded stone circle sites containing a large concentration of rings. The Pilgrim site consists of 71 rings with point chronologies ranging from the Pelican Lake phase to Old Women's phase, both providing dates consistent with the period. Further investigations from the site produced radiocarbon dating samples, confirming the point typology dates with several supporting dates falling within the Pelican Lake range and the Avonlea phase (Davis et al. 1982).

In comparison to the current project, the Airport Rings site is relatively small in number with 11 rings compared to some of these sites with 100+ rings. Nevertheless, even with fewer rings, Airport Rings exhibits characteristics of repeated use. Evidence for this comes from an Avonlea point found at the bottom excavation level in one of the stone circles and radiocarbon dates from hearths in the other two rings, discussed in Chapter 6.

Many of the hallmarks of the Late Holocene, such as side-notched arrow points, pottery, and wider use of plants and animal resources are found along the Yellowstone River north of the park. However, many other hallmarks of the period, such as bison drives and jumps, sheep and pronghorn traps, aggregations of domestic stone circles, winter habitation sites, horticulture evidence by bison scapula hoes, rock art, medicine wheels, and variations in pottery styles (Frison et al. 1996) have yet to be found in YNP. As mentioned earlier, no one has even found a cave site or pit house in Yellowstone, often associated with periods preceding the 1500 to 500 B.P. time range (Hale 2003: 39). All of these noted site types, save the aggregated stone circle sites, are the gems most archaeologists want the chance to discover and explore during their career.

Contact and Protohistoric Period (300 to 150 years ago)

There are numerous archaeological sites of Native American origin in the Greater Yellowstone Area (GYA), some that have become world famous such as Mummy Cave, located just 13 miles east of the East Entrance to the Park (Husted and Edgar 2002). While the number, composition, and specifics of each site is large and varied, in general most of the more contemporary sites, dating from about A.D. 1500 onward, are dominated by Blackfoot, as well as, Crow, Salish, and Shoshone origin.

Ethnographic accounts detailed by Stanley Vestal note many different explorers to the Plains region recording the native populations living in conical lodges, with accounts dating as far back as the mid sixteenth century. Vestal, in his introduction to tipi history in Laubin and Laubin's (1977) book on tipis, discusses some early European accounts of tipi use falling within the dates immediately before the dates widely associated with European contact with Northern Plains groups. One of the oldest accounts noted by Vestal comes from the Spanish explorer Francisco Vasquez de Coronado's 1540-42, expedition into the present day Southwest region of the United States, where Coronado found hunters living it skin tents. Vestal (In Laubin and Laubin 1977: 4) also shares an even better description of tipi rings from another Spanish explorer, Don Juan de Onate's

1599, expedition where skin tents were described as being made of tanned hides and painted bright colors.

Contact period stone circle sites probably exist within the Upper Yellowstone Valley, but the past archaeological work in the 1970s and 80s did little to no testing of stone circles to confirm their chronology. A majority of the dating information available for these sites comes from relative dating techniques associated with the chronology of projectile point phases found during the initial survey. A good example of a contact period stone circle site is 24TL211. Site 24 TL211 was identified near Shelby, Montana during a stone circle mapping project conducted by Steve Aaberg. Aaberg, upon the request of a private landowner to record cultural resources on the property, surveyed several sites at the Benjamin Ranch Homestead during the summer of 1995. Aaberg and his crew visited four known sites on the property, resulting in the documentation of more than 500 rings between the sites (Aaberg 1995).

With the large number of rings located and mapped at each site, Aaberg was successful not only in addressing the issues dealing with the lack of standardized recording practices when it comes to stone circle sites, but also in establishing a data set for comparative interpretations on a larger scale. The work at the ranch established the presence of multiple occupations of several sites, including 24LT211, based on projectile point chronology. Aaberg (1995) not only discovered points he most closely compared to Besant Phase points, but a metal point was also collected during the survey. Metal points were not fashioned through pre-European technology in North America in this area. A metal point associated with a ring at site 24TL211 suggests the inhabitants camping in this location had access to a European trade source or another native group with trade connections.

Between the 16th and 18th centuries, the Spanish and French explorers were covering vast tracts of the American interior, claiming land for their kings, queens, and country to be followed closely by the British around the end of the 18th century (Frison et al. 1996). French fur trappers and traders were recorded trading in the region of the Missouri and Yellowstone River confluence possibly as early as 1738 (Wood and Thiessen 1985). By this time, these European groups had at least made contact with the Mandan and Hidatsa villages along the Missouri bringing limited amounts of metal, trade beads, and other goods with them in exchange for furs during the protohistoric period (Frison et al. 1996). Thus, metal points are introduced to the natives of the region for a brief period of time until the introduction of the gun during the Contact period. The gun would

eventually come to dominate the Plains and many other regions for hunting and warfare (Frison et al. 1996).

During this time, there were two types of metal points in use on the Plains. The first type was the metal trade good point made by machine with carefully beveled edges and the second was the style fashioned by natives using scrap metal (Russel 1962: 132). Russel (1962) figures that the native groups of the Northwest Plains probably acquired their metal points from the Hudson's Bay Company, an assumption that is more than likely accurate as there is little information detailing other European groups exploiting the region during this time. The metal point found by Aaberg matches the description Russel (1962: 132) provides for a metal hunting point, having been kept rounded to ensure an easy extraction from a kill, unlike the square shape developed for times of war as the square point was more difficult or painful to remove.

Native groups during the Contact period on the Northwestern Plains found themselves face to face with increasing numbers of European homesteaders, pioneers, cattlemen, miners, and others looking to claim land or venture into unexplored territory to make a new life for themselves (Frison et al. 1996: 37-40). Horses also became common during this period with the possibility of horses introduced to interior Plains as recently as the early 1700s from southern tribes such as the Comanche (Ewers 1955). If horses had not been introduced before, they were introduced during the protohistoric period of the first Spanish and French expeditions into the interior. Many ethnographic and historical accounts coming from this time period note a wide variation in cultural practices between the various tribes known to live and use the greater Yellowstone region. These accounts detail differences in such things as horse use over foot travel, types of domestic structures, and even diversity in beliefs.

According to Crow explanations for how they became a discrete ethnic group on the Plains they have a story of how one of two brothers, No Intestines, was directed to look for seeds of the sacred tobacco during his vision quest. During his wanderings, he took his people over much of the Great Plains, specifically passing through a place "where there is fire', perhaps Yellowstone National Park or a fiery coal pit (Nabokov and Loendorf 2002 quoting Voget 1984). After settling in the Big Horn Mountains, the Crow began to separate into regional subdivisions. Of these, the largest was the Mountain Crow, who consider (and still claim) the region near present-day Yellowstone National Park as part of their aboriginal territory (Nabokov and Loendorf 2002).

In contrast, the Shoshone are often considered the only “permanent” residents of Yellowstone National Park. It is important to understand that “permanent” does not mean sedentary, but that a significant portion of their semi-nomadic lifestyle took place within Yellowstone National Park (Nabokov and Loendorf 2002). Historic evidence describing non-horse using groups in the park around the 1800’s may have been referring to the Shoshone (Davis et al. 1995). This account may possibly provide the answer to the often-asked question of why more tipi rings are not found within the interior of the park and why wikiups are far more evident.

Photograph 6. Shoshoni camp; Photographer unknown; 1871. Courtesy Yellowstone National Park Digital Archive.

It is important to understand that the Shoshoni or “Sheep Eaters”, as they are commonly (and often incorrectly) referred to by Euro-Americans, are actually comprised of several groups of Shoshonean-speaking Indians that were recognized and distinguished among themselves primarily by their dominant food pursuits (Nabokov and Loendorf 2002). Once Euro-Americans entered the Rocky Mountains region, they sometimes assigned different names to these groups, specifically: 1) The Lemhi, often called Northern Shoshone and referring to the western group of Sheep Eaters and

"salmon eaters"; 2) Eastern or Plains Shoshone including primarily the "buffalo eaters"; and 3) the Sheep Eaters, sometimes called the Mountain Shoshone, who lived throughout the warmer months in Yellowstone National Park and the adjacent area following bighorn sheep. These distinctions were not always followed, many Euro-American accounts and literature of the different people lump these three groups of Shoshone together as "Snake".

There are few historic accounts of Native American use in northern Yellowstone National Park after the parks creation in 1872. This is mainly due to efforts by the early administrators of Yellowstone National Park to downplay or eliminate Indian involvement and usage of the park (Nabokov and Loendorf 2002, Introduction, and pp. 103-112). However, there are some relevant accounts.

On October 14th, 1811 the Hunt party, bound for Astoria, Oregon, crossed the Rockies just south of the Grand Tetons and camped near a post near St. Anthony, Idaho, and encountered father and son of Shoshone affiliation (Janetski 2002b). There is an account of a party of fur trappers, which included Joe Meek, who are attacked in 1829 by a party of Piegans between the Yellowstone River and Devils Slide, located only a few miles north of the project area. In 1835, the highly literate and active trapper Osborne Russel encountered a small Shoshone family camped in the Lamar Valley (Janetski 2002b)

In 1929, Crow leader Plenty Coups gave an account to Horace La Bree about a buffalo hunt that took place when Plenty Coups was 12 years old (c. 1860) (Nabokov and Loendorf 2002). This account, which correlates to the area near Hellroaring and Coyote Streams area, as well as the nearby area called Buffalo Flats, so named in 1870 by a group of prospectors because "we found thousands of buffalo quietly grazing" is located northeast of Tower Junction (Nabokov and Loendorf 2002).

There are mostly undated but numerous accounts of wickiups throughout the park, attributed to numerous Native American groups such as the Crow, Salish, Blackfeet, and Shoshone (Nabokov and Loendorf 2002). Some, such as site 24YE301, are less than 15 miles from the MYAP project area, and it is not a great stretch of the imagination that the Shoshone, who Nabokov and Loendorf attribute the majority of the wickiups to, traveled through the project area. Wickiup Cave, 24BE601, is a well-known structure of timbers, branches, pine boughs and rocks used to create a shelter within a small rock shelter (Davis 1975).

A sheep hunting blind located across the Yellowstone River from the MYAP 2007-2008 project area, has possible Shoshone associations, while another well known camp site, the Eagle Creek Site (24PA301) has known Shoshone association as well as the closest intermountain pottery known to Yellowstone National Park (Jackman 1997).

Previous Archaeology Near Airport Rings

Four major surveys of limited areas within the larger upper Yellowstone River drainage system have been conducted over the last half century, beginning in 1959. Specific geographic areas comprising the previously surveyed portions of the Upper Yellowstone River include Paradise Valley, parts of Tom Miner Basin, Yankee Jim Canyon, and Gardner Canyon in Park County, Montana, with the Black Canyon of the Yellowstone and Lamar Valley within YNP comprising the Wyoming portion previous studies. Though there may be individual reports and smaller scale surveys conducted over the years, the following four surveys cover a majority of recorded stone circle sites in the drainage system. Even though these surveys were of phase I nature and conducted little or no phase II-III excavation, the chronological extent of occupation associated with stone circles in this area suggest a date as early as the middle period. Phase I testing generally consists of a pedestrian survey with possible artifact collect. Within the areas included in the Upper Yellowstone River drainage, recorded stone circle sites are limited to reports on 64 sites. Local archaeologists such as Ken Deaver, Larry Lahren, and Tom Jerde recorded most, if not all, of the stone circle sites in these valleys and the following surveys are references or updates to their work.

The prehistoric culture history described above provides a context for description of archaeological results of the 2008 MYAP field efforts. The MYAP project area has experienced prior work itself, in the form of Phase II NRHP evaluation of Site 24YE14 near the Gardiner High School. Sporadic informal surveys have been conducted along the Yellowstone River by YNP archaeologists as well as local collectors. In particular, local avocational archaeologist Tom Jerde recorded several prehistoric archaeological sites along the banks of the Yellowstone River in 1986 north of the current location of the HRC building. He also recorded the probable location of the historic train depot Cinnabar on the site form for 24YE355, the Yellowstone Bank Cache Site. In 1994, Walt Allen completed a surface reconnaissance of the Boundary Lands in expectation of its use as part of the Stephens Creek bison management area. No report was generated

during this project, with limited updates of Jerde's original site forms (and some site boundary changes) being the main result.

In 1997, Shortt (1999b) located and identified three sites that are within, or immediately adjacent to, the MYAP 08 project boundaries. The first, 24YE0083 is located directly east of the North Entrance Station on a small terrace overlooking the Gardiner River, site 24YE0118, which is located to the northwest of the North Entrance Station in an open field, and 24YE0072, located on the south side of the Gardiner-Mammoth Road on a well defined terrace to the west of the road. No additional cultural resources studies have been conducted within the bounds of the current project area. Below we provide an overview of prior archaeological investigations in the vicinity of the MYAP project area to provide a basis for the work completed in 2008.

During the 1950-1960s, initial archaeological survey was conducted of the Yellowstone Valley and vicinity (Malouf 1958; Hoffman 1961). These initial survey reports included only a handful of stone circle sites and their locations within the park even though when reading through the reports it appears that many more sites existed but were not recorded. Hoffman recorded five stone circle sites within the Gardiner River drainage, but his report only lists information on three of these sites. Hoffman does mention that the goal of his survey was not to officially or systematically survey areas within YNP (1961: 16-18) but rather to get an overall sense of the park's archaeological potential, possibly contributing to the lack of important information. Survey of areas within the park found tipi rings along Lava Creek, Blacktail Deer Creek, and in the Lamar Valley. Most of the sites, though high in elevation, were located on benches above a water source, but still within the bottom of the associated valley. Subsequently, George Arthur (1966) documented 47 prehistoric sites along the Yellowstone River drainage during a survey of the upper 100 miles of the Yellowstone River drainage from Big Timber to the Yellowstone Park boundary. Arthur's survey extended along a majority of the already noted interest area from Paradise Valley to the northern portion of YNP including a half dozen stone circle sites, of which he only reports on the sites he felt were significant or odd (1966). Even though all of these sites are listed as stone circle sites, it is evident that not all of the rings are the result of tipi use. Several of the sites contain rock features that Arthur suggested might be effigy features, as they consist of more than just a single circular ring, and another site has a half ring described by Arthur as a possible fasting shelter due to its northeast orientation and construction (Arthur 1966: 63). The fasting shelter shares similar qualities noted for

vision quest shelters in construction, with rocks being piled up making short walls, as well as with its orientation where a majority of vision quest structures are found with openings to an easterly direction (Fredlund 1969).

What Arthur's survey does accomplish, even with the lack of reporting on all stone circle sites, is his analysis of site location always near a water source (300 yards) and almost always on similar geographic terrain (bench or terrace) (1966: 67). In his report, Arthur also reported the identification of the Clovis point found during the excavation of the Gardiner Post Office (Arthur 1966:94-95), though no additional reports mention artifacts of this antiquity.

Lahren reexamined Arthur's sites and recorded additional sites, bringing the total to 117 sites in the Gardiner-Livingston portion of the upper Yellowstone River valley. The Eagle Creek site (24PA301), excavated by Arthur between 1962 and 1967 on the tributary stream, revealed four occupation levels, of which the lowest level (IV) is thought to be 3000 years old based on the probably association with surface Middle Archaic age projectile points (Arthur 1966a, 1966b; Conner 1967). Eagle Creek is also one of the few sites in the region with prehistoric pottery. A Master's Thesis completed by Janet Jackman at The University of Montana in 1997 indicated that the pottery has technological affinities to both Crow and Shoshonean wares.

The Carbella site (24PA02), also excavated by Arthur, is located about 12 miles downstream of Gardiner, near Yankee Jim Canyon. Level 2 of the site contained most of the artifacts including Middle and Late Archaic and Late Prehistoric points and faunal remains. Unfortunately, the site was not intact, as it had been heavily looted by the time of Arthur's investigation (Arthur 1966) as had many other sites in the valley possibly by the residents of Livingston or Emigrant.

In 1973, Lahren conducted a survey between Mammoth and Gardiner for a sewer line trench and marked the first prehistoric cultural materials exposed within the area. Even though no stone circles sites were identified during his survey, Lahren's work did uncover deeply buried occupation levels suggesting an extended use of this upland area. Of the artifacts identified during the study, there were projectile points referable to Early, Middle and Late Archaic periods as well as to the Late Prehistoric. Some of the 46 sites identified contained stone circles and cairns that appeared to form alignments, possible for game drives or service some religious or ceremonial function (Shortt 1999a). The stone circles suggest that some of these sites also served as residential sites.

Test excavations conducted in 1997, at 24YE344 by Museum of the Rockies (MOR) archaeologists failed to relocate those conducted by Lahren but did identify various artifacts that suggested prehistoric occupations dating from the Middle Archaic McKean period with additional Late Archaic Pelican Lake Periods as well (Shortt 1999a).

Excavations upstream from the project area within the Black Canyon were conducted by Cannon and Phillips (1993) at 24YE353. Their excavations revealed three eroded hearth features that yielded radiocarbon dates between 1189 and 1289 B.P. Additional tests were conducted at 24YE353 in 2002 by MOR, and then again in 2004 by Lifeways of Canada Ltd. While these investigations are ongoing, they have so far uncovered a series of buried cultural levels that ranged from Late Prehistoric (Avonlea), Late Archaic (Pelican Lake), Middle Archaic (3500 B.P.), a late Paleoindian Cody Complex component dated at 8800 B.P. and an additional three levels occurring below the 8800 B.P. level.

Three test excavations were conducted by MOR at three sites within Wyoming (48YE882, 48YE1025, and 48YE1027) on Hellroaring Creek approximately 12 miles upstream from the project area, at its confluence with the Yellowstone River (Meyer 2004). These investigations revealed buried cultural materials at all three sites. Site 48YE1025 had diagnostic artifacts related to Paleoindian and Early Archaic periods, while site 48YE1027 provided projectile points ranging from Late Prehistoric through Middle Archaic periods (Meyer 2004).

In 1997 Janet Jackman summarized previous work conducted at Eagle Creek (24PA301), and mentions research conducted by Walter E. Allen in 1992 and 1993 determined that the site had an Intermountain tradition of ceramics, indicating a likely Shoshone occupation due to their extensive use of this ceramic style (Jackman 1997).

Additional class III cultural resource inventory was conducted by MOR archaeologists in 1998 along the Mammoth to Gardiner road (Shortt 1999b). These investigations revealed three sites located within, or immediately adjacent to, the project area: 24YE0083, 24YE0118, and 24YE0072. Investigation at 24YE0083 uncovered one Early Middle Precontact (Bitterroot or Hawken) projectile point, one indeterminate Middle Precontact Period atlatl point, a Late Precontact Period arrow point, three projectile point tips, and one projectile point midsection, In addition, a biface fragment, endscraper fragment, two retouched flakes, and one utilized flakes were also uncovered. Features for 24YE0083 include five stone circles and two rock-lined pits.

Site 24YE0118 consists of lithic scatters of varying density. In total, 187 obsidian tertiary flakes, 2 opaque red chert flakes, 2 semi-translucent white chert flakes and a single black quartzite flake were observed at 24YE0118. In addition, a semi-transparent white chert side-scraper was collected, while there were no features associated with the site.

Site 24YE0072 consists of a scatter of approximately 150 obsidian debitage flakes that are evenly dispersed over the terrace. Features for the site consists of six stone circles, located on the southern portion of the terrace, combined with twelve cairns in varying alignments and arrangements. It is postulated by Shortt (1999b) that these cairns could be either the remains of a game procurement system, such as a drive line and or corral, or possibly remains of a structure with associated sacred or religious meaning.

Again, relatively few stone circle sites are present along the Gardner River as with the sites noted around Blacktail Deer Creek by Hoffman (1961). Mack Shortt and crew recorded seven stone circle sites within the MYAP project area. Several of these sites contain only one ring, of which at least two sites bear structural similarities and are oriented in a similar fashion as the fasting shelter recorded by Arthur at site 24PA320 (1963). These features are consistent in form and directionality of their opening (NE) with the fasting shelter recorded at 24PA320, sharing similarities to the stone configuration illustrated in Arthur's report (1966: 77). The location of these single ring sites on high knolls and isolated points along this part of the Gardiner River suggests a possible non-domestic function, as they exhibit similar characteristics described for sites with ceremonial use mentioned earlier. Another site listed by Shortt is a lone ring on the edge of another larger ring site and although listed as an individual site, 24YE70 is likely part of the larger neighboring site 24YE72 (1999). Shortt's survey has relative dates based on projectile points associated with stone circles ranging from Late-Late Prehistoric to a possible Early Archaic component (1999).

Throughout the years, assortments of archaeological remains have been identified along the Yellowstone River valley downstream from Gardiner to Livingston. Some of the more important are discussed below.

In 2000, Sanders conducted test excavations at site 24YE14 just south of the project area to investigate the potential for buried cultural materials. The site 24YE14, previously tested in 1997 by archaeologists with Montana State University, Museum of the Rockies (Shortt and Johnson 2000), and contained radiocarbon samples that

indicated prehistoric occupations dating to 1650/1700, 2350/2380, 2510/2570 and 5200 years B.P. Cultural materials included chipped stone tools and debitage, faunal remains, fire-cracked rock, and hearth features. Projectile point's diagnostic to the Late and Middle Archaic periods were also recovered (Sanders 2000a).

During the summers of 2003-2004, Sanders (2005) directed site re-recording and test excavations within the Lamar Valley and the Black Canyon of the Yellowstone. Four of the sites in the Black Canyon (Sites 24YE1-4) were originally recorded in 1992 by John Dorwin of the Northwest Community College in Powell, Wyoming, while these and two others (24YE23 and 24YE24) were investigated in 2001 by MOR archaeologists (Shortt and Davis 2002). While one of the sites could not be relocated (24YE4), four of the others (24YE1, 24YE2, 24YE 23, 24YE24) in the Black Canyon were deemed eligible for nomination to the National Register of Historic Places. The investigations of the prehistoric sites found that they were mostly comprised of non-obsidian flaking debris and a variety of chipped stone tools. The projectile points that were recovered spanned the entire chronological spectrum, from Early Archaic to Late Prehistoric periods.

Finally, between the two MYAP field seasons in the Boundary Lands—2007-2008—The University of Montana field teams surveyed a total of 2,757 acres, including 2,057 in 2008 and 700 in 2007. MYAP crews worked at 47 sites and collected 9,979 artifacts, including 2,725 lithics and 7,254 historic artifacts. Several stone circle sites were revisited from previous surveys and two new sites with rings were also recorded (MacDonald 2007, Mass and MacDonald 2008). Faunal and botanical remains were also collected at Yellowstone Bank Cache (24YE355, Area A), Cinnabar (24YE355, Area B), and Airport Rings (24YE357). The park's first excavation of a stone circle site resulted in the establishment of site 24YE357 as a domestic stone circle occupation site with both Late Prehistoric and Middle Archaic occupations of the landform. The Airport Rings Site (24YE357) serves as the model, multi-component occupation site for comparative analysis of continued landform use within the Upper Yellowstone River drainage presented in the remainder of this report. The full reports of investigations from the MYAP research (MacDonald 2008; Maas and MacDonald 2009) are available through Yellowstone and The University of Montana.

The results from these surveys have accounted for the locating and recording of 64 stone circle sites along the roughly 65-70 mile stretch between Livingston, Montana, and Mammoth, Wyoming. After reviewing site reports of the work previously conducted in the Upper Yellowstone River Valley system, much of it is outdated and incomplete.

Another major goal directing research methods was the need for a sufficient number of sites or sample size for making comparisons. Much of the past work with stone circle sites have relied heavily on comparative data sets as a majority of sites do not provide adequate data with which to address larger research questions. Researchers cannot test many of their hypotheses or even answer basic questions like those pertaining to site identification without a large enough sample of information from stone circle sites. Some identified stone circles are not domestic sites, others do not provide any datable or identifiable remains, have no associated artifacts, while others may show multiple occupations of the same site inhibiting the ability to discern differences in site patterning. If there is no data with which to use for comparing there is no easy way to make the connections necessary to produce the answers for these research questions.

The current project, thus, represents the most recent of this long line of prior archaeological work in YNP's northern portion near Gardiner, Montana. The next chapter provides an overview of stone circle studies in Montana and the Yellowstone Valley to provide a context for the archaeological excavations at that important prehistoric site.

CHAPTER 3. STONE CIRCLES IN ARCHEOLOGY

by Michael C. Livers

As discussed in the previous chapter, the high altitude upland valleys and foothills in the greater Yellowstone region have shown a continued occupation by hunter-gatherer populations throughout the last 10,000 years B.P. (Baumler, et al. 1996; Bender, et al. 1988; Frison, et al. 1976; Kornfeld, et al. 2001; Meltzer 1999; Reeves 1973; Short 1999a, 1999b; Smith and McNees 1999). Through absolute and relative dating techniques, these intermountain areas have proven to be habitable living locations for these groups for thousands of years. Knowledge of continued land use is important in order to understand settlement patterns of early populations in intermountain regions over time. However, this type of archaeology can only go as far to answer where these groups were living and not why one place was favorable over the other. The reasons for prehistoric groups staying in one location over another are important to understand but were not always considered during the early years of archaeological research on stone circles. Tipi ring studies are just one of the ways to begin understanding the larger questions about settlement practices and land use on the Plains.

Stone circles, or “tipi rings” as they more generally are known to the public, dot the landscape across many regions of the Great Plains as well as many other areas outside of the boundaries set for the Plains Region. When dealing with “stone circles” or “stone circle” sites, the reader should be aware of the underlying concept with the study and reporting of these sites. A majority of reports on sites associated with stone circle features hold these features synonymous with Native American “tipis” or other conical shaped lodge dwellings creating these features. In the field of Archaeology and CRM, the tipi ring idea has held precedence over all other ideas concerning stone circle features. To the practitioner in the field and researcher in the lab, stone circle sites have thus become “tipi ring” sites. The overarching idea of sites as tipi rings has caused several things to happen over the nearly 50-year discourse on stone circles. How this ironclad linkage has established itself in the literature and the inherent concerns this interpretation has created in the field of archaeology are discussed below.

Overview

There is extensive literature on the subject of stone circle interpretation, a majority of these texts refer to only a handful of sources when discussing the background of the field. Almost every article or publication dealing with stone circles follows a similar format in explaining the problems with stone features and how people have addressed these issues over time. Most researchers have found stone circle sites problematic because they simply lack information or data potential. Seminal research on tipi rings started out with work in the 1950s and 60s by Carling Malouf (1960, 1961), Thomas Kehoe (1963), Jack Moomaw (1960), William Mulloy (1960, 1961), and Jacob Hoffman (1953, 60), in several Northern Plains states containing ring sites.

While there were others before them noting varied observations concerning stone circles, their work initiated the current interest of stone circle function. The authors' discourse on the topic of stone rings or circles provided the general consensus in the field of archaeology that these features were more often than not correctly associated with Plains tipis or some form of conical Native American structure. Following their lead, Leslie Davis held a symposium in the early 1980's to address tipi ring issues, followed shortly by James T. Finnigan (1982) and J. Quigg and John Brumley (1984), essentially discussing the same things as Malouf, Kehoe, etc. One of the most-cited works coming out of the late 1990s was written by Ken Deaver and Lynelle Peterson (1999). Their paper provides a summary of the past discourse on stone circles and calls for standardized practices dealing with stone features in cultural resource management (CRM), similar to earlier attempts made by Quigg and Brumley (1984) in North Dakota.

Concerns, Questions, and Direction of Research

Davis introduces the historical accounting of tipi rings in archaeological research touching on the fact that the compiled papers in the *Plains Anthropologist* volume were simply the latest discussions on method and technique of stone circle studies. Early archaeologists held the first symposium in the 1960's with a collection consisting of a handful of papers on stone rings by Carling Malouf (1960), Jack Moomaw (1960), and William Mulloy (1960). Following suit, Davis notes in the late 1970s his participation in another conference on stone circles with noted archaeologists Mike Quigg, Jim Finnigan, and Davis himself (1981). It was this conference, the Eleventh Annual Conference of

Chacmool, the Archaeological Association of the University of Calgary, which prompted Davis to gather researchers to discuss the stone circle topic at the 1981 Plains Anthropology Conference (1981: 1).

Davis's article provides a good introduction to understanding the relevance of stone circle structures and their importance to the general direction of research associated with the papers from the 1981 conference. Davis provides a fair review of the ideas of the time. Noting the work with tipi rings from E. B. Renaud in the 1930's and the work of Hughes and Bliss, both in the late 1940s, Davis presents probably the best summary of stone circle archaeological sites prior to the bulk of the research since the late 1950s. Even with the earliest work with stone circles, the largest concern remained that of the site type itself and its importance to the archaeological record.

> Open campsites occupied by non-horticultural, semi-nomadic people and characterized by usually aceramic tipi rings were often judged of least importance; the lack of observed cultural materials, such as pottery and the complexity and shallowness of deposits seem to have been critical factors that fostered judgments of the relative unimportance when tipi ring sites were compared with other kinds or archaeological sites. (Davis, 1980: 1)

The amount of tipi rings located across the Plains region clearly make it appear as though understanding the feature was an important topic for archaeologists. Ted Brasser provides an image of the sheer immensity through his identification of the geographical area or geographic extent of tipi rings in a 1982 article about tipis and plains nomadism. Brasser borrowed other research and concluded that stone tipi rings are most abundant archaeologically in Alberta and Saskatchewan to the north, Montana, parts of Colorado, and Wyoming (Brasser 1982: 312). Outlining the furthest extent of stone circle site locations goes as far south as Texas, east into Manitoba and Minnesota, and as far west as Idaho, even parts of Utah (Brasser 1982). As the reader can see, the area covered by hunter-gatherer groups making stone circles is quite impressive, the area of described above covers parts of 13 states and three Canadian provinces.

Based upon different articles over the past six decades, archaeologists and researchers have estimated the number of tipi rings in excess of at least one million on the North American Great Plains. Davis mentions some work done in the 1970's that suggested that the Great Plains in Canada contained at least this many stone circles, suggesting that the total number of rings prehistorically could have numbered into the many millions and possible even a billion (Davis 1980). These estimates have the potential to be fairly accurate if tipi using populations are increasing over time.

Requesting the number of tipi ring sites from the State Historic Preservation Office for only a handful of counties in Montana resulted in a return of at least 1000 sites designated as tipi ring sites. Providing each of these sites has a minimum or average number of four or five rings, it is clearly evident how quickly the numbers could add up into the millions. Doing some quick arithmetic for the possible number of individual rings from these 1000 sites would put the count at a minimum of 4000 to 5000, likely a huge underestimate.

The question, explored in the following sections, becomes how to address tipi ring sites when they tend to provide less than desired results for research and information purposes. These questions are the questions the pioneers in the archaeology field had to address. After presenting the works of these pioneers' previously mentioned research on stone circles, Davis feels this early work on these sites left unanswered questions and did not provide much if any value to the scientific record. Field practices during the pioneer's time in archaeology lacked consistency to adequately deal with the site type. Funding for these projects was not a high priority so research goals often remained untested (Davis 1980).

Function and Identification

What exactly were all of these early archaeologists and researchers concerned with about stone circles? Much of the early work recorded on stone circles mainly took place in parts of Montana and Wyoming (Malouf 1960; Kehoe 1960; Mulloy 1960; Wedel 1963). "The issue of apparently absent artifacts and other traits clearly linked to domiciliary use and residential function was at the heart of the prolonged debate regarding the function(s) of stone circles (Mulloy, Hoffman, Malouf)" (Davis 1981: 3).

In the first article on stone circles in Southwestern Lore symposium papers (Davis 1981), William Mulloy was one of the first to introduce the archaeological community to the inherent tipi ring or stone circle predicament. The predicament was whether stone circles were actual representations of where a tipi once stood and, if so, how to address the fact within the archaeological record. Mulloy looked to stone circle research in the scope that stone circles, "…have not yet received the attention they deserve and they will be difficult to investigate because of the paucity of artifacts associated with them" (Mulloy 1960: 1). Mulloy was no doubt in touch with the knowledge of the time on stone circle sites, but persisted that after much work done on stone circle sites himself, that a

majority of sites containing ring features could in no way represent camp or tipi locations (1960).

In fact, Mulloy believed that the sites he investigated held no resemblance to a preferable campsite location and therefore were not “tipi rings” due to the site locations, described as lacking the necessities to live (1960: 2). Along with a horrible location, Mulloy noticed the size varied considerably between rings. Rocks were re-used creating overlap in the rings, the number of rings differed from site to site, the rings were not always in a circular form, and what he deems most “convincing” or telling of site function, is the lack of cultural remains allowing association of “household activity” (1960: 2). He mentioned that he did not find any hearth features associated with any of the sites he investigated (1960). It seems that Mulloy concluded the variations in site and intersite patterning as an indicator of non-habitative use of stone circle sites and he actually associated the rings with a religious or spiritual function.

The next paper coming out the Southwestern Lore Symposium was a paper by Carling Malouf (1960). Malouf has several other articles on stone circles, or tipi rings, which are very thoughtful and noteworthy for the time of publication. His article on tipi rings does the topic justice in associating a domestic function with the stone circles than Mulloy’s (1960) paper. Malouf himself touches upon one of the original misconceptions with stone circles at the time and says, “Almost everywhere in the Plains they are usually called ‘tipi rings,’ although little serious study heretofore has been made to ascertain their actual use or purpose” (1960: 3).

Upon his investigation of rings in Montana and Wyoming, Malouf described many stone circle sites usually being located near water for at least part of the year and fuel sources, leading him to believe that they were of a domestic nature (1960). Unlike Mulloy, Malouf noted that the site located on ridges and terraces were always close to water, leading the reader to assume that Mulloy automatically dismissed site location as domestic because he did not see any water or fuel sources. Malouf recorded that even where water was present, but no wood, there were no stone circles, reinforcing his belief in these sites as having a domestic function (1960). Even more concrete data are the presence of domestic tools, such as scrapers and knives associated with the site features. Malouf found several sites containing domestic materials (1960), again leading the reader to assume that perhaps Mulloy did not have a large enough sample in his investigation of stone circles sites and as a result of the nature of artifact paucity within stone circle sites, was too quick to judge site function. It is interesting to note that

Malouf did not find any hearths in his investigations even with the help of bulldozers stripping back large sections of earth around the stone features.

What allowed Mulloy to claim non-tipi ring stone circle in terms of shape is also apparent in Malouf's study of stone circles. Malouf on the other hand, notes other structures that could leave similar features behind and even though Malouf's work led him to conclude that a majority of the stone rings were probably tipi rings, or of domestic nature, some features did have other uses (1960: 5). In Malouf's follow up paper on tipi rings in 1961, he addressed the differences and problems associated with stone circles, or assumed tipi rings, in much more depth.

In his paper, Malouf concluded that his assumptions and the research at the time did suggest a domestic origin for stone circles. Historic and ethnographic accounts added to the growing amount of archaeological information (Malouf 1961; Wedel 1963). Seeing the need to enlighten others in the field to the specific nature of stone circles in the archaeological record, Malouf was the first to spell out the differences in stone circle typology and function thus the overarching term "stone circles". He suggested the only time the term "tipi ring" was applicable to a stone circle was when a domestic nature is identifiable through habitation evidence like hearths or domestic tools (1961: 388). However, during his fieldwork Malouf did have issues finding buried features associated with any stone circle even after digging trenches across the sites with backhoes (1961). Not having buried features brings up a valid question concerning the function of presumed tipi ring sites.

The best aspects of Malouf's paper are his responses to Kehoe and Mulloy's investigations of stone circles. Malouf noted that natives utilized sod and timbers where stones were sparse to hold down tipi covers so that could account for the lack of stone or irregular shapes (1961: 384). Malouf also mentions that stone circles did not necessarily need a gap in the circle for an entryway. In some cased an oval slit was present, off the ground, allowing rock placement all the way around the tipi (1961: 384).

Malouf (1961) also provides an overview of stone circle typology, including six variations of stone circles with different functions and resulting formations. The first ring type described is the *partial ring* created by the reuse of rocks for new tipi rings or the destruction through plowing or weathering processes. The second is a *single course* rock outline probably left behind from pulling up the tipi cover. The third is a *multi course ring* consisting of more than one ring showing the possibility of an inner liner to the tipi probably for winter use. *Stone walls* are the fourth category in which rocks are piled up

in a circle. Malouf does not elaborate on the function of the stone walls, but a similar function could be elaborated from the next stone feature type. The fifth type of stone feature is the *corral or fort*, where groups utilized rocks to support or reinforce branches, timbers, and bushes for corralling animals or protection. After decomposition of the floral remains, the supporting rocks did take on a circular shape. The final stone circle type noted was the *medicine wheel* or other features religious in nature or function. Several historical accounts noted ritualistic use of stone circles or creation to aid in vision quests (Malouf 1961).

Returning to the papers in the *Southwestern Lore* volume, the final article in the Southwestern Lore Symposium was by Jack Moomaw (1960). His perspective on stone circles seems quite nostalgic or mystic as he sees these prehistoric people in the light of them being the "ring makers" and refers to them throughout his paper in a fashion that conveys awe of the unknown. It appears here that the use of "stone circle" is similar to the term used in the description of druid like megalith features from Britain. The aspects Moomaw reviews from his investigations include the possibility of varying ring size based upon the availability of rocks or resources in the area, providing an insight into the size difference, one of the issues with Mulloy. To answer some previous questions about stone circles, Moomaw looked at historic photographs to determine if native groups used stones to hold down their tipis. Upon discovering no rocks in the photos, Moomaw linked the historic use of wood or metal pegs to hold down the tipi cover (1960: 6).

Another reoccurring issue has been the lack of hearths or fire pits associated within stone circles, but Moomaw did find charcoal evidence with some of the features (1960). It is with the features Moomaw did not find any charcoal evidence or had structural questions about which bring out his professional opinion. Moomaw thought the ring makers made the rings for spiritual reasons such as burials or death related structures (1960: 7), yet another belief leading to the assumption that stone circle builders were druidistic or mythical.

A type of religious effigy is Moomaw's best interpretation for a majority of stone circle sites because he ruled out other interpretations such as using stone for hide curing, which he said did not work (1960: 8). Moomaw also saw the lack of doorways present in the structures or the lack of conformity in the gap of the rings due to possible natural causes also ruling out a domestic structure (1960). He looked next to the variability of structures that do utilize stones and came to the conclusion the stone features he analyzed did not fall under the guise of domed shaped structures, sod houses, or pit

houses and could not then be tipi rings. To round out his theories, one could infer Moomaw's conclusion as snide towards future archaeological endeavors regarding stone circle features. "Perhaps, when many of these 'tipi rings' have been excavated by archaeologists, enough material may be found to prove their ages and more definite clues may be discovered to explain what they really were and why the 'Ring Makers' made them" (Moomaw, 1960: 9). Moving forward in time with research done in the 1980's, Fred Schneider provides the probable answer for Moomaw's difficulty in accepting stone circles as tipi rings:

> Past investigations of tipi rings usually focused on excavation of ring interiors, and they commonly placed a test unit over the center of the ring. In this manner, many earlier investigators reported a lack of results. It is difficult to determine why this was so. Literature published prior to 1970 shows that many early investigators did not make use of screens but simply chunked out or skimmed the soil with shovels. It is no wonder that many archaeologists reported a paucity of artifacts and became disenchanted with tipi rings and their excavation (Schneider 1981: 93).

Schneider could not put it more perfectly when discussing the disenfranchisement felt by the archaeological community past and present when dealing with these sites. Stone circle sites still present issues in the form of lagging cultural deposits allowing for contextual and temporal understanding of the mobile groups using them. The biggest concern with the lack of artifacts and dateable features still presents itself in work done even today as evident by the examples provided below.

More specific examples of stone circle work include John Brumley's (1990) review of several sites in Montana. During one survey, Brumley recorded 63 stone circles and then spray-painted the rocks to enhance visibility (1990: 23). Very few cultural materials were visible on the surface. Brumley's crew sampled 16 of the 63 features by auguring eight-inch holes in and around the features totaling 138 all together. The depth of these holes varied eight to 31 inches ending in coarse gravels at the limits of depth. The report does not make any reference to screening the dirt from the auger holes but the author assumes that the dirt was screened for artifacts due to the decision to allocate test units within certain features. From the auger results, digging comprised four test units in three of the augured features with higher cultural material potential. The results of the test units noted that the depth of cultural material was less than ten inches leading to a minor time span or single occupation component. The site had only four flakes and two scrapers recovered during the testing (1990: 23).

To compare data with the survey mentioned earlier, Brumley reviewed two other sites he worked on during a large survey project with stone circle features. The first site had 58 stone circles with little comparison to the survey project in terms of cultural materials other than in places the depth of material was over three feet deep. The next site had even less to compare and the report did not even mention stone circles; however, consultants excavated several test units in "camp processing areas" (Brumley 1990: 25).

Brumley also worked on the 40 Mile Coulee project in Alberta where field crews recorded 79 stone circle sites. Out of these 79 sites, 757 test units were excavated within 76 circles (1990: 25-26). With Brumley's site comparisons the notion that there is a lack of artifacts associated with tipi ring sites unmistakably presents itself in the cultural deposits. Comparing sites, Brumley did come across large variability in the volume of artifacts coming from auger tests and excavations providing more insight into the possible contextual and temporal variations of habitation by prehistoric Plains groups.

Dooley also reviewed a report by Ethnoscience Inc., where a phased survey of over 11,000 acres resulted in the identification of more than 2000 features, 1400 being stone circles and 400 plus being rock cairns. Excavations comprised more than 220 test units, including at least one in each stone circle site. These efforts resulted in the recovery of more than 6,000 artifacts. Out of the survey's large artifact count, the crew only discovered 138 lithic tools. During the study, the crew discovered 42 diagnostic projectile points, of which only 26 were directly associated with stone circles, the rest with rock cairns (Dooley 2004). These results would seem to fall in line with the commonality of not finding much in terms of diagnostic artifacts associated with stone circle sites. A mere 26 out of almost 1,400 stone circle sites in the large project area yielded temporal cultural data. There was less than a two percent success rate for finding a diagnostic projectile point associated with a stone feature. The survey and results display just what type of hurdles archaeologists involved in Plains archaeology encounter with stone circle sites. Differences in survey and excavation methods can generate varied results.

In 1981, Schneider reviewed a report of a stone circle site in North Dakota to test for validity. The original study recorded more artifacts found outside of the rings, but the volume of artifacts and artifact categories was more prevalent inside the stone circles. Schneider's reinterpretation of the data lead to the request that future studies focus on the type of research questions asked, allowing excavation practices to vary depending on research strategies. Early archaeology work focused on tipi rings was seemingly

unaware of larger issues concerning recording and mitigation practices. Schneider brings out the evidence for inaccurate practices of the past associated with lack of understanding for tipi ring sites. He discovered in his research that many early archaeologists working with tipi rings did not bother to excavate the whole ring or even areas outside of the ring. Schneider's ideas for reevaluating the sites were to excavate entire rings, the area outside of those rings, and to use better recovery techniques. Schneider (1981) hypothesized that tipi inhabitants would make use of the area outside and adjacent to their dwelling, and he expected just as many artifacts were located outside the ring compared to artifacts from inside the features. There is an obvious call for standardized practices in order to adequately address and assess stone circle features. All of these studies push towards the direction of having a set way of identifying and mitigating tipi rings sites.

> The archaeologist is faced with a dilemma, for this is a resource which, while it presently exists in great numbers, is facing ever-increasing destructions as a consequence of energy exploration and development. At the same time, this is an inadequately studied resource, and it is not possible, and certainly not desirable, to excavate every ring or even every ring site (Schneider 1981: 93).

For whatever reason these stone circles were created, Malouf was one of the first to differentiate the possibilities of varied function based upon stone circle typology. After reviewing the past arguments, Quigg and Brumley (1984) were the first to suggest a typology, confirming the movement from the earlier debates ending with the archaeological community reaching a consensus on the function of most stone circles as assumed tipi rings.

With archaeologists now generally agreeing that stone circles are the remains of tipi rings, earlier tipi ring research pushed in other directions. James T. Finnigan (1982) synthesized tipi research in his Masters Thesis at the University of Saskatchewan. Putting the work of Malouf, Kehoe, etc., together, Finnigan details identification criteria for assessing stone circle function as domestic or as a tipi ring. Finnigan labels the five criteria necessary for associating a stone circle with a possible domestic function, or as a tipi ring, through the discourse of tipi ring research before the 1980's. The five categories of classification are as follows in Finnigan's Master's thesis:

> 1) the shape does not deviate significantly from a circle; 2) there are no interior stone features that would render the interior of the tipi ring uninhabitable unless they are clearly a post-use modification; 3) the inside diameter falls between 2.5 m and 9 m; 4) the slope of the ground is less than or equal to 5°; 5) the ground surface is dry and stable (1982: 4).

As well as these five categories to aid in stone circle classification, Finnigan notes that the presence of central hearths and defined living floors are two additional indicators for the interpretation of stone circles being habitation structures (1982: 5).

In terms of new practices, Finnigan's thesis mentioned the new directions and innovations of tipi ring research in the 1970s. These new aspects involved excavating inside as well as outside of the stone feature, instead of just stripping the sod out from the inside of the feature (1982: 8). Development of advanced methods to record stone placement with the tipi quick-method, utilizing a protractor diagram and string, along with compass to map out rock position, came from this period of research. Along with the tipi quick-method, boulder flow analysis measured the carbon accumulation under the rocks of the stone circle for dating, which Finnigan notes was not successful (1982: 9). Other notions coming of the 1970s included recognition of the use of tipi pegs to stake down the tipi cover, allowing site formation without the tell tale stone rings verifying site occupation (Finnigan 1982).

Even with the advance in knowledge, Finnigan introduced a new problem in stone circle archaeology that is still prevalent today: distinguishing multiple use sites from single use sites. The large sites, meaning more rings, leads to the notion of multiple uses, whereas smaller numbers of five to ten rings do not automatically suggest continued usage (Finnigan 1982). At the same time, Finnigan agrees that it is often impossible to differentiate single from multiple use sites. Today the same is true, there is no way to distinguish single use occupation from multiple use occupation based on surface features unless it is obvious rocks were reused to create new rings. Actual mitigation of the site and the discovery of temporal artifacts or dateable features is the only way to make the declaration of specific components.

With all of the advances made in the field aiding in the understanding of tipi rings, the old problems and even new ones brought on by new techniques still seem to present themselves. However, not only did all of these early archaeologists get the function debate out of the way, they also developed a somewhat generalized identification system allowing for faster confirmation of stone circle site function. Even with all of the past work, there were still larger questions that these establishments failed to address. After almost two decades of debate and insufficient work on stone circle sites, inhibiting

formal understanding of the nature of these sites, quantitative observations finally brought results to the discipline. However, these new results from observations brought on the discovery of new boundaries. In order to formulate a better process for understanding new research questions, those digging up sites since the 1980s until today run into the problem due to the lack of uniform application of field methods.

Standardization

The original concerns with stone circles aside, those involved in the fields of archaeology and CRM from the 1980s to today have had great difficulty bridging the gap needed to form a focused approach in analyzing stone circle sites. In 1984, Quigg and Brumley published a report for the state of North Dakota's Comprehensive Historic Preservation Plan detailing the steps adequate for the time in identification, evaluation, and assessment of stone circles based on past tipi ring research. Their report modeled how archaeologists and resource managers needed to address stone circle components in great depth.

In their compilation, many factors are deemed necessary to better understand tipi ring sites originally left out by many previous studies on rings. The most important factors to include in tipi ring studies are an introduction, data presentation for future use of data sets, stratigraphy, a summary, interpretations, and final recommendations for the importance of the site to shedding light to human history (Quigg and Brumley 1984). They provided the first standardized guide to studying stone circles, but for whatever reason the state soon abandoned strict adherence to its use and the guide was not widely accepted in whole by the archaeological community (Melton 2008; Picha 2008). Since Quigg and Brumley's publication, many aspects of the document are outdated and no longer pertinent. Other attempts at creating guides and models have not occurred until recently.

After looking at six states located within the Great Plains region--Montana, North Dakota, Wyoming, South Dakota, Colorado, and Nebraska--the inability to approach stone circle sites and the site features in a uniform manner becomes very noticeable. The terminology and classification system for identifying features varies quite a bit from state to state. Variation is not necessarily a strange occurrence in the practice of CRM due to the lack of guidance from federal and state agencies.

The wording in both Sections 106 and 110 of the National Historic Preservation Act, allows for vague and varied practices from federal agencies conducting surveys on cultural resources. In Section 110, the language is vague in application saying that federal agencies need only take measure to ensure properties on their land receive proper identification, recording, and care in a manner consistent or compliant with Section 106. Going to Section 106, several parts have even worse implications, inhibiting standardization of recording and identification practices. Looking specifically at Section 800.11 on documentation standards, agencies only need to provide documentation, "To the extent permitted by law and within available funds. When an agency official is conducting phased identification or evaluation under this subpart, the documentation standards regarding descriptions of historic properties may be applied flexibly." (NHPA 1995)

As a result, differences are evident after looking through SHPO site recording forms, only one state has specific guidelines and regulations for recording and evaluating stone circle sites because the State Historic Preservation Office (SHPO) only needs to provide guidance if there are procedural issues within the state. The state archaeological site form is itself different from state to state. Archaeologists and consultants use the site form in the field to record aspects important to the site such as site features, location, description of the site, and artifacts found during survey. Some states combine historic and prehistoric components into one form while others keep them separate. One such way to remedy the situation of variation within agencies with similar site types clearly recognizable in the archaeological record is to develop a programmatic agreement (PA), on stone circle studies, discussed more below.

Differences with Standardization

Archaeology uses the term "Tipi ring" in North American practice to differentiate prehistoric structures pertaining to a certain geographic or cultural region. However, upon conducting background research into the various SHPO's site classification methods of the Northern Great Plains an interesting difference arose. The SHPOs do not use the term "tipi ring" unanimously in site identification reports. It seems likely that the lack of unification among state requirements might initiate issues concerning the identification and recording practices in CRM.

Looking at the varied state forms, all six of these states discuss below have archaeological site forms to record site characteristics in the field that are located on their state's SHPO website. What each of these states does not have is a way in which to record or identify the features of these sites. Several of the states have manuals or guides to accompany the site form to aid the researcher in the field with descriptions and in the case of one state an actual standard for recording stone circles. The first thing to address is how does the site form categorize and classify the site and its features when writing up the final reports. When someone designates or classifies a stone circle site as such, is their identification correct? What if his or her classification system does not allow for differentiation and a stone circle site happens to be a medicine wheel site? Does the archivist or someone at the SHPO office go through each report to check site types and get all actual tipi ring/stone circle sites in one category or do they leave reports unedited with the probability of inaccurate representation of site types? After going through each state's site form and classification system, anyone interested in the subject of standardization might see the need for an updated, cohesive system.

Colorado's site form does not have any boxes to put check marks in but rather allows the field recorder the chance to describe every aspect of the site in writing. Along with the fairly blank site form is an instruction form detailing the different ways to address site resources. The most interesting part is the section dealing with prehistoric architectural features. This section explains that these prehistoric features are measurable in descriptive terms, such as stone circle, or in functional terms, such as tipi ring. In all of the other associated forms and manuals, there is no discussion on any other type of stone feature or how to record or identify them.

The state of Nebraska is even more interesting than Colorado in determining and identifying stone features. The only thing the state of Nebraska has on their archaeological site form remotely related to rock features is a box for "rock outlines or rock concentrations". Is the field recorder supposed to assume that by rock outline the state means stone circle or tipi ring? The only other place the category of stone features could fit is in the "other" category. There is not a manual or guide to benefit the field recorder locatable on the SHPO website. The closest thing to a guide on the Nebraska SHPO website was an article produced by the SHPO and the Archaeology Division of the State Historical Society promoting archaeology in the state. *High Plains Archaeology*, the fifth such publication on archaeology in the state, notes several times on the presence of stone circles or "tipi rings" within areas of the state (Koch 2000).

Therefore, there are stone circles within the state and the state normally refers to them as tipi rings. However, there is no place in the site forms or SHPO manual that would lead a researcher to the conclusion the state of Nebraska recognizes these site types.

The Wyoming archaeological site form indicates that key words are associated with site report forms when doing database searches of recorded sites and provides key words. Is one to assume these key words are to follow suite with the feature types given on the site form? The Wyoming feature descriptions include stone circle, cairn, and (stone) alignment. It is probably safe to assume that stone circle here specifically means tipi ring as medicine wheel and other rock structures would fall under the classification of an alignment. In a 2005 report on stone circles and stone features the difference between site types is clearly evident due to the resulting field procedures utilized for CRM work (Hartley and Wolley Vowser).

South Dakota's recording system for prehistoric archaeological components consists of a site form as well as a guide manual provided by the SHPO office. The site form itself is very basic and could lead someone in the field recording the site to forget something if they were in a hurry or were not paying close attention to their duties. The site form has two specific areas to record features identified at a site. The first section is actually identifying the type of feature and it is here where the manual would come into play as a reference. The manual has very specific descriptions of what denotes a site feature. The descriptions of concern are those dealing with stone features and the manual does quite a good job at differentiating their definitions. The manual defines an (rock) alignment as drivelines or medicine wheels; a Cairn is a separate feature type described as a rock pile (non-historic), and finally a stone circle feature is classified as a tipi ring. As well as the list of feature descriptions, the site form offers the field recorder a section to provide a more accurate representation of the site and the features it contains. Essentially, the site form allows for judgment calls and the ability to describe site components as accurately as possible.

North Dakota on the other hand offers less to the field recorder's imagination in their NDCRS Archaeological site form. North Dakota does not split up their classification of stone features as South Dakota does. The North Dakota site form has two options for stone features and that is either a stone circle or other rock features. It is interesting to note that North Dakota does not seem to assume that a stone circle is automatically a tipi ring as assumed in South Dakota. However, North Dakota does offer the field archaeologist guidance and information in the form of a training manual when it comes

to recording stone circle sites. The manual is under revision now, as it is outdated (Picha 2008), and is likely the impetus for Montana's current standards on identifying and recording stone circle sites (Peterson 2008; Melton 2008).

Montana has by far done the best job in addressing the practices associated with identifying and recording stone circle features. In 2002, Mark Baumler, the Montana State Historic Preservation Officer, adopted the regulations and guideline standards to identifying and recording stone circle sites from the Montana Bureau of Land Management office (BLM). The BLM developed these guidelines from a 1998 symposium on tipi rings discussing everything from the start of this paper's review to future research goals attainable in tipi ring studies (Deaver and Peterson 1999). After communications with Baumler and Wilmoth, they explain these guidelines fall short in function as they are simply nothing more than suggestions resulting in other agencies having the ability not to follow or use them as a guide at all. However, the Montana SHPO is required to provide standards and guidelines for determining eligibility of state property as described in the Montana Code Annotated, Title 22, Chapter 3, Part 4, section 23. The SHPO is also required to provide guidance under Section 101 of the NHPA. The concerns with individual agencies having control of their own CRM practices seem quite clear now when looking at the results of poor word choice in the NHPA.

With minor changes made by the SHPO to these BLM guidelines, facilitating more accurate measures for CRM practices, Montana State Archaeologist Stan Wilmoth warns users that the recommendations made by the SHPO were merely compromises from a panel of experts in the late 1990s. The BLM excluded Stan from the symposium panel because of his feelings for more documentation than the BLM was looking for and the result was the bare minimum the SHPO office would allow for, reaching a compromise with the BLM (Wilmoth 2008). The biggest thing Wilmoth sees in standardization of archaeological practices is that they can be different from group to group but in the end, the guidelines need to mean something to another group in terms of transferability. If one group cannot use another's data and research either because the data sets do not transfer or are not explainable then the original researcher standardization methods are worthless to everyone (Wilmoth 2008).

After discussing the need for standards in a conversation with Wilmoth, he mentioned that he was still not happy with the quality of standardization, as the results were only compromise and not everyone needed to follow them precisely to get the job done (Wilmoth 2008). However, Stan did say there were good things about having

differences between agencies and groups from state to state. "Having different standards can work out well because the differences are discussed, different research questions and assumptions get brought to light etc. In the end good work is good work and poor work is bad" (Wilmoth, 2008).

Would it be too much to ask these states with similar cultural resources to have the same terminology and process of evaluation? Even a state such as Montana that has come so very close to developing a standardized effort or programmatic agreement (PA) has not been able to do so. Programmatic agreements are contracts with which to expedite project review regarding certain situations encountered during the process of identifying and mitigating cultural resources. A programmatic agreement is an alternative procedural method available to federal agencies having similar situation arise often during the Section 106 compliance process. The NHPA describes the ability for federal agencies to pursue alternative means to comply with Section 106 in subpart C of Section 106, Section 800.14. As long as these agencies are following Section 106 guidelines, the agencies are able to develop an alternative procedure.

PAs are the next logical step in creating standardized practices in CRM. Agencies may use PAs when there are similar or repetitive effects on properties even on a regional or multi-state scale. When creating a PA the agency is able to form their own procedures as long as they follow Section 800.14(b)(2)(a) of the NHPA meaning they must make an effort to consult appropriate parties such as the SHPO, other agencies, or tribes if deemed necessary. The formation of a PA for stone circles seems to be the most logical step in conquering the inherent questions posed repeatedly during encounters with the site type in CRM work. Does a PA provide the best direction then to formalize a standardized approach for performing CRM work when those agencies developing the PA do not include other agencies coming across similar resources? If agencies are not working towards a common goal it seems superfluous to perform archaeological work that is tailored to specific agency needs and difficult to reference otherwise.

Eligibility

It becomes increasingly difficult not to assume problems associated with stone circle sites are the result of a lack of standardized methods for CRM practitioners. These agencies do not want to designate a stone circle as being a tipi ring because they could

be incorrect in requesting certain information recorded when there is no evidence suggesting that a stone circle functioned as a tipi ring in the first place. The difficulty with the evaluation process then becomes how to resolve measures associated with mitigation and identification of the resource.

The big concern remains today with how to use the resulting information gathered from these habitation sites on the Great Plains. With increasing need to protect the cultural resources from destruction for various uses around the United States, congress passed the National Historic Preservation Act in 1966. With the act came the ability for "Historic" cultural properties to be protected from the impacts created by any federally sponsored project through the eligibility standards for archaeological and historic sites to be included on the National Register of Historic Places. NHPA practitioners know that tipi rings with their lack of surface data are difficult to find eligible for listing on the National Register of Historic Places (NRHP) under these standards without mitigating and destroying the resource to gather sufficient data. Adding to eligibility matters, Deaver notes in his volume, the belief for the inclusion of tipi rings as eligible to the national register come from the idea that every undisturbed ring has the potential to provide information into the behaviors of past peoples. Yet, others believe that stone circles only provide the ability to infer the past on a larger sample size (Deaver and Peterson 1999).

The most prevalent eligibility standard for archaeological sites comes from the fulfillment of Criteria D. The NHPA describes four categories that can make sites eligible:

> "A) that are associated with events that have made a significant contribution to the broad patterns of our history; or B) that are associated with the lives of persons significant in our past; or C) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or D) that have yielded, or may be likely to yield, information important to prehistory or history." (36 CFR 0.4)

Deaver and Peterson note in some cases stone sites have fallen under eligibility requirements in criteria A and in criteria B, but rarely, if ever, do these sites meet important architectural components required under criteria C (1999).

As a result, nomination of stone circle sites to the list rarely occur, as noted by Davis (1981), and they are removable, creating another issue involving funding a dig that may not collect the desired amount of data. However, four sites have received nomination to

the National Register over the years. These four sites are all located in the central and northern Great Plains Regions. The first stone circle site to gain acceptance to the National Register (under Criterion D) was Tipi Hills in Sheridan County, Montana. Its nomination occurred in 1975 followed shortly by the Goose Creek Tipi Ring Site in 1978. This tipi ring site is located in Wallace County, Kansas and was also found eligible for listing under criterion D, for information potential. The next site and only site labeled as a stone circle site on the registry is the Keota Stone Circles Archaeology District/ Shull Tipi Rings. The site is located in Weld County, Colorado and gained nomination to the registry in 1981 under the information potential category for eligibility. The Weld County site was the only tipi ring site to contain explicit explanation of what information it provided the archaeological record; it is said to provide human association with ceramic periods. The final site listed on the National Register was the Basin Oil Field Tipi Rings, 1985, located in Campell County, Wyoming.

Many issues could arise when each state has its own classification system and terminology for similar types of cultural resources. Many prehistoric groups or tribes probably did not confine their activities inside just one state's boundaries, especially if they were a mobile plains group following migrating buffalo herds. If the language of the NHPA provides room for variable practices during Section 106 compliance, is there any way to save stone circle features from repeated destruction? Stone circle sites are disappearing from Federal lands even though these sites are an important archaeological component to the understanding of prehistoric people's behaviors. The process of CRM allows for the mitigation of stone circle sites to gather what information is available resulting in the constant destruction of sites. Since most stone circle studies seem to result only from threats to the resource rather than more problem-oriented studies, tipi rings are a highly underutilized research subject in need of better protection.

Providing Better Protection

There is one way in which agencies could offer better protection for tipi ring sites and this comes in the form of finding tipi ring sites eligible as Traditional Cultural Properties (TCPs). *National Park Service Bulletin No. 38* (Parker and King 1990) provides added protection to stone circle site types in some situations. The NPS Bulletin No. 38 states, "Traditional cultural significance is derived from the role a property plays in a community's historically rooted beliefs, customs and practices." The only provision for

the use of TCP classification of stone circle sites or any site in general is that federally recognized tribes can prove affiliation or past use of the site in question, unfortunately meaning that not all tipi rings are eligible as TCPs (Boughton 1999).

TCPs are only eligible as TCPs if the sites meet the National Register Criteria A through D as well as the requirement provided by Bulletin No. 38. The interesting thing about this is that Federal agencies, at least in Montana, have bypassed consultation with tribes on stone circle sites due to the inabilities to designate significant or specific cultural affiliations. Melton and Baumler provided similar statements concerning consultation when discussing whether native perspective was included in Montana's stone circle standards. Melton said, "I can say it is unlikely anyone talked to the tribes about changing data required for recording stone circle sites, since most of the emphasis is on physical features" (2008). Baumler (2008) provides an even dimmer perspective saying, "Over the years, we have spent quite a bit of time listening to and considering tribal input on stone circle sites. Our recognition that some stone circle sites may qualify as traditional cultural properties is also reflected in the planning bulletin. In practice however, it is difficult to get agencies to consult with tribes about evaluating stone circle sites unless they happen to be on reservations, "unusual" or involve special features."

Even though TCPs cannot fully protect stone circle sites due to some minor inconsistencies in the way federal agencies view Native American past, Bulletin No. 38 provides the first steps to protect cultural properties without having to recognize site importance on the verge of its destruction. Federal agencies need to push for the recognition of tipi ring sites as associated with native past in general, without having to have a specific cultural affiliation. By limiting protection rights to just those sites eligible through living association and not associating native prehistory with all sites, regardless of known affiliation, will always remain as a constraint to understanding tipi rings at the highest level possible

CHAPTER 4. RESEARCH METHODS

By Douglas H. MacDonald and Michael C. Livers

This chapter provides an overview of the research design and archaeological methods utilized in the excavation of the Airport Rings site. We describe the methods of archaeological survey and excavation, as well as methods of prehistoric artifact analysis. In order to help answer the many important questions about the history of the study area, the University of Montana utilized standardized methods of site identification, excavation, and artifact analysis. Expected results from the survey and excavation of sites come in four forms when looking for evidence to answer many of the general questions associated with stone circle research. These results are spatial information regarding site location, floral and faunal remains, diagnostic points, and dateable features providing age of use. Each of these methods is described in detail below.

Archaeological Survey Methods

The initial archaeological survey field task was to characterize the geomorphology of the project landform. The MYAP field team initially walked the project area to characterize and become familiar with its setting and environs. Initial reconnaissance and analysis of geologic and soils maps indicated a complex land formation system. Landforms were affected by both alluvial and colluvial processes. The Yellowstone River terraces in the project area are quite old and stable, primarily comprised of Pleistocene gravels with a mantle of Holocene-age alluvium from river deposition. Landslide, Stephens, and Reese Creeks have cut narrow ravines/arroyos as they pass through these Yellowstone terraces. These areas have creek terraces with narrow floodplains. The project area landforms have also been affected by colluvium washing from the fairly steep slopes at the base of Sepulcher Mountain and Electric Peak. The very name of Landslide Creek in the project area implies active sediment movement from the steep slopes northerly toward the project area and the Yellowstone River. Colluvium and alluvium often can bury archaeological deposits and make them difficult to observe from the ground surface (see Figure 2).

Given the dynamic geomorphology described above, The University of Montana team conducted a limited amount of geomorphological auguring to determine the depth and

type of sediments across the MYAP area. Crew members used a hand auger to excavate 5x5-cm probes to contact with basal gravels in a southeast-northwest transect parallel to the Yellowstone River. Between 5-10 auger probes were excavated in the project area. Excavated holes were backfilled to return the ground surface as close to original as possible.

Sediments were described according to standard soil horizon nomenclature (e.g., A-E-B-C horizons) with colors compared to Munsell color charts. Textures and types of sediments were also described (e.g., silt, loam, sand, gravel, etc…). The ultimate goal of the geomorphological auguring task is to describe project landforms and evaluate their formation. Such information is crucial during the interpretation of formation patterns at archaeological sites. Auger probes will also determine the presence or absence of buried surfaces (e.g., Ab horizons) with the potential for stratified archaeological deposits.

After geomorphological auguring, The University of Montana archaeological team conducted a systematic surface survey of the project area. During survey, a detailed project map was kept using both global positioning system (GPS) and total station technology. Students initially recorded the locations of auger and shovel test pit (STP) excavations, as well as sites, with a Garmin GPSmap 60CSx handheld geographic positioning system (GPS) unit. A map was subsequently generated using Maptech software which placed the GPS coordinates on 7.5 minute United States Geological Survey (USGS) quadrangle maps.

During the survey, individuals spaced approximately 5 ft. (3 m) apart walked slowly across the project area to observe artifacts on the ground surface. When artifacts were identified, the team assembled to conduct a detailed examination of the ground surface around the find spot. All additional artifacts were marked with pin flags. Site boundaries were delineated and recorded using the GPS unit. A field map of the site in relation to major landforms was also recorded by field personnel. Subsequent to discovery, each artifact identified on the ground surface was mapped by field personnel under the direction of the Principal Investigator and/or the graduate student teaching assistant using forms created for the project. A sample of artifacts representative of the surface scatter were individually described and photographed. Students also recorded attributes such as artifact type, dimensions, color, and raw material for these surface-identified artifacts. Diagnostic artifacts were collected for curation at the Heritage Research Center (HRC). Each diagnostic artifact collected in the field received identification by a

unique field specimen (FS) number linked to its provenience within the site and overall project grid. This information was recorded in an FS log and upon the plastic collection bag for each artifact.

Photograph 7. Archaeological Survey in the Boundary Lands near Reese Creek. View South.

Archaeological Excavation Methods

Airport Rings (24YE357), located in the Boundary Lands project area, is a perfect example for detailing concern on dating tipi rings. The Airport Rings Site is a multi-component, stratified tipi ring site consisting of two occupation levels with both Late Prehistoric dates (300 - 400 B.P.) and a Middle Archaic date (5300 B.P.) based on radiocarbon dating results. Approximate landform sedimentation rates are discussed in the results section. Proper excavation methods described in the following section should prevent interpretation issues such as those encountered with stratified sites.

As discussed in Chapter II, the oldest tipi rings on the Plains date to the beginning of the Middle Archaic period at the earliest (5000 B.P.), with limited to no use before this time based on relative and absolute dates obtained from sites (Brasser 1982; Dooley 2004). This assumption has the potential to be highly inaccurate due to poor excavation and survey methods, with researchers basing claims from limited data on only a handful of sites with earlier archaic dates, meaning further research in this valley also has the potential to establish the relative age associated with stone circle use in the area (Brasser 1982; Dooley 2004). The age predicament comes in the inability of properly dating modern surface features, the actual ring, with diagnostic artifacts or other features, which is one issue for using stone circles themselves as a unit of measure.

As stone circles are surface evidence of possibly buried cultural remains, caution should be taken when interpreting sites based on surface features (Wandsnider and Camilli 1992). Although there may be deeply buried cultural layers, the probability of these deeper layers being associated with the stones as they presently sit on the surface are highly unlikely. The same holds true for artifacts. Just because an artifact is found within a ring, on the surface, or buried, does not necessarily mean the artifact is as old as the ring or vice versa. The same holds true for datable features such as hearths, even though much of the knowledge concerning tipi chronology comes from absolute radiocarbon dates from these features. Many of the stone circle sites in the Upper Yellowstone Valley do not have absolute dates or relative dates associated with projectile point recovered from the sites. A similar situation has been noted in Wyoming by Indiana State University Professor Laura Scheiber. After examining site forms from 2,785 stone circle sites from the Bad Pass region of Wyoming, she determined that only 1.2% of the sites were securely dated through excavation and/or radiocarbon dates.

Photograph 8. Test Unit Excavation of Stone Circle Feature 6 at 24YE357. View northeast.

Re-evaluating and adding to the data set for the region is important in understanding settlement and mobility strategies of Intermountain Archaic groups in the area as well as for those Intermountain groups on a larger scale. Following the Montana State Historic Preservation Office's *Standards and Guidelines for Evaluating and Recording Stone Circles Sites* (MT SHPO 2002) provides the necessary methods for recording and mitigating a stone circle site. In order to maximize efficiency of any phase II or III excavations, subsurface testing and imaging techniques should be employed to focus in on probable locations of diagnostic features or artifact concentrations. Magnetic subsurface imaging techniques similar to those utilized during more recent stone circle projects are worthy techniques to add to stone circle research methods. Scheiber has employed the use of geophysical gradiometry surveys in her survey of Bad Pass stone circle sites (Scheiber et al. 2008).

After identification and delineation, archaeological sites with high research potential were subjected to test unit excavation. In particular, as requested by YNP Archaeologists, the MYAP team excavated Cinnabar (Yellowstone's historic train depot), as well as three prehistoric sites, including the Yellowstone Bank Cache Site (24YE355), RJP-1 (24YE190), and Airport Rings (24YE357). Test units consisted of 1x1-m squares and were excavated stratigraphically within natural and cultural soil horizons, using trowels and shovels. Quantities of test units excavated at the respective sites were determined based on their overall dimensions and research potential.

During site evaluations, each archaeological item or excavation location was mapped in relation to an established site grid oriented to magnetic north. The detailed project area map was created using a Leica TCR407 Power Reflectorless Total Station owned by The University of Montana and operated by the Principal Investigator, Field Director, and/or Crew Chief. The total station was utilized to accurately place test units within the established project area grid. The site grid was oriented within the overall project grid; however, each individual site will maintain its own intrasite grid based on a datum established at an arbitrary 1000N 1000E location with an elevation of 100 m. In addition to the electronic mapping using the total station, planviews and profiles were also hand-sketched of each site during the 2007 and 2008 field season to provide a realistic perspective that is sometimes lost in electronic mapping. Maps generated for the project generally utilize measurements taken with the total stations in consort with the hand-drawn field maps.

Photograph 9. Excavation of Stone Circle Feature 6, Airport Rings Site (24YE357). View southeast.

Initial testing of stone circles sites is often done by drilling auger holes by hand to help develop a geomorphological framework per site allowing for the identification of buried cultural layers and provides a less costly method to locate buried features (Brumley 1990; Quigg and Brumley 1984). In addition to hand drilling auger holes, subsurface imaging with a magnetometer survey of individual sites is a newer technology that would possibly speed up the process of locating features as well as confirm the presence of hearths based on differences in electromagnetic fields created by subsurface features (Jones 2005; Martin, et al. 1991). This type of survey uses a magnetometer to locate buried deposits based upon observations of total magnetic intensity or its vertical gradient created by difference in rock or sediment.

Testing should take place not only inside the stone rings but outside as well, a mistake made often in stone circle research, in order to understand overall site patterning (Schneider 1983). Testing outside of the ring is useful as there may be refuse piles or fire pits outside of the ring due to the difference in the way camps are set up during certain times of the year. Past archaeologists misunderstood stone circle potential as seen by poor excavation methods used by Malouf (1961), simply skimming

or stripping the sod up from the inside of a ring, or Light (1984) noting excavations of only a few inches beneath the rocks of the stone circles. Brumley (1990) and Deaver (1989) note that deeply buried components exist at some stone circle sites even though these may not be associated with use of the ring.

Within strata containing cultural materials, excavations proceeded within 5 cm levels and diagnostic and select additional artifacts were point provenience whenever possible to provide for precise vertical and horizontal artifact control. Within recognized subsoil strata with no cultural material, excavations proceeded within 10-cm levels. In non-feature contexts, sediment was screened through 6-mm (0.25-inch) hardware cloth for systematic artifact recovery. The choice for using the 6-mm screen is due to the sediment from several of the excavated soil horizons being very hard and blocky causing enough problems when attempting to screen for cultural materials. A size of mesh any smaller would have proved overly time consuming and unwanted for the type and size of artifacts recovered from the site. Within identified features, samples of sediment were screened through 0.5-mm hardware cloth to increase recovery of small artifacts, including faunal and botanical remains, among other items (e.g., charcoal, etc.). Recovered botanical remains were examined by Paleoresearch, Inc. of Colorado, as requested by Ann Johnson of YNP.

Cultural features (e.g., foundations, basements, privies, etc…) identified during testing were numbered, photographed, mapped, excavated and profiled, as appropriate. Perimeters of pit and basin-shaped features were defined in planview, with a subsequent cross-section to provide a feature profile. Features were excavated in 5-cm levels within test units to increase provenience accuracy. Field observations and excavation data for features and test units were recorded on standardized forms developed by The University of Montana.

The ultimate goal of test unit excavation was to collect data by which to characterize how Airport Rings was used during prehistory. The field methods described above yielded outstanding data by which to interpret historic site use patterns at the former train station.

Artifact Analysis Methods

Four main types of artifacts were recovered during the 2008-2009 field seasons, including flaked stone artifacts, faunal remains, ethnobotanical remains, and historic

artifacts. This section summarizes the basic methodology to be utilized in analysis of each class of artifacts.

Five basic categories of information can be derived from flaked stone artifacts: depositional, temporal/stylistic, functional, technological, and raw material. Each of these aspects of the lithic record is interrelated and cannot be completely divorced from the others. Raw material analysis identifies the lithic materials that were exploited; this information permits inferences to be made about procurement strategies and the related issues of exchange and settlement mobility. Technological analysis examines tool design and methods of production, maintenance, and recycling; this information helps to document the organization of technology and to address issues such as site function. Functional analysis determines the tasks in which tools were employed; this information also helps to document the organization of technology and site function. Temporal/stylistic analysis provides chronological as well as other cultural information; typically, however, only the most formalized stone tools are usually diagnostic (e.g., projectile points), and even these items tend to be less sensitive to temporal change or regional styles than are ceramics. Information about depositional processes helps to identify activity areas, tool kits, and larger-scale site formation processes; this information is derived from cross mending and plotting artifact distributions.

The methods and procedures used to generate data about these five aspects of the lithic record are reviewed briefly here. As lithic artifacts are analyzed, information is recorded on analysis sheets as a series of codes; then, the codes were entered into an Access database. For the purposes of data analysis and manipulation, this database was then analyzed using Excel, SPSS, and Surfer computer programs. Access and Excel were used for data manipulation and table manufacture, while SPSS was useful for statistical analyses, and Surfer was used to generate contour maps of artifact densities at the site. These computer programs facilitated a better understanding of site-use patterns.

The analytical approach to stone tool production and use can be described as techno-morphological; that is, artifacts were grouped into general classes and further divided into specific types based upon key morphological attributes, which are linked to or indicative of particular stone tool production (reduction) strategies. Function is inferred from morphology as well as from use-wear. Surfaces and edges of tools were examined for traces of use polish and damage with the unaided eye and with a 10x hand lens. A conservative approach to the identification of utilized and edge-retouched flakes

was taken because of a number of other factors can produce similar edge-damage, such as, trampling of materials on living surfaces, spontaneous retouch during flake detachment, and trowel contact. Data derived from experimental and ethnoarchaeological research was relied upon in the identification and interpretation of artifact types. The works of Root (2001), MacDonald (1995; MacDonald et al. 2006), and Andrefsky (1998) were drawn upon most heavily.

Lithic artifacts were separated into one of six artifact classes, including debitage, cores, bifaces, unifaces, fire-cracked rock, and cobble tools. All types were quantified by both count and weight in grams. Debitage includes all types of chipped-stone waste that bears no obvious traces of having been utilized or intentionally modified after being discarded. During detailed lithic analysis, debitage was sorted into eight types, and observations on raw material and cortex are recorded. Detailed analysis involved placing flakes in those categories that provide information on the types of tools produced and their production stages. This typological analysis was combined with mass analysis, including size grading and weighing of groups of flake types (Ahler 1989; Hall and Larson 2004). Artifacts were size graded by placing them on a template with concentric circles at 1, 2, 3, 4, 5, 6, 7, and 8 cm diameters. After grouping artifacts by raw material, size, and type, each debitage group was weighed collectively.

After analysis of the debitage, the various identified tools, including cores, unifaces and bifaces were individually examined and described. Cores are cobbles or blocks of raw material that have had one or more flakes detached, but they have not been shaped into tools or used extensively for tasks other than that of a nucleus from which flakes have been struck. Unifaces include both formal tools, like endscrapers, and informal tools, like utilized flakes and edge-retouched flakes. Flakes from cores or bifaces can be used as informal (expedient) tools or worked into formal tools. Maximum length, width, and thickness were recorded in mm.

Bifaces are chipped stone tools that have been shaped by the removal of flakes from both faces or sides of a cobble or large flake. In most cases, they are hafted and used as projectile points and/or knives. Technically, bifaces are also cores, because the flakes detached from them during production and maintenance can be used as tools themselves. The same holds true for unifaces and other cobble tools. Projectile point types were assigned in comparison with appropriate comparative specimens, as illustrated in major regional works (e.g., Frison 1991). In future research, the Principle

Investigator will evaluate projectile point retouch, as recently described by Andrefsky (2006).

Lithic raw material sourcing is one of the best means by which to trace prehistoric human movement on the landscape. As such, a limited number of obsidian and dacite samples were submitted to Dr. Richard Hughes at the Geochemical Research Laboratory in Portola Valley, California, to determine their locations of origin. While it is assumed that Yellowstone's own Obsidian Cliff (and other sources) was the likely point of origin for most obsidian at the sites (Davis et al. 1995), artifacts in the park are often recovered that indicate use of obsidian sources elsewhere in the northwest and southwest. Recent studies in YNP have also shown that dacite can be reliably sourced to known quarries in Montana and elsewhere. Obsidian artifacts were commonly recovered by MYAP archeologists at several sites, while dacite, basalt, and andesite artifacts were comparatively rare, as discussed in Chapter III and IV.

Table 1. Descriptive Characteristics of Volcanic Lithic Raw Materials found at Sites in the Project Area.

Material	Material Description	Material Type
1.00	indeterminate volcanic	other volcanic
1.10	black, mostly opaque obsidian	obsidian
1.20	Black, mostly translucent obsidian	obsidian
1.30	Black obsidian with white inclusions, mostly opaque	obsidian
1.40	other volcanic possible welded tuff	other volcanic
1.50	andesite, dacite	dacite

In addition to obsidian, the proposed research entailed the collection of chert cobbles across Yellowstone National Park to characterize the variability in locally-available cherts. By isolating the range of diversity in local lithic raw materials, the exotic (non-local) materials can be isolated and a better picture of the scale of human movements can be assessed by the project team.

During the summer of 2007, YNP Archeologist Ann Johnson identified a large chert outcrop within the Crescent Hill basalt formation, approximately 20 miles east of Mammoth Hot Springs. The Crescent Hill formation is within the Sunlight Group within the Absoroka Volcanic Supergroup. Based on its location with the Crescent Hill Formation, the chert is herein identified as Crescent Hill chert, with the specific source location being identified as Robin's Quarry after an intern who worked with Johnson at YNP. Crescent Hill chert precipitated as large nodules within the columnar basalt

formations and can be found in two contexts: 1) eroding from hill tops or knobs; and 2) eroding out of the columnar basalt formations themselves. Crescent Hill chert from Robin's Quarry occurs within an approximately 300 acre area both north and south of Grand Loop Road between Mammoth Hot Springs and Tower Junction.

Crescent Hill chert occurs in a wide range of colors and qualities. During summer of 2007, Principal Investigator MacDonald collected a representative sample of chert material from the northern portion of the quarry (north of Grand Loop Road). Based on this collection, 11 types of high-grade chert were identified from Robin's Quarry, as delineated in Table 2. The large range of chert and chalcedony from the quarry makes it extremely difficult to characterize Crescent Hill chert, except to state that it is widely variable in color, quality, and translucency. Given the wide range of chert varieties and its high quality, it should be assumed that a vast majority of chert artifacts from sites in YNP and vicinity are from Robin's Quarry, as appears to be the case at sites from the MYAP project area. The lithic raw materials described in Table 3 are for artifacts observed in collections from sites in the MYAP project area. Each of these has been compared to Crescent Hill chert hand-samples collected from Robin's Quarry and likely derives from that source given its proximity (30 miles upriver) to the current project area.

Table 2. Descriptive Characteristics of Crescent Hill Chert from Robin's Quarry within YNP.

Material Code	Material Description	Chert Type
2.10	chalcedony, milky lustre, fine-grained, fully translucent, white inclusions	Crescent Hill
2.20	Red chert/jasper with white linear/ovoid inclusions in matrix, occasional pinkish sections and occasional black stringers	Crescent Hill
2.30	bluish-black chert with red inclusions and orange striations, opaque, dark	Crescent Hill
2.40	Waxy Tan chert, small red and black inclusions, semi-waxy, opaque	Crescent Hill
2.60	Tan chert (not all waxy) with lighter white/tan inclusions, occasional chalcedonic sections	Crescent Hill
2.70	Coarse grained gray-tan chert with black mottles; verging on quartzite	Crescent Hill
2.81	red chert/jasper, opaque, linear black and orange striations	Crescent Hill
2.90	light olive green, fine -grained chert with occasional black stringers, opaque	Crescent Hill
3.00	blackish-brown chalcedony, moderate translucence, white cortex, black stringers, some reddening and orange sections	Crescent Hill
3.20	red chert with white and tan sections, opaque, very fine grained, slight translucency on edges	Crescent Hill
3.30	white chert/chalcedony with pink/reddening, opaque except for slight translucency on edges	Crescent Hill

In addition to Crescent Hill chert from Robin's Quarry, several other chert varieties were recovered as artifacts across the MYAP project area. These chert types could not be positively matched with hand samples from Robin's Quarry and may derive from other locations, either within the park, from exotic, non-local sources, or simply

represent variance. These other cherts are described in Table 3. In addition, small amounts of quartzite, orthoquartzite, and porcellanite were recovered as artifacts at MYAP sites. Each of these materials is also described in Table 3.

Table 3. Descriptive Characteristics of Other Chert and Other Material Types found at Sites in the MYAP Area.

Material Code	Material Description	Material Type
2.00	chert, indeterminate	untyped chert
2.50	brownish tan chert w/small red, black inclusions,Semi-waxy,opaque	untyped chert
2.80	pure red jasper, opaque, waxy	jasper
2.82	reddish orange chert/jasper, fine-grained, mostly opaque, slight translucency on edges	untyped chert
3.10	white chert, opaque to dull gray; some pinkish sections	untyped chert
4.00	Porcellanite	porcellanite
4.10	red porcellanite	porcellanite
4.20	gray porcellanite	porcellanite
5.00	quartzite, white-gray, fine-grained	orthoquartzite
5.10	red, yellow/tan banded orthoquartzite, very fine grained, high quality	orthoquartzite
5.20	coarse-grained, low quality quartzite, gray	quartzite
6.00	red ochre	hematite

The ultimate goal of lithic analysis is to characterize the lithic technological organization of site occupants. Sourcing of obsidian, dacite, and chert samples provides a means to better understand site and regional use by prehistoric Native Americans (cf. MacDonald 1998, 1999; MacDonald et al. 2006). Subsistence and settlement patterns, as well as daily task activities, can be interpreted based on the data collected during detailed lithic analysis. Work already done with lithic sourcing in the region by Davis et al. (1995: 52) has discovered a trend in the use of obsidian where Bear Gulch obsidian dominates in the intermountain areas and Obsidian Cliff obsidian on the Plains. This work has also established relative dates associated with the most frequent periods of Obsidian Cliff obsidian use based on previous work by Davis and Zeier (1978).

The two time periods most noted for the increased utilization of obsidian from the region come during the Middle Period Pelican Lake and the end of the Late Prehistoric Period during the Old Woman Phase. Obsidian artifacts recovered from both the 2007 and 2008 projects have dated to these two phases of significant use as well as the ranges included before and in between those of heightened obsidian reliance. A general trend of increased reliance from local obsidian resources over time is evident in the archaeological record of the region. “Increased population, expanded mobility and territoriality, and the development and operation of wide ranging obsidian trade networks may account for that heightened obsidian utilization” (Davis et al. 1995: 61) when

Obsidian Cliff obsidian has even been found in the Hopewell culture area in Ohio dating to the Pelican Lake period.

Ethnobotanical and Faunal Analysis

In addition to lithic and historic artifacts, the project recovered botanical and faunal remains from prehistoric and historic features (e.g., hearths and storage pits). Floral analysis from soil samples can provide seasonality of occupation (Wright and Bender 1980) and would suggest seasonal variability in mobility patterns based upon plant resources. This is where locating hearths becomes essential as the chances of finding a concentrated macrobotanical sample associated with the subsistence strategy used at a site is difficult if not impossible without submitting large quantities of soil for flotation. Providing a hearth sample for analysis could generate a representative sample of possible plant species used by prehistoric groups in the area for cooking or consumption.

Frison notes the strong evidence of Archaic peoples subsisting on plant resources in the southern portion of the Greater Yellowstone system (1991). A rise in stone cooking pits and plant processing tools, such as grinding stones, provide evidence of a foraging strategy which disappears almost completely from the archaeological record north of Gardiner, towards the south end of the project area (Frison 1991). Although, this trend might be the result of a change in seasonal subsistence patterns, these features persist throughout the western and central portions of Wyoming. This is a strong indication of a higher reliance on hunting and the analyses of soil samples as well as faunal samples would lend support to a more hunting based subsistence strategy in the Upper Yellowstone area.

As described above, soil samples were collected for analysis by Paleoresearch, Inc. Botanical remains collected from flotation samples and macrobotanical samples hand-collected during excavations were analyzed by Paleoresearch. The macrofloral samples were floated using a modification of the procedures outlined by Matthews (1979). Each sample was added to approximately 3 gallons of water, and then stirred until a strong vortex formed. The floating material (light fraction) was poured through a 150 micron mesh sieve. Additional water was added and the process repeated until all floating material was removed from the sample (a minimum of five times). The material that remained in the bottom (heavy fraction) was poured through a 0.5-mm mesh screen. The floated portions were allowed to dry.

The light fractions were weighed, and then passed through a series of graduated screens (US Standard Sieves with 2-mm, 1-mm, 0.5-mm and 0.25-mm openings) to separate charcoal debris and to initially sort the remains. The contents of each screen then were examined. Charcoal pieces larger than 2-mm, 1-mm, or 0.5-mm in diameter were separated from the rest of the light fraction and the total charcoal weighed. A representative sample of these charcoal pieces was broken to expose a fresh cross section and examined under a binocular microscope at a magnification of 70x. The weights of each charcoal type within the representative sample also were recorded. The material that remained in the 2-mm, 1-mm, 0.5-mm, and 0.25-mm sieves was scanned under a binocular stereo microscope at a magnification of 10x, with some identifications requiring magnifications of up to 70x. The material that passed through the 0.25-mm screen was not examined. The heavy fractions were scanned at a magnification of 2x for the presence of botanic remains. Remains from the light and heavy fractions were recorded as charred and/or uncharred, whole and/or fragments. The term "seed" is used to represent seeds, achenes, caryopses, and other disseminules. Macrofloral remains are identified using manuals (Martin and Barkley 1961; Musil 1963; Schopmeyer 1974) and by comparison with modern and archaeological references.

Samples from archaeological sites commonly contain both charred and uncharred remains. Many ethnobotanists use the basic rule that unless there is a specific reason to believe otherwise, only charred remains will be considered prehistoric (Minnis 1981:147). Minnis (1981:147) states that it is "improbable that many prehistoric seeds survive uncharred through common archaeological time spans." Few seeds live longer than a century, and most live for a much shorter period of time (Harrington 1972; Justice and Bass 1978; Quick 1961). It is presumed that once seeds have died, decomposing organisms act to decay the seeds. Sites in caves, water-logged areas, and in very arid areas, however, can contain uncharred prehistoric remains. Interpretation of uncharred seeds to represent presence in the prehistoric record is considered on a sample-by-sample basis. Extraordinary conditions for preservation are required.

In addition to the information provided by the remains themselves, ethnographic documentation is often consulted to verify or predict likely macrofloral remains. This documentation provides information related to Native subsistence patterns and the types of plants used by these groups for any number of purposes related to food, clothing, ceremonial, or medicinal needs. Native plants in the region like pine, several types of grasses, and members of the lily family have been documented as plants that were used

for any one of the purposes noted. The same type of information pertaining to use is applicable to charcoal samples and the types of plant used as fuel.

As with botanical remains, faunal remains from features were analyzed to determine subsistence strategies of prehistoric and historic site occupants. When possible, element, portion, side, and the presence of human modifications were recorded for each specimen. Faunal analysis through Zooarchaeological taphonomy studies would provide representative samples indicative of subsistence strategies (Brewer 1992). Specific goals pertaining to faunal collection is finding subsistence evidence of large game species such as elk, moose, bison, deer, and antelope suggesting a fit into the large game hunting strategies proposed for groups in this region by Frison (1991) and others.

Even though counting bone samples may shed light into what types of food sources are utilized (Grayson and Frey 2004) this may not accurately represent the larger subsistence patterns being utilized (Butler and Lyman 1996). What taphonomic studies can do is relate information from subsistence practices involving butchering and processing strategies to diet breadth as well as environmental questions (Lupo 2006; Nagaoka 2002; O'Connell and Hawkes 1988). The Montana Comparative Skeletal Collection at the Philip L. Wright Zoological Museum, University of Montana was used to identify the mammal and bird bones from the site. Results of analysis of ethnobotanical and faunal remains are included in Chapter VI.

Other Specialized Analyses

Finally, other specialized analyses were conducted as appropriate during the course of the project. Radiocarbon dating analysis is another important tool used for dating organic remains at a site allowing for comparisons of the plant and animal resources being used at a site. Even though absolute dating is an important tool, it also presents problems when associating buried components with surface deposits. A single use stone circle site dated using absolute methods suggest a valid acceptance of subsurface to surface association. Although our excavation efforts uncovered a multi-occupation component for Feature 4, associated floral and faunal materials still allow for insight into subsistence patterns used during the different periods of occupation. The team obtained three radiocarbon dates from samples of wood charcoal in good archeological contexts. Samples of charcoal were subsequently submitted for radiocarbon dating to BetaAnalytic, Inc. of Miami, Florida. These analyses are also included in Chapter 6.

CHAPTER 5. SURVEY AND MAPPING OF THE AIRPORT RINGS SITE

By Douglas H. MacDonald and Michael C. Livers

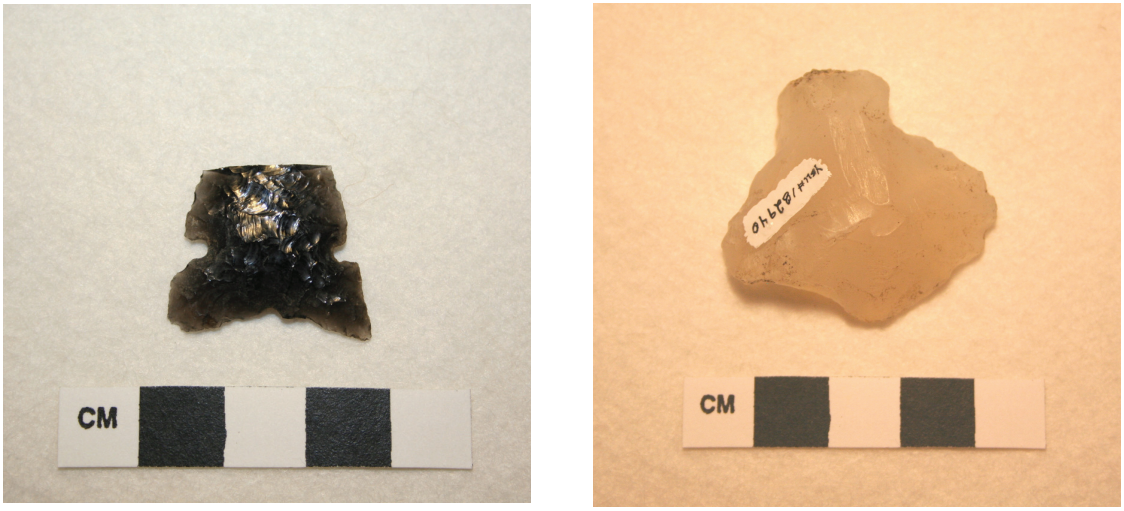
One of the main goals of the MYAP team in 2007-2008 was to map and excavate the Airport Rings Site. The ultimate purpose of work at the site was to determine the site's potential eligibility for listing on the National Register of Historic Places. Work at Airport Rings was comprised of two main phases, including: 1) Initial Phase I survey and mapping; and 2) Phase II excavations. As reflected in this chapter, the MYAP team mapped the distribution of features at the site, and subsequently excavated several important features at the site, results of which are included in the next chapter.

Photograph 10. Excavations within Airport Rings Feature 8.

Phase I Survey and Mapping, Airport Rings

Site 24YE357—the Airport Rings Site—is a concentration of 11 stone circles and associated debris within 100 ft. of the Old Yellowstone Road as it descends from the upland colluvial slopes into the valley terrace landform below (Figure 7; Photograph 11). The site is immediately across the road from the Henderson Homestead Site (24YE196),

indicated by a distal impact flake scar. The point was not resharpened for use as a projectile; however, one of the point's basal tangs was resharpened to a sharp edge, perhaps for recycling as a cutting tool.



Photograph 12. Surface-Collected Artifacts, Airport Ring Site: Left—FS 53; Right—FS 54.

The other surface-collected artifact from the 2008 reconnaissance is a quartzite end scraper recovered on the far eastern edge of the stone circle portion of the site near Reese Creek. The scraper likely was hafted to a small handle. The scraper's distal edge has been resharpened to a 60-90 degree angle and has experienced repeated use on very hard materials, indicated by the crushing of the distal working edge. A small portion of the working edge is also broken, perhaps due to use on hard materials. Artifact provenience for both 2008 artifacts in Table 5, use the site's Total Station grid coordinates instead of GPS coordinates.

In addition to the two surface-collected artifacts from 2008, 8 artifacts were collected in 2007, including six orthoquartzite flakes and two tested obsidian cobbles. Each of these artifacts was collected west of Reese Creek, away from the stone circle site into the area identified on Figure 7 within the historic site component. This area also contains a low-density scatter of prehistoric lithics in addition to the scatter of historic refuse. As will be discussed in the next section, the main prehistoric occupation was clearly in the eastern portion of the site associated with the stone circles. The remainder of this section provides an overview of mapping at the stone circle portion of the Airport Rings Site.

not make sense given the assumption that earlier circles are on average smaller than more recent ones. Nevertheless, anyone recording a stone circle should take caution when counting rocks making up the actual ring. More or less rocks may be associated with the ring's use and with any survey, the final rock count would be a potentially arbitrary number. If this assumption of size and age is correct, one would expect larger circles to be more recent and, thus, to have more stones than earlier (presumably smaller) circles.

One possible interpretation of this inverse ratio is that larger stone circles had larger and heavier hides and presumably more poles for support, reducing the need for as many heavy exterior stones to hold down tepee edges. Another possibility comes from the ethnographic knowledge of an inner liner being used along the bottom of the lodge among some groups (Kehoe 1960; Malouf 1961) decreasing the importance of completely weighing down all of the lodge edges. Alternatively, other ethnographic information explaining the lack of stones could represent the use of an inner liner, as wooden stakes were sometimes used to fasten the liner down from the inside, also decreasing the importance or need to weight down the entire outside edge (Wedel 1963). A further explanation may even be the difference in the season of use and the unnecessary need to hold down the lodge's edge during warmer weather when the edges were often elevated during the day, a trend noticed in some historic photos of tipis on the Plains. This is supported by Lowie's (1922) ethnographic account of the Crow using rocks around the tipi, which reports some informants stating rocks were used to hold down tipi covers only during the winter.

gaps in the larger than the small circles. In that vein, it is likely that 24YE357 contains the remains of multiple occupations, as evidenced by occasional overlapping of stone circles and the apparent recycling of rock, which can be observed by significant gaps in the walls of a few of the stone circles, especially the larger features. The constant recycling of rocks by later site occupants is also the likely reason that Rings 2 and 3 (Feature 2 and 3) were not intact and lacked a discernable shape.

Three people have recorded different measurements for the 11 stone circles at Airport Rings. As the stone circle measurements vary from person to person only one table of measurements is adhered to above, Table 6. Based on planviews drawn in the field, surface areas of the three excavated rings (Features 4, 6, and 8) are roughly 25 m^2 for both Features 4 and 8, while Feature 6 has a much smaller internal surface area closer to 12.5 m^2 than the 19 m^2 proposed in Table 6. The evidence behind the adjusted surface areas comes from the number of test units put in at each feature not matching up with the percentage of surface area actually covered during excavation if using ring areas from Table 6. Explaining this more clearly with the numbers, the 10.5 test units laid inside Feature 4 comprised approximately 43% of the total interior surface area of the ring. With previous measurements taken for the stone circle, the areas covered by these test units would have only covered around 20% of the surface area of Feature 4, a number that does not add up. This is a similar situation for the other two excavated features as well. According to the previous measurements, the 10 test units laid in for Feature 6 would have only covered 40% of the interior area when the test units obviously cover a majority of the rings interior (around 80%). Feature 8 had 11 test units gridded inside the ring covering close to 45% of the area inside where as the old measurements made the ring area smaller meaning the test units would have covered over 55% of the interior area, an observation that is not accurate. This adjustment provides an example of just how arbitrary accurately measuring stone circle area can be from person to person.

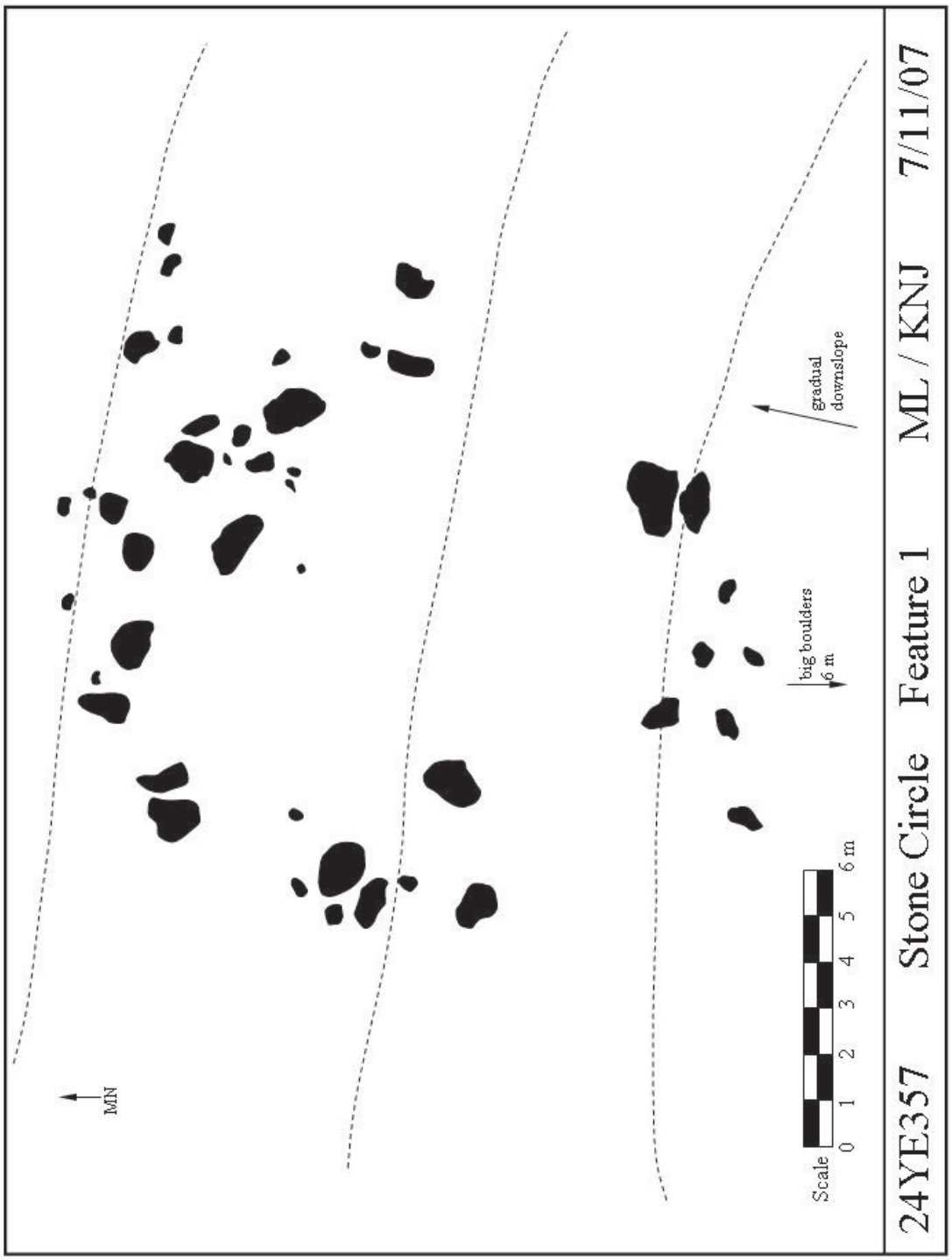


Figure 9. Planview of Stone Circle Feature 1 from 24YE357 (Airport Rings Site).

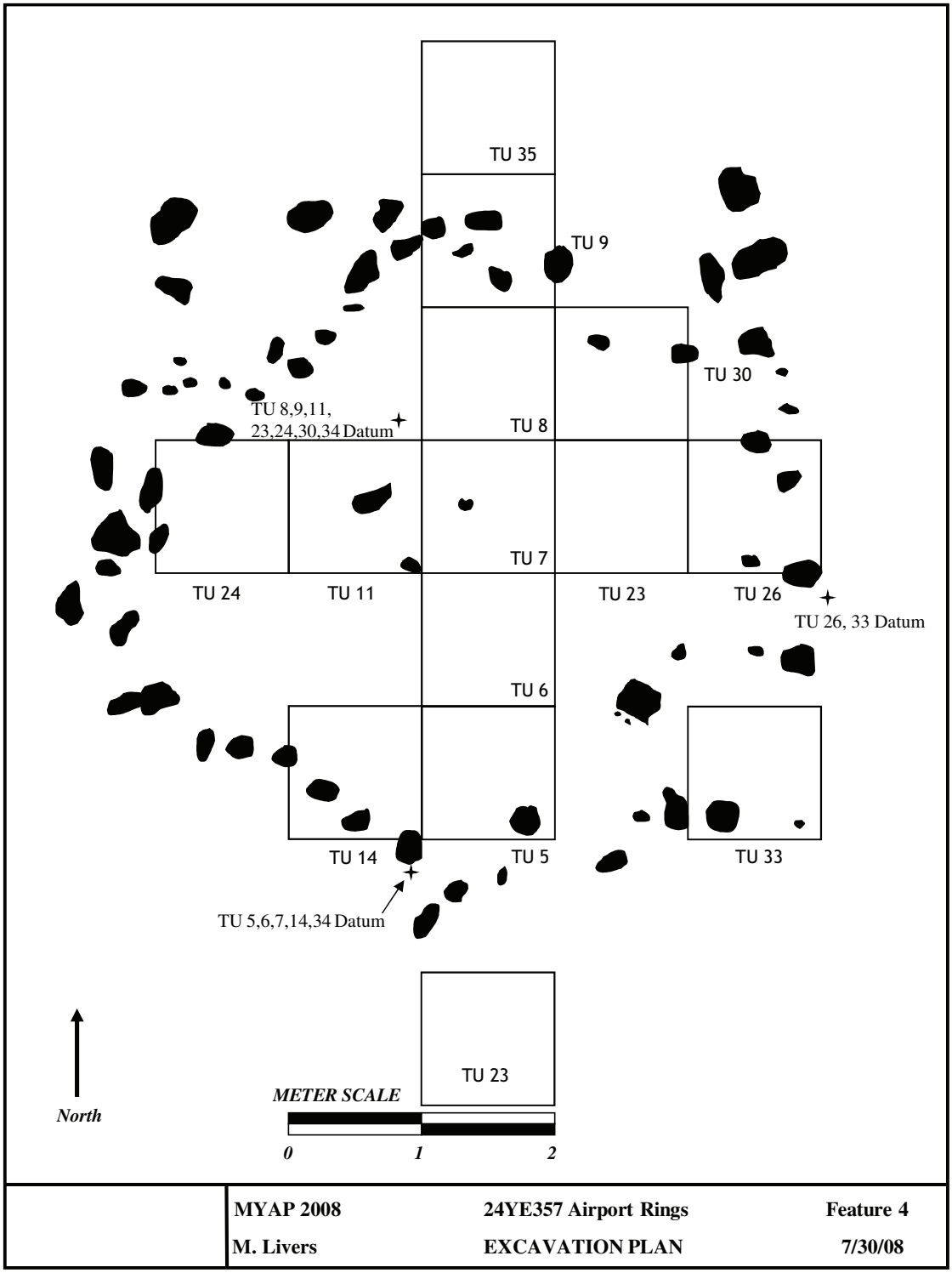


Figure 10. Planview of Stone Circle Feature 4 with excavation plan from 24YE357 (Airport Rings Site).

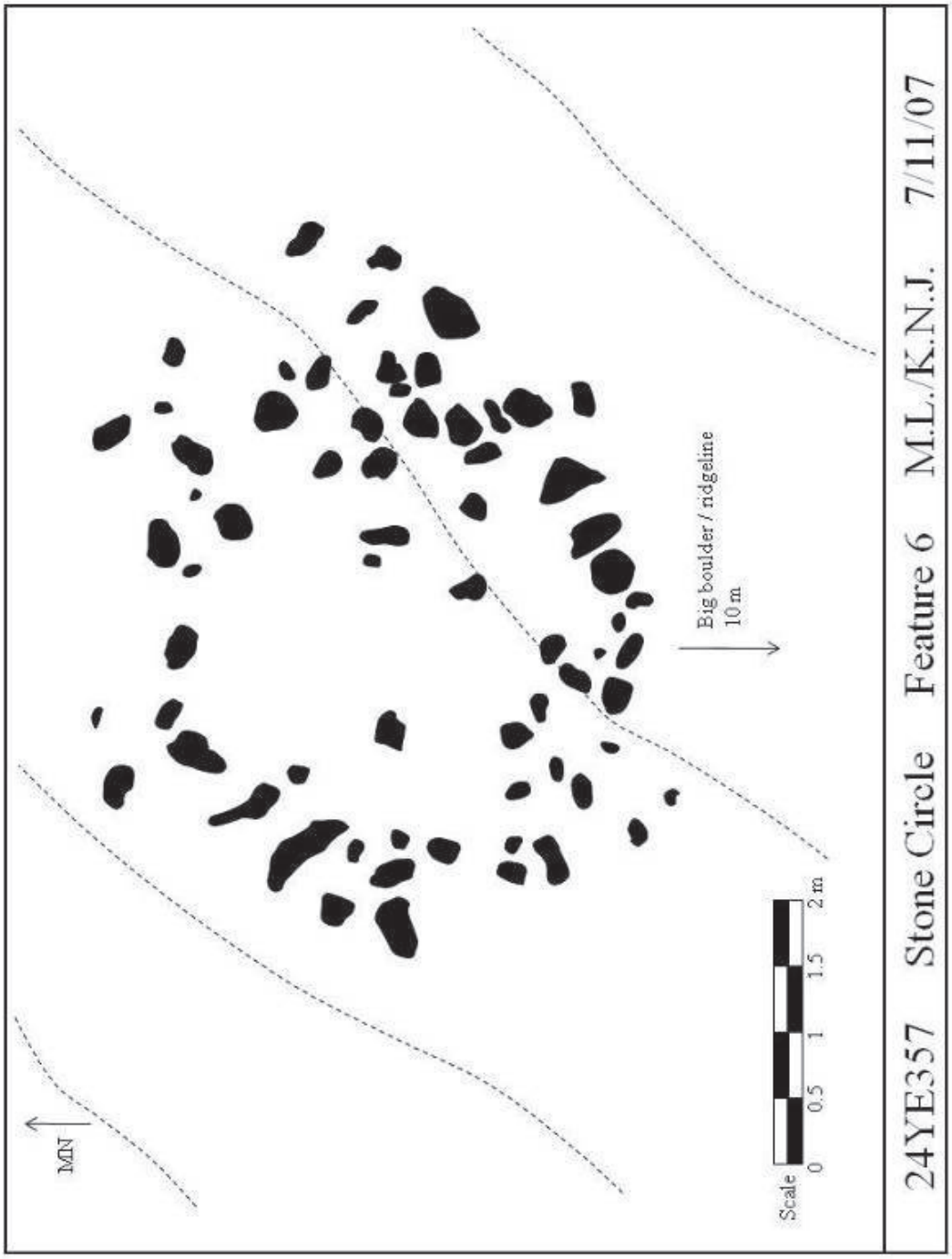


Figure 11. Planview of Stone Circle Feature 6 from 24YE357 (Airport Rings Site).

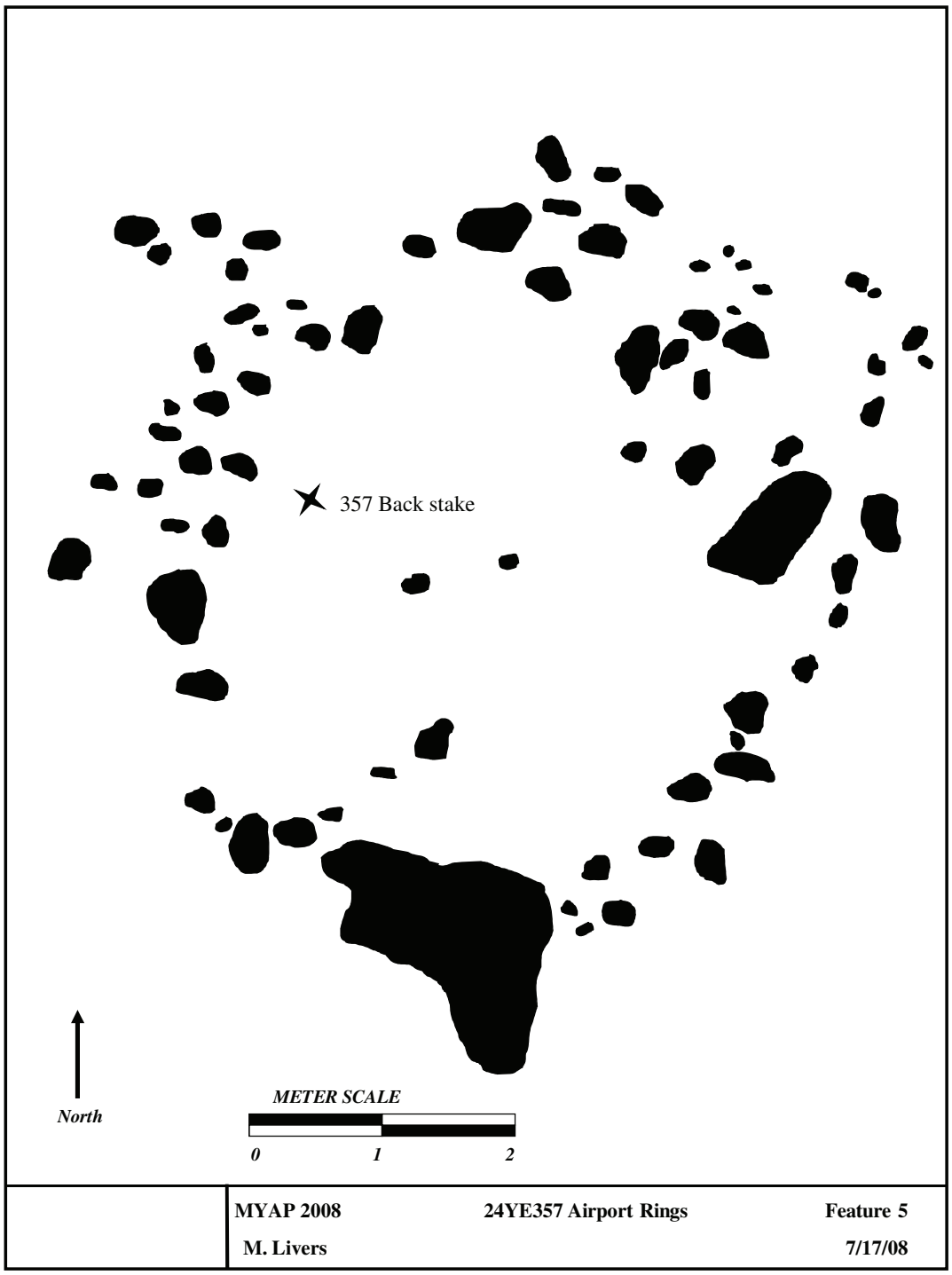


Figure 12. Planview of Stone Circle Feature 5 from 24YE357 (Airport Rings Site).

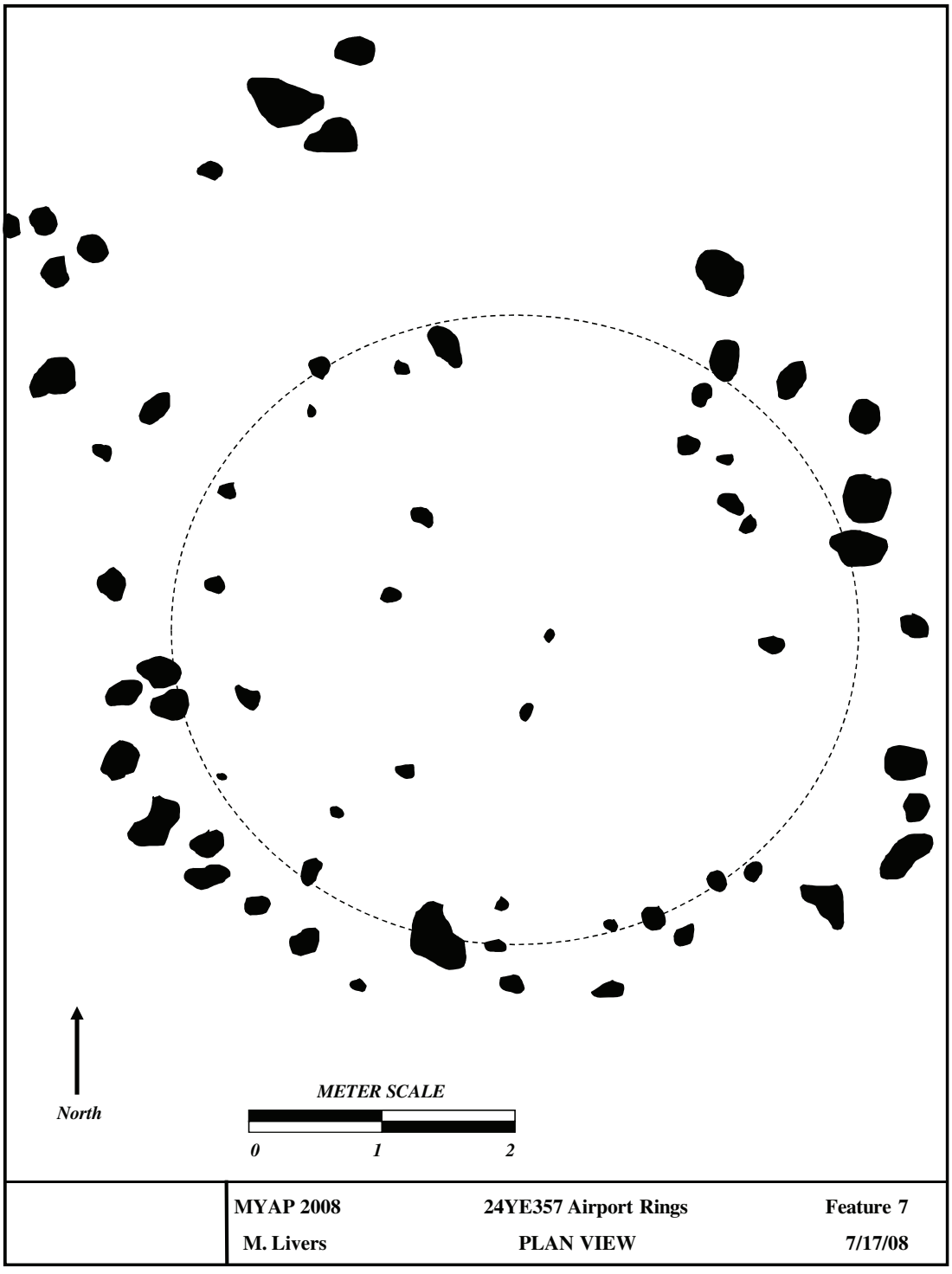


Figure 13. Planview of Stone Circle Feature 7 from 24YE357 (Airport Rings Site).

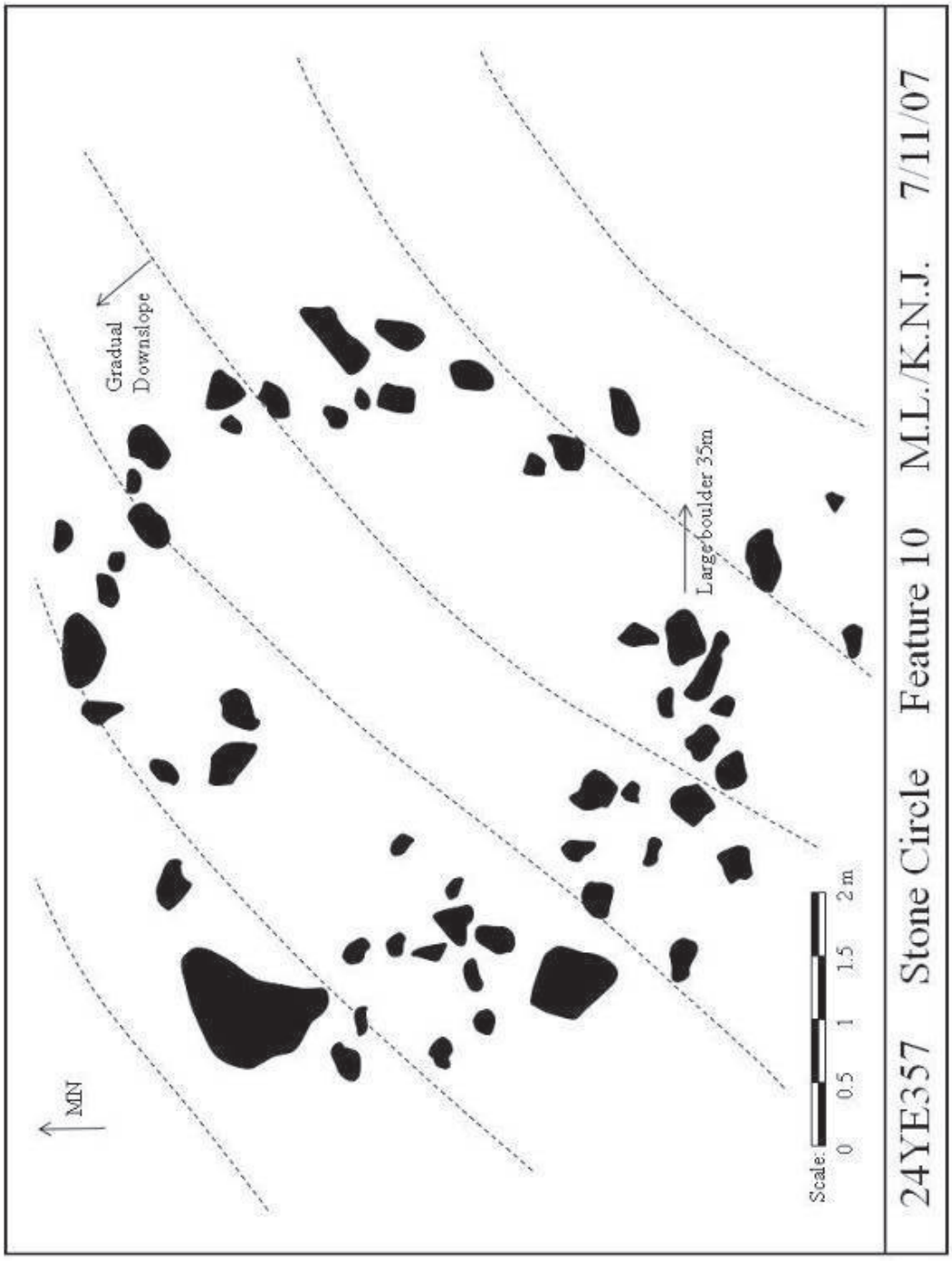


Figure 14. Planview of Stone Circle Feature 10 from 24YE357 (Airport Rings Site).

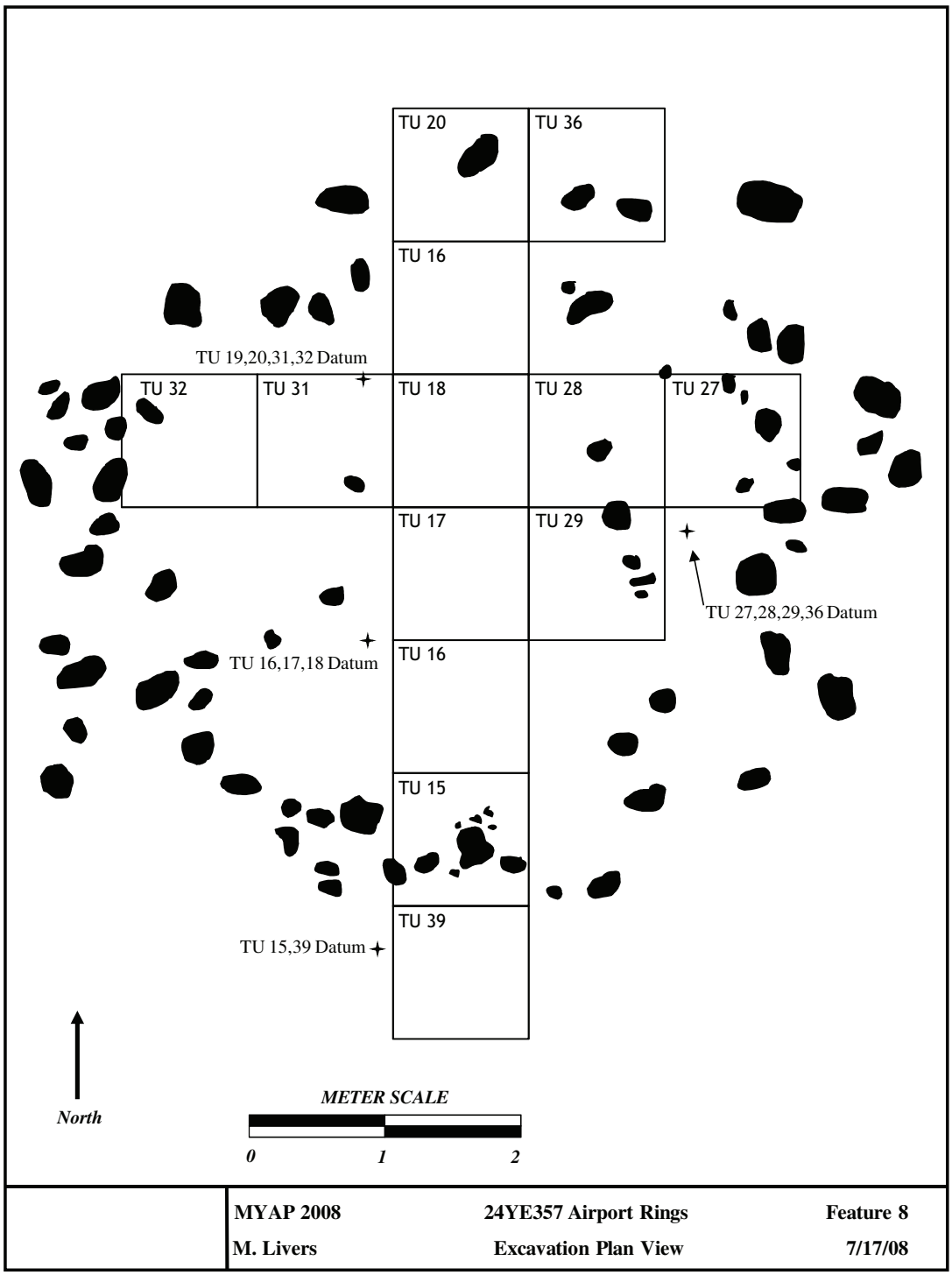


Figure 15. Planview of Stone Circle Feature 8 with excavation plan from 24YE357 (Airport Rings Site).

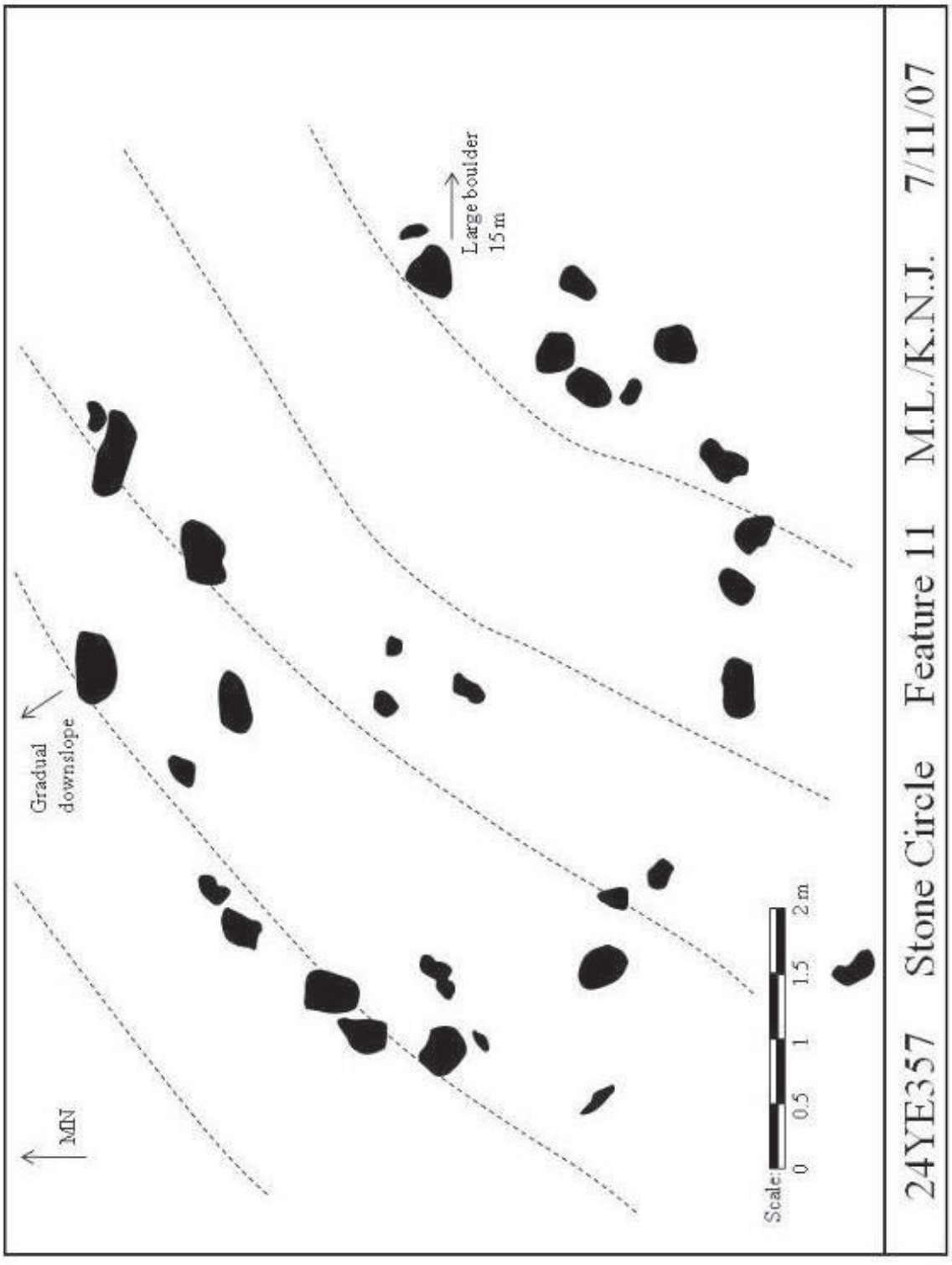


Figure 16. Planview of Stone Circle Feature 11 from 24YE357 (Airport Rings Site).

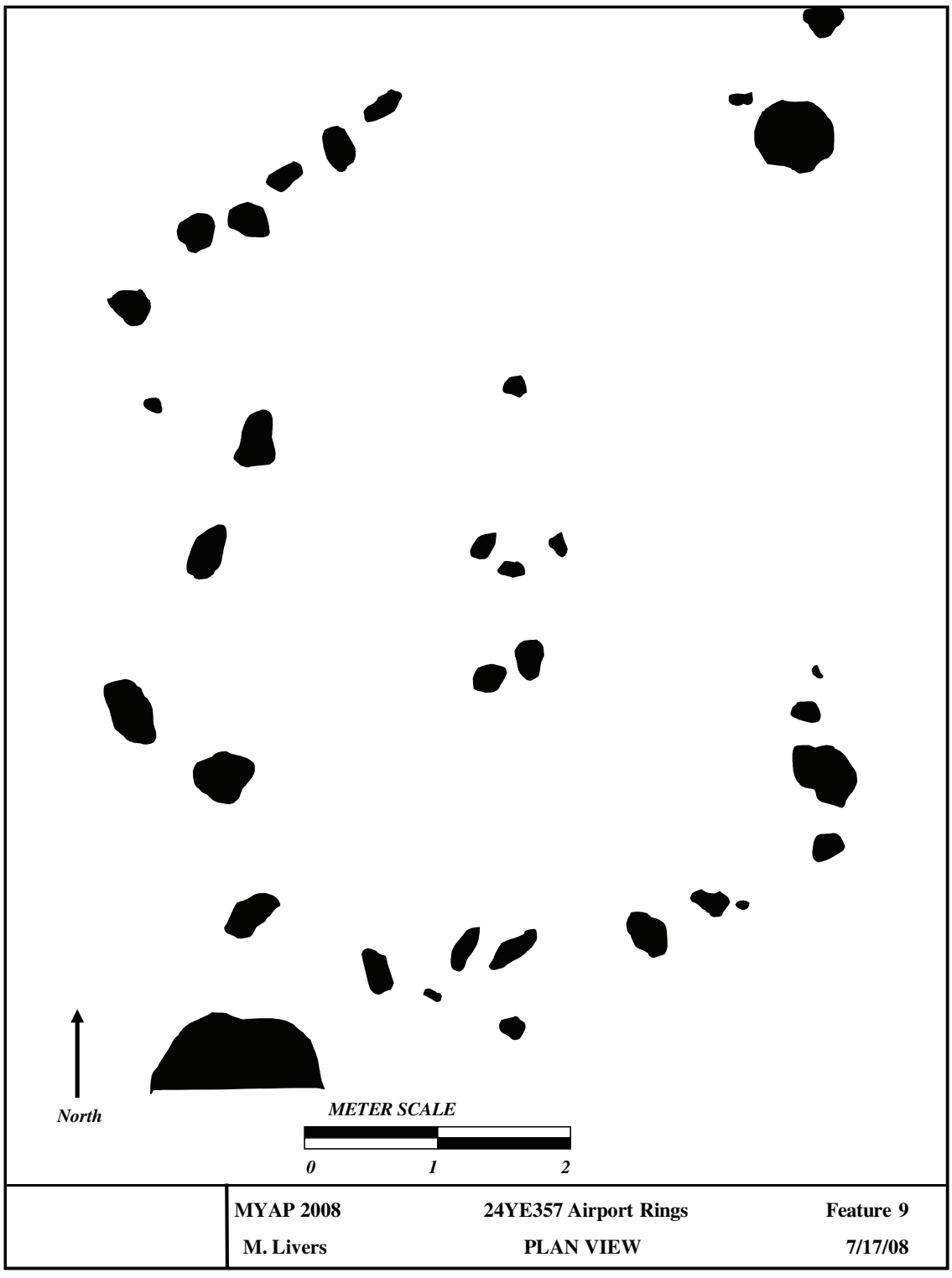


Figure 17. Planview of Stone Circle Feature 9 from 24YE357 (Airport Rings Site).

Results of Site Mapping

Several inquires can be made about intersite and intrasite patterning founded on the information recorded during the mapping of stone circle sites. Light (1984) notes a minimum of four possible behavioral factors that could influence the distribution of individual rings at a site. These factors include such behaviors like the one obviously present at Airport Rings concerning the number of occupations occurring at a site. Couple the number of occupations with the amount of people per episode, the need for defense, and kinship or other social relationships between the people, and any one of these would create a unique intrasite camp pattern (Light 1984: 38-39). Often with larger campsites, there are no discernable patterns associated with the layout of individual rings at the site (Kehoe 1960; Light 1984; Oetellar 2006). Often enough this is because there were multiple occupations of the area and even though larger tipi ring sites contain different areas of use associated with each occupation, archaeologists consider all of these different areas part of a whole. More work beyond just a pedestrian survey would be necessary to address and differentiate periods of use, something many archaeologists do not have the time or interest in pursuing.

Kehoe (1960) believes that there are several additional factors causing the change in camp layout involving subsistence strategies and ceremonial or religious practices derived from various topographic settings, though he did not establish trends related to geographic setting. This is the one possible instance where a pattern does present itself in the archaeological realm in terms of large scale site patterns. Ethnographic observations have recorded the knowledge of a camp circle from tribes on the Northern Plains coming together during the summer months for communal buffalo hunts (Kehoe1961; Oetellar 2006). These camps circles could also have relations to sun dance ceremonies performed in conjunction with the communal summer hunts.

Kehoe discovered some intrasite patterns from stone circle sites he visited in the 1950s, when dealing with sites containing few rings. His observations offer one of the earliest examples of how someone could define probable single occupation areas within a larger site. These early observations document vague patterns when there were only one, two, three, or four or more rings per site. When three rings were present at a site, they were in either a single row or forming a triangle where as sites with four or more rings had arrangements in single lines, double lines, V shapes, semi-circles, or circles (Kehoe 1960: 442). Single ring occupations would obviously not provide any evidence

the same period of occupation. The second possibility of another three tipi occupation might have been from Features 2, 3, and 4, though this would have been before the use of Feature 4 as the rocks used to make this ring were probably taken from Feature 2 and 3. Other observations coming from the mapping of Airport Rings suggests that Feature 1 was a single ring occupation because of its distance from the rest of the rings, unless it was an isolated feature associated with other rings.

Features 2 and 3 were the most disturbed and scattered rings at the site and if the Middle Archaic date from the Feature 4 hearth is associated with the use of a tipi, supports the three tipi triangle pattern suggested prior to the use of Feature 4. Feature 4 itself may have been a single occupation event as dates from Features 6 and 8 to the east returned earlier as well as later occupation dates than those recovered from Feature 4. Features 10 and 11 were probably from their own occupation episode based on their location and the number of rocks recorded missing from neighboring Feature 9. Looking at Kehoe's site trends, associated dates, and the construction of current features, the Airport Rings site could have had at least six different occupation events during the past 5000 years. Given the potential for re-use on an annual basis, more than six occupations could have taken place at the Airport Rings site. In the site's present condition, Kehoe's study is able to point out six of the many occupations episodes probably occurring on the landform.

CHAPTER 6. EXCAVATION OF THE AIRPORT RINGS SITE

By Michael C. Livers and Douglas H. MacDonald

After mapping the surface distribution of artifacts and features, the MYAP team excavated three of the most intact stone circles at Airport Rings to determine their integrity and potential to yield information regarding the prehistoric use of the site. A total of 39 test units were excavated in 2008 within stone circle features 4, 6, and 8. The three stone circles selected for excavations—Features 4, 6, and 8—are among the most intact at the site. Features 4 and 8 each also had portions of rock exposed in their center, providing a possible opportunity to yield dateable material from a hearth. Feature 6 was selected because it is among the smallest of the stone circles at the site, providing an opportunity to explore its function and possible age compared to the larger circles such as Feature 8.

Excavation methods follow those described in Chapter III. In total, the MYAP 08 team excavated 39 square meters during the 2008 field season at the Airport Rings stone circles, including 14 square meters associated with Feature 4, 12 square meters for Feature 6, and 13 square meters associated with Feature 8 (Table 7).

Table 7. Summary of Excavation Results, Airport Rings (24YE357).

Feature	Size (Sq.M.)	Excavated TUs (n)	% Exc. Feature	Lithic Artifacts (n)	Lithics/m^2	Interior Features	Faunal/Soil Analyses	Historic Artifacts (n)
4	19.6	14	71.4	357	25.0	2 hearths	Bison, Large Mammal, Juniper, Sagebrush	2
6	19.6	12	61.2	180	14.8	none	Unidentified	0
8	22.9	13	56.7	157	11.9	1 hearth	Large and Medium Mammal Willow, Sagebrush	0
Total	62.1	39	**Average** 62.8	694	**Average** 17.5	3 hearths	4 fuel sources, Bison and other unknown mammals	2

These represent 50-75 percent samples of the three stone circles. Excavations were conducted to provide north-south and east-west longitudinal cross-sections in each of the stone circles in an attempt to uncover a central hearth feature supporting hypotheses about the site's function. In addition, test units were excavated to the north and south of each stone circle to provide an evaluation of the use of space outside of the stone circles themselves, a task important in determining differences in artifact assemblage formation.

During excavations of the three stone circles, a total of 687 lithic artifacts were recovered, including 357 from Feature 4, 180 from Feature 6, and 157 from Feature 8. Four additional artifacts were surface collected for a total yield of 687 lithics from the site. These artifacts ranged from lithic tools such as bifaces and unifaces to modified cobbles and lithic debitage.

Table 8. Lithic Class Counts by Feature, Airport Rings Site.

Feature	Biface	Debitage	FCR/Cobble/ Unmodified Cobble	Uniface	Total
4	10	296	14	5	325
4.1	0	10	0	0	10
4.2	0	2	13	0	15
6	4	174	0	0	178
8	0	136	4	3	143
8.1	0	2	10	0	12
Surface	1	1	0	2	4
Type Count	15	621	41	10	687

Feature 4 had the most lithic tools with 10 bifaces and 5 unifacial flakes, while Feature 6 had the four remaining bifaces recovered during excavation. Some of the bifacial tools are projectile points that are discussed further in the following sections providing more detailed information on the excavation results for each feature. Feature 8 had several cobbles and only three unifacial flakes. The remaining lithic artifacts from each feature consisted of lithic debitage and a count of fire cracked rock collected from the fire features in both Features 4 and 8.

Table 9. Lithic Type Counts by Feature (Airport Ring Site).

Feature	BF	BS	DF	ER	ES	FF	HS	IB	IF	LB	MB	PP	RF	rock	SF	UF	FCR/Unmodified Cobble	FT Total
4	31	2	7	3	1	158	0	2	14	3	0	5	0	0	81	4	14	325
4.1	2	0	0	0	0	1	0	0	2	0	0	0	0	0	5	0	0	10
4.2	0	0	0	0	0	2	0	0	0	0	0	0	0	0	7	0	6	15
6	21	2	1	0	0	93	0	0	10	1	1	2	0	0	47	0	0	178
8	14	1	0	3	0	77	2	0	2	0	0	0	0	2	39	3	0	143
8.1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	10	12
Surface	0	0	0	0	1	0	0	0	1	0	0	1	1	0	0	0	0	4
Type Count	68	5	8	6	2	332	2	2	29	4	1	8	1	2	180	7	30	687

Key: bs=blockshatter; df=decortication flake; er=early reduction flake; ib=indeterminate biface; bf=bifacial reduction flake; sf=shaping flake; ff=flake fragment; if=indeterminate flake; es=endscraper; lb=late stage biface; pp=projectile point; mb=mid stage biface; uf=useware retouch flake; hs=hammerstone; rf=retouched flake

The lithic debitage collected from each feature consists of a small number of flake types indicating different forms of tool production and maintenance. Decortication and early reduction flakes are flake types associated with early stages of tool production while bifacial reduction and shaping flakes are associated with late stage tool manufacture and maintenance. Early stage reduction flakes from Feature 4 account for only 10 of the 350 total flakes, or 3.5% of flakes, while 126 late stage flakes comprise 36% of combined Feature 4 lithics. Feature 6 early stage flakes comprise less than 1% (n=1) of the 178 total flakes from the feature and late stage production flakes make up approximately 38% (n=68) of identifiable reduction flakes from the feature. Combined early stage reduction flakes from Feature 8 consist of three (2%) out of155 lithics and late stage flakes number 54 or 35% of the total (Table 9).

In a 2009 *Archaeology in Montana* article, John Pouley used mass analysis to test for lithic reduction activity areas within several stone circles at a site in North Dakota. Pouley (2009) uses Stevenson's (1985) idea of three occupation phases occurring in the cycle of site occupation, use, and abandonment, in support of the different types of lithic activities occurring during each phase. During the initial phase, site occupants finalize tool production, during the exploitation phase reduction activities consist of tool maintenance or possible manufacture, and finally during the abandonment phase tools are discarded while new tools are prepped for the move (Stevenson 1985). If this three phase settlement system is applicable to all stone circle sites in the region there appears to be an absence of lithic debitage associated with the manufacture of new tools at the Airport Rings site. Testing of the site may have missed early stage reduction work

activities within the rings due to placement of test units or simply not digging deep enough within in the features. Full-scale manufacturing probably would have occurred outside the tipi in warmer weather, providing another reason why the 2009 investigations missed certain types of artifacts. However, this evidence provides a more likely interpretation where the terrace was the location of a brief stop off or resting point for small foraging groups coming out of the park interior on their way back to the larger winter encampments further up the valley. If this was just a brief resting spot for small groups coming out of the park it does not seem at all unlikely that the occupants would wait until their return to the larger camp to begin tool manufacture activities if the camp was not more than several miles away.

Table 10. Sourced Artifact Type Counts by Feature (Airports Rings Site).

Feature	Bear Gulch	Grasshopper Knob	Obsidian Cliff	Feature Count
4	2	1	12	15
6	0	1	7	8
8	0	2	7	9
Surface Find	0	0	1	1
Total Source Count	2	4	27	33

Selected obsidian artifacts from the site were submitted for XRF analysis (Table 10), resulting in a range of raw material sourcing locations up to 100 miles away from the site. X-Ray fluorescence sourcing of 33 of the artifacts indicated that the majority (n=25, 71.43%) are from Obsidian Cliff, Wyoming. Two obsidian artifacts were from Bear Gulch, Idaho, including: FS 9 (a late stage biface) and a late stage preform (FS 115). Four artifacts derive from Grasshopper Knob, a relatively poorly-known dacite source in west-central Montana. Field specimen 31 is an untyped biface, while FSs 38, 111, and 127 are debitage. Additional XRF interpretation is provided for each feature in the sections below.

In addition, analysis conducted by Paleoresearch, Inc. on ethnobotanical remains from soil samples taken out of the three identified hearths offer insight into the type of fuel and possible plant resources utilized at the site. Two of the samples are from hearths excavated within Feature 4—Features 4.1 and 4.2—and one is from a hearth in Feature 8—Feature 8.1. Macrobotanical data is also presented in the discussion of the hearth features from Stone Circle Feature 4. The remainder of this section provides results of excavations of each of the three stone circles, including details regarding the hearth features.

A small amount (n<100 total) of faunal remains were recovered from each circle allowing for limited taxonomic identification (Figure 19). Bison identification was derived from the presence of molar fragments, and while other remains could not be specifically typed to individual species due to heavy fragmentation, they were identifiable under broader type categories.

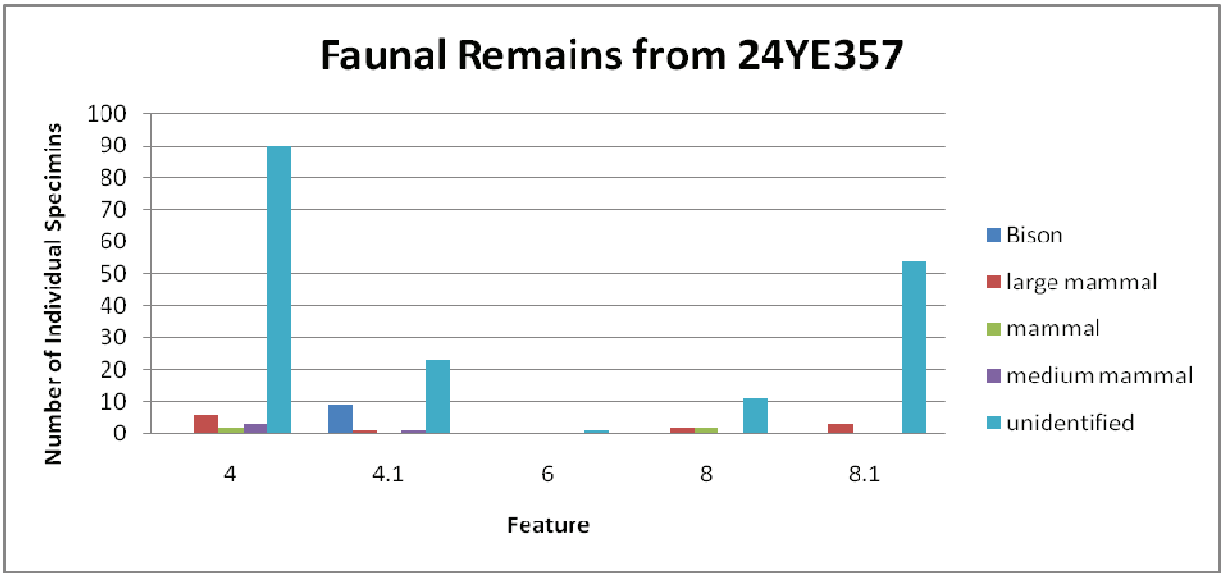


Figure 19. Faunal Remain Type Count by Feature (Airports Rings Site).

A total number of 208 faunal remains were recovered from the 2008 excavations of Airport Rings (Figure 19). Although a majority of remains were unidentifiable (N=179, 86%), several specimens were identified as Bison (N=9, 4%) while the remaining artifacts were classified as large mammal (N=12, 6%), medium mammal (N=4, 2%), or general mammal (N=4, 2%). The faunal evidence suggests the possibility of a range of game utilized by hunters in the valley. Large game species in the area include bison and elk, while medium sized mammals could be any variety of medium ungulate (deer, pronghorn, mountain goat, or bighorn sheep). Feature 4 had 101 or 49% of the faunal remains collected, including 6 large, 3 medium, 2 general mammal, and 90 unidentified specimens. Feature 4.1 had 34 (16%) faunal artifacts including 9 typed to Bison, 1 large, 1 medium mammal, and 23 unidentified. Feature 6 had one unidentified faunal remain recovered during excavation accounting for less than 1% of faunal materials. Feature 8 had 2 large, 2 general mammal, and 11 unidentified counts comprising a total of 15 specimens or 7% of all faunal remains. Finally, Feature 8.1 had a total of 57

artifacts including 3 large mammal and 54 unidentified specimens making up the final 27% of faunal materials recovered.

Table 11. Sample Weight of Faunal Remains from All Features, 24YE357.

Feature	Bison	large mammal	mammal	medium mammal	unidentified	Total Weight (g)
4	0	7.5	1.2	1.9	20	30.6
4.1	3.2	1.2	0	1.6	3	9
6	0	0	0	0	0.4	0.4
8	0	2.6	0.6	0	1.7	4.9
8.1	0	8.8	0	0	8.4	17.2
Total	3.2	20.1	1.8	3.5	33.5	62.1

A total combined weight of 62.1g was recovered from three ring features, Feature 4, Feature 6, Feature 8, and two fire features, Feature 4.1 and Feature 8.1 (Table 11). The weight of faunal remains recovered during excavation suggests a higher reliance on large game species during the period of use for Feature 8.1 (8.8g) than during the occupational use of Feature 4.1 (1.2 g). However, there are many temporal factors that could have affected the specimens prior to collection not considered. The data also points to the allocation of a larger range of species during Feature 4 and 4.1's use with the evidence for large (8.7g), medium (3.5g), and general mammal (1.2g) specimens. Adding the total specimen weights for Feature 8 and 8.1 also suggests a higher reliance on large species with a combined weight of 11.4g. Both of the radiocarbon dates for these fire features date to the Late Prehistoric Period and a natural assumption would be then the data from both features suggest a similar pattern. The ideas here are based on the faunal data that was recovered, but the unidentified remains create a difficult obstacle during analysis. The patterns suggested could be skewed as the sample size for each feature is relatively small and probably provides only a portion of the large picture. It is necessary to explore the distribution of faunal remains within the ring features to verify that the remains from Feature 4.2 are not the cause for the apparent difference between the use of the two Late Prehistoric ring features.

Table 12. Faunal Distribution for Features by Test Unit Counts, 24YE357.

Feature	TU	Bison	large mammal	mammal	medium mammal	unidentified	Total TU Count
4	11	0	0	0	0	17	17
	23	0	0	2	0	0	2
	30	0	0	0	0	6	6
	33	0	0	0	0	5	5
	5	0	0	0	0	2	2
	6	0	0	0	0	3	3
	7	0	6	0	0	57	63
	8	0	0	0	3	0	3
4.1	7/11	9	1	0	1	23	34
6	37	0	0	0	0	1	1
8	17	0	0	0	0	5	5
	18	0	2	1	0	6	9
	31	0	0	1	0	0	1
8.1	18	0	3	0	0	54	57
Total Type Count		9	12	4	4	179	208

A total for 208 faunal artifacts were recovered from 11 test units in three stone circles. Feature 4 has two fire features, Feature 4.1 and 4.2. While no faunal remains were recovered from Feature 4.2, remains were recovered from Test Units 23 and 30, the test units in which this feature is located. The faunal count for the test units around Feature 4.2 contains a low number of unidentified (N=6) and generally typed mammal remains (N=2). The majority of the faunal remains coming from Feature 4 are associated with the test units directly bordering Feature 4.1 (TU 6, 7, 8, 11). Feature 4.1 itself had 34 artifacts from within while Test Units 7 and 11, the test units this feature is located in, had faunal counts of 63 and 17 respectively. The faunal remains from Feature 8 and 8.1 are all located within Feature 8.1 and the test units immediately surrounding it (Table 12). Analyzing the data, it appears that Feature 4.2 did not have a significant effect on the faunal remain differences between the two Late Prehistoric occupation dates associated with Features 4 and 8. Further subsurface study of the landform would be necessary to establish a better representative sample of the species being hunted during the Late Prehistoric Period. Perhaps if the faunal remains were not as heavily processed a larger sample would have been generated from the unidentified category during analysis leading to stronger supported conclusions concerning the type of species being utilized by feature occupants.

Table 13. Count of Burned Faunal Remains by Feature, 24YE357.

Feature	Not Burned	Burned	FT Count
4	80	21	101
4.1	23	11	34
6	1	0	1
8	1	14	15
8.1	0	57	57
Total Specimens	105	103	208

The count of burned versus unburned faunal remains table is provided to demonstrate that while unburned remains do not suggest food processing was absent, burned remains are direct evidence that food processing was occurring not only inside the ring features but in the fire features as well. Almost all of the faunal remains recovered from Feature 8 and 8.1 were burned to some extent (Table 13). The presence of burned remains within Feature 8.1 proposes not only was the fire feature used as a cooking hearth, but it was also used as a possible clean up and refuse location for discarded food.

Feature 4 Excavation Results

The MYAP 08 team excavated a total of 14 1x1-meter test units associated with Feature 4, the westernmost of the excavated stone circles (Photograph 14, Figure 20). Twelve test units were placed within the feature while another two were placed outside of the ring. Feature 4 measures approximately 4.5 x 5.5 meters in diameter, with its east-west dimension slightly larger than its north-south dimension. The total area of Feature 4 is 19.6 m^2, among the three smallest circles at the site. The initial five test units—TUs 5-9—were placed north-south through the center of the circle, with TU 5 receiving the arbitrary grid coordinate 500N 500E. TUs 11, 23, 24, and 26 were placed east-west across the feature center. TU 30 was placed just to the north of TU 23 to investigate a likely hearth feature (Feature 4.2), while TU 14 was placed adjacent to TU 5 on the southern edge of the stone circle to investigate a pile of fire-cracked rock at that location. TUs 23 (south), 35 (north), and 33 (east) were placed on the stone circle's edges to explore artifact distributions around the feature's edges. An additional goal as for the placement of test unit 33 was to test for the presence of a possible door or entryway location along the southeast edge.

Photograph 14. Final Overview of Stone Circle Feature 4 Excavation.

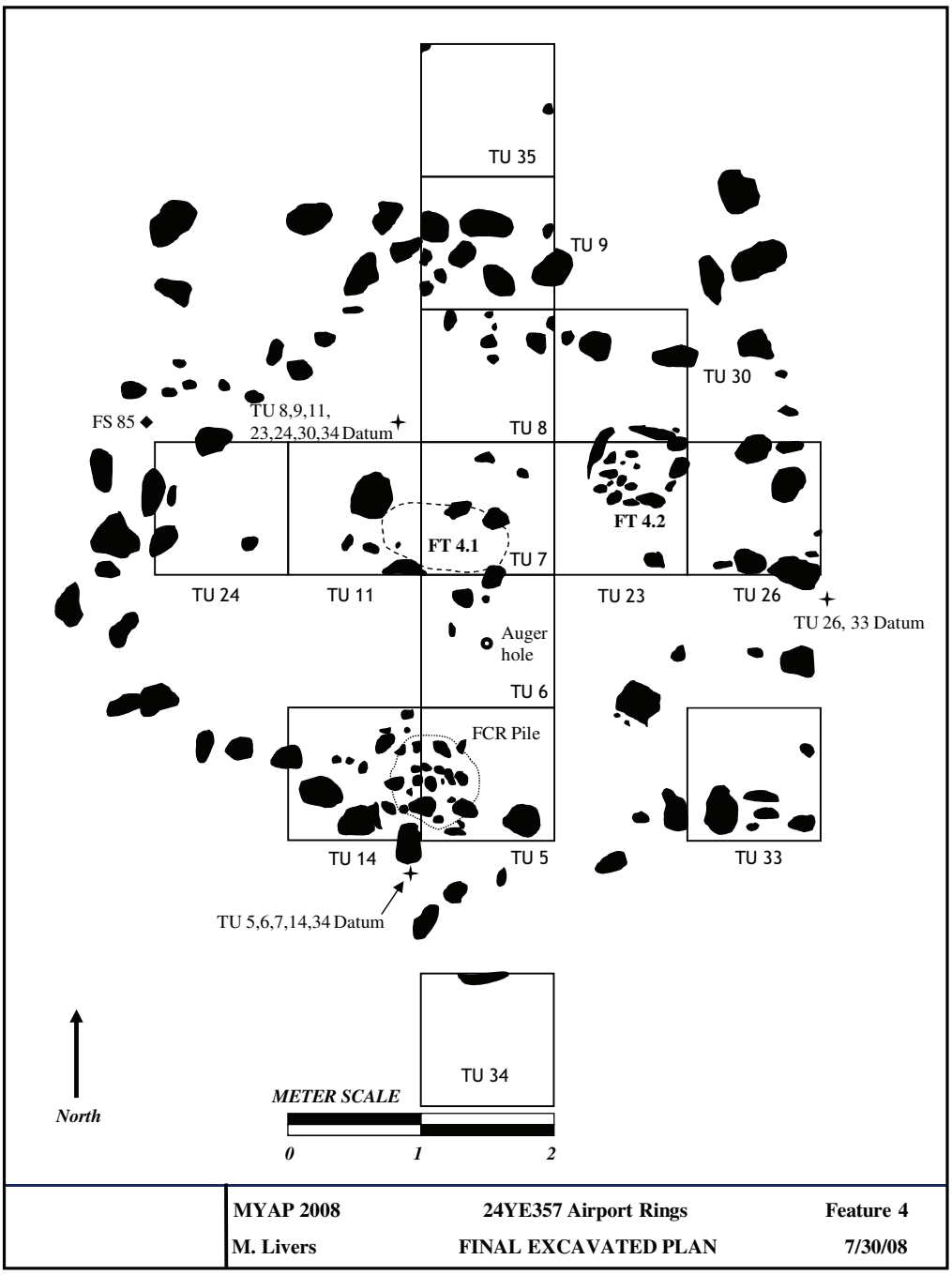


Figure 20. Final Excavation Planview for Feature 4

A representative sample of site stratigraphy was taken from Test Unit 6 towards the south end of Feature 4 (Photograph 15, Figure 20). An approximately 6 cm wide auger hole was placed in the center of the test unit after digging seven, 5 cm levels to test for buried soils and to better define the type of deposition on the landform. The auguring of the feature went to a max depth of 104 cm below ground surface before hitting a level of

glacial cobbles and gravels, a common stopping point in all auger tests of the bench. The topsoil was similar across the landform comprising a gray brown sandy silt stratum with remains of surface vegetation. Beyond the first two strata comprising the silty sandy A Horizon, the Bt Horizon is comprised of a hard dark yellowish brown, blocky clay layer intermixed with sandy silty pockets in the flaky lower regions of the clay level. The following 70 some centimeters are silty and sandy loam deposits, the results of glacial outwash activities on the terrace probably during the Late Pleistocene.

Photograph 15. Test Unit 6 East Wall Soil Profile (Stone Circle Feature 4, 24YE357).

Excavations within Feature 4 revealed a fairly standardized A-Bt horizon sequence across the entire feature, with no clear differences in soil profiles inside or exterior of the feature. Based on these soil data, occupation appears to have been fairly brief, or clearly not long enough to create a dense living surface within the interior of the stone circle. Lithic artifacts were generally within the upper 10-30 cm of sediment, suggesting a single occupation. The present-day surface likely has had little to no accumulation or deflation since site use during prehistory. While some sediment may have accumulated due to aeolian forces, the rate of sedimentation is fairly slow to non-existent on this Late Pleistocene landform. A total of 14cm accumulated over the top of the oldest feature, dated to approximately 4,520 B.P., meaning the net sedimentation rate on the terrace is around 1cm for every 322 years.

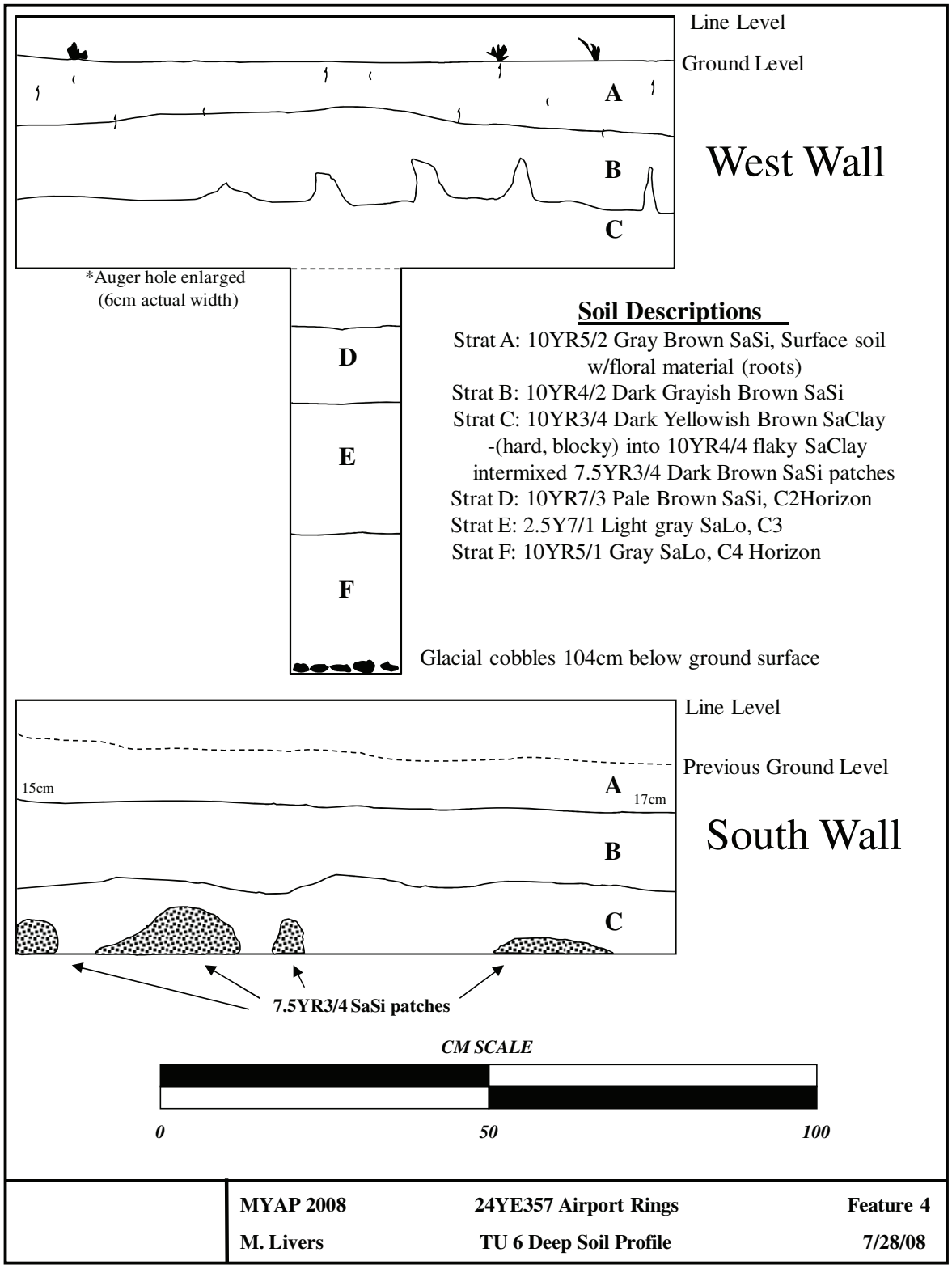


Figure 21. Representative Soil Profile from Test Unit 6, Stone Circle Feature 4 (24YE357).

In total, the MYAP 08 team recovered a total of 350 lithic artifacts from stone circle Feature 4 (Table 15). As noted above, a small number of faunal remains were also found in Feature 4, providing minimal chance for interpretation beyond class and size due to the nature of heavy processing.

Table 14. Burned and Unburned Faunal Type Count, Feature 4, Feature 4.1 (Airport Rings Site).

Feature	Burned (Y/N)	Bison	large mammal	mammal	medium mammal	unidentified	FT Total
4	N	0	6	2	3	69	80
	Y	0	0	0	0	21	21
4 Total		0	6	2	3	90	101
4.1	N	9	1	0	1	12	23
	Y	0	0	0	0	11	11
4.1 Total		9	1	0	1	23	34
Type Total		9	7	2	4	113	135

A majority of the bone fragments were too small for proper identification outside of classifying the pieces as belonging to a large, medium, or general mammal. The only positive match to a specific animal species was the recognition of several molar fragments from a bison (Table 14, Photograph 16). Other than the identification of the Bison molar, the other identified fragments provide data suggestive of a camp subsisting on large and medium game species available in the region. Macrobotanical studies for the area have failed to provide direct evidence of subsistence patterns possible due to the type of soil in the region (Jackman 1997). Fish remains are also an unlikely find in the Yellowstone Region due to the acidic nature of the soil and degradative nature of fish bone. The interpretation of large

Photograph 16. Bison Molar Fragments recovered from Feature 4.1 (Stone Circle Feature 4, 24YE357).

to medium game subsistence activities for the Airport Rings site fits in with known patterns of hunter-gatherer subsistence in the Greater Yellowstone Region (Frison 1991; Jackman 1997).

Table 15. Feature 4 Lithic Reduction Flake Counts by Test Unit, 24YE357.

TU	BF	BS	DF	ER	ES	FF	IB	IF	LB	PP	SF	UF	FCR/Unmod. Cobble	TU Total
Surface	0	0	0	0	0	0	0	0	0	0	0	1	0	1
5	2	0	2	0	0	10	1	0	0	0	0	0	4	19
6	7	1	0	0	0	41	0	3	1	1	16	0	0	70
7	2	0	0	0	0	5	0	4	0	1	5	0	4	21
8	7	0	0	0	0	9	1	0	0	1	5	0	0	23
9	2	0	0	0	0	5	0	0	0	1	1	0	0	9
11	4	0	1	1	0	7	0	1	0	0	6	0	0	20
14	1	0	1	0	0	6	0	0	0	0	3	1	0	12
23	1	0	0	1	0	9	0	0	0	0	6	0	5	22
24	1	0	0	1	0	11	0	2	0	0	3	0	0	18
26	0	0	1	0	0	6	0	1	0	0	6	1	0	15
30	0	0	0	0	0	4	0	0	1	0	7	0	0	12
33	0	0	0	0	0	3	0	1	0	1	0	0	2	7
34	0	1	1	0	1	15	0	1	1	0	9	0	0	29
35	4	0	1	0	0	28	0	1	0	0	21	1	4	60
FT 4.1	2	0	0	0	0	1	0	2	0	0	5	0	0	3
FT 4.2	0	0	0	0	0	1	0	0	0	0	0	0	1	1
Grand Total	33	2	7	3	1	161	2	16	3	5	93	4	20	350

Key: bs=blockshatter; df=decortication flake; er=early reduction flake; ib=indeterminate biface; bf=bifacial reduction flake; sf=shaping flake; ff=flake fragment; if=indeterminate flake; es=endscraper; lb=late stage biface;; pp=projectile point; uf=useware retouch flake

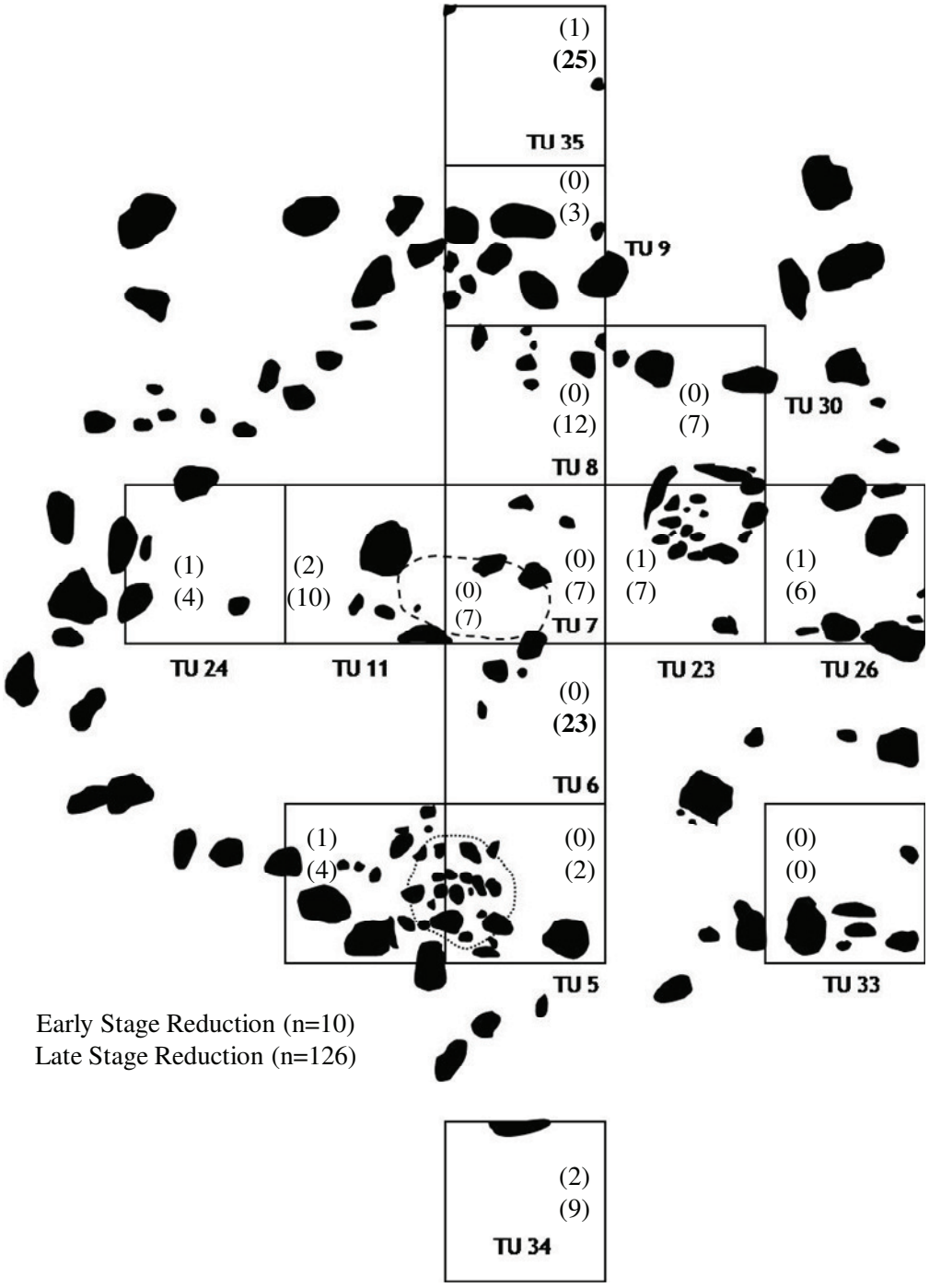


Figure 22. Feature 4 Lithic Reduction Flake Counts by Test Unit, 24YE357.

The lithic artifacts are comprised largely of late-stage biface thinning and pressure flakes from the manufacture of bifaces and projectile points. Although there are over 160 other typed pieces of lithic debitage in the artifact assemblage of Feature 4, these lithics cannot provide positive insight into the specific phase of lithic reduction occurring

during occupation. As discussed earlier in the chapter, early and late stage reduction flakes provide specific evidence from which to draw conclusions for the type of lithic reduction activities occurring and the relative location of the activity within a feature. While late stage reduction flakes account for over a third (36%) of all lithic artifacts from Feature 4, there are really no discernable reduction activity areas within the ring (Figure 22). Artifact numbers generally become larger towards the center of the ring indicating that Feature 4.1 was the center of activities in this structure. Reduction activities would have taken place facing the fire providing the necessary light inside the tipi.

Even though there are slight spikes in the general and late stage lithic counts in Test Units 6 and 35, this is possibly due to the deeper depth at which these test units were dug (Table 15). The deeper depths provide a larger sample size giving the appearance of a concentrated lithic reduction area indicative of reduction activities when the percentage of reduction flakes is actually within the range of shallower test units (average around 33%). The most common lithic raw material in the assemblage is obsidian (70%). While the vast majority of the obsidian is translucent, we recovered four flakes of tiger-striped (orange-banded) obsidian in Feature 4. Chert from the Crescent Hill formation near Mammoth Hot Springs was also commonly used by inhabitants of Feature 4, accounting for nearly 20 percent of lithic artifacts. Other lithic materials accounted for in the Feature 4 assemblage include small amounts of dacite, orthoquartzite, and untyped chert. The presence of local stone resources like tiger-striped obsidian and Crescent Hill chert, in addition to more distant sources of Dacite debris coming from the artifact assemblage recovered from excavating Feature 4 is suggestive of a network of heightened mobility necessary to procure raw materials.

Table 16. Sourcing Results of Selected Artifacts from Stone Circle Feature 4, 24YE357.

FS #	Feature	TU	XRF Results	Type Code
9	4	6	Bear Gulch	LB
20	4	8	Obsidian Cliff	PP
23	4	7	Obsidian Cliff	BF
44	4	14	Obsidian Cliff	UF
47	4	11	Obsidian Cliff	DF
59	4	24	Obsidian Cliff	FF
59	4	24	Obsidian Cliff	ER
79	4	26	Obsidian Cliff	SF
97	4	6	Obsidian Cliff	BF
101	4	33	Obsidian Cliff	PP
105	4	6	Obsidian Cliff	BF
115	4	30	Bear Gulch	LB
127	4	6	Grasshopper Knob	SF
131	4	35	Obsidian Cliff	BF
142	4	34	Obsidian Cliff	SF

Geochemical analysis performed on select samples submitted for sourcing returned quite interesting results. Out of the 15 artifacts sent off for XRF sourcing, two different obsidian sources and one dacite source were designated as the originating locations for the artifacts (Table 17). Twelve obsidian artifacts from Feature 4 were sourced to the local Obsidian Cliff source in the park as well as two others to the Bear Gulch site in Idaho, somewhere over 100 miles away from the Airport Rings site. Once dacite artifact submitted was sourced closest to the Grasshopper Knob formation located roughly the same distance from the Airport Rings site in southwestern Montana as the Bear Gulch site. Chert samples were compared against local Crescent Hill samples collected as previously discussed.

Taking the context of these artifacts and their sourcing analysis information into consideration, patterns emerge pointing to an increased utilization of lithic resource areas further away from the Yellowstone valley during earlier occupations and more localized lithic procurement later in time. Based on lithic sourcing information from other sites within the Boundary Lands, this trend is supported by evidence showing increased use of the Bear Gulch and Grasshopper Knob sources during the Archaic periods as opposed to the higher reliance on closer resources during the Prehistoric Period (MacDonald 2007; Mass and MacDonald 2008). These nearer sources being sites such as the Crescent Hill Chert Quarry and local Obsidian Cliff source both about 20 miles from the Airport Rings site. Obsidian Cliff was a fairly well known raw material extraction location even during Archaic times as many artifacts recovered from the Yellowstone

area date to this period. All of the point fragments submitted for sourcing analysis, from the Late Archaic Avonlea to the Late Prehistoric tri-notched, came back with matches to the Obsidian Cliff source. Although the Obsidian Cliff obsidian source shows continued use over an extended period, artifact analysis details an increased reliance on the source by later period peoples. This shift in raw material allocation fits the intensification model of local raw material procurement strategies used by later park groups proposed by Davis et al. (1995).

Table 17. Summary of Lithic Artifacts by Class and Lithic Material, Feature 4.

Lithic material	Biface	Flakes	FCR	Uniface	Nat. Rock	Total	%
Crescent Hill	3	62	0	2	1	68	19.05
dacite	0	2	0	0	0	2	0.56
obsidian	7	239	0	2	0	248	69.47
orthoquartzite	0	1	0	0	0	1	0.28
sandstone	0	0	26	0	0	26	7.28
untyped chert	0	11	0	1	0	12	3.36
total	10	315	26	5	1	357	100.00
%	2.80	88.24	7.28	1.40	0.28	100.00	--

While the vast majority (88%) of the lithic debris from Feature 4 is flaking debris, excavations recovered 15 stone tools, including 5 unifaces and 10 bifaces, among which were five projectile point fragments. The five unifacial tools include four expedient utilized flakes used for daily tasks within the lodge. Two unifaces each were produced from obsidian and Crescent Hill chert. The unifaces were recovered in TU 14 in the south, TU 26 in the east, and TU 35 in the north of Feature 4, respectively. This random distribution indicates no specific work areas associated with unifacial tool use. The lone other uniface recovered in Feature 4 is a very small red chert or porcellanite end scraper (FS 140) from TU 34 exterior of Feature 4 to the south. The entire perimeter of the scraper was retouched to a 90 degree angle and it was likely hafted to a small handle and used in scraping activities in the southern portion of the stone circle. The scraper is very small and was likely discarded due to a lack of utility given its small size.

Table 18. Unifacial Tools, Feature 4, 24YE357.

FS Number	Material	TU	L (mm)	W (mm)	Th (mm)	Comments
44	Obsidian Cliff	14	14.13	12.93	2.68	unimarginal hand held cutting tool
67	obsidian	26	15.68	6.61	2.39	unimarginal flake tool
85	Crescent Hill	Surf.	21.62	14.24	2.77	bimarginal use - wear, likely used as hand-held cutting tool (bone, antler)
131	Crescent Hill	35	22.61	9.68	4.35	unimarginal use hand-held cutting tool
140	untyped chert	34	19.78	14.76	5.19	Endscraper; possible porcellanite

Diagnostic projectile points include three Late Prehistoric side-notched arrow point fragments, a Middle Archaic Oxbow point base, and an untyped (probable Late Archaic) point fragment (Table 19). Two of the three arrow points (FS 20 and 101) were produced from obsidian, while a third (FS 8) was produced from a tan-white fine-grained variety of Crescent Hill chert. The two Late Prehistoric obsidian points were sourced to the local Obsidian Cliff source inside of the park. All of the arrow points are basal fragments likely broken during use and discarded at the site. One of the Late Prehistoric point fragments (FS 20) has deep side notches with fairly pronounced lateral tangs and may be a Late Prehistoric Rose Spring arrow point.

Table 19. Diagnostic Projectile Points and Tools, Feature 4.

FS Number	Lithic Material	TU	L (mm)	W (mm)	Th (mm)	Description
8	Crescent Hill	9	-	10.84	3.68	Late Prehistoric base
20	Obsidian Cliff	8	15.25	14.40	4.53	Late Prehistoric Rose Spring?
23	Crescent Hill	7	-	23.06	8.13	Untyped (Archaic?) Notched
52	Obsidian	6	9.40	8.74	2.56	Middle Archaic Oxbow
101	Obsidian Cliff	33	-	13.57	3.10	Late Prehistoric base

The Middle Archaic Oxbow projectile point (FS 52) is a basal fragment. The point was produced from translucent obsidian and was likely broken during use as a projectile; it was recovered in TU 6 in the southern portion of Feature 4. The fifth projectile point (FS 23) is comparatively large with side-notches and was produced from reddish Crescent Hill chert with black mottling. Because it is only a small basal fragment, FS 23's type is uncertain, although it resembles Late Archaic types more so than Late Prehistoric. The latter point was found in TU 7, while the possible Rose Spring arrow point was found in TU 8. Both of these test units are immediately adjacent to both fire features (Features 4.1 and 4.2, discussed below) within the center of stone circle Feature 4.

Based on the presence of three Late Prehistoric arrow points, a Middle Archaic point, and the fifth untyped (but probably Late Archaic) point, Feature 4 is a stone circle used on multiple occasions during prehistory, beginning as early as 4,500 years ago, as denoted by the Oxbow point and the Feature 4.2 radiocarbon date (discussed below). Feature 4.1 was dated to the Late Prehistoric period which corroborates the multiple use periods of the stone circle. Based on the overall low density of lithic debris, occupations

seem to have been fairly brief and perhaps limited to one or more camps on a seasonal basis.

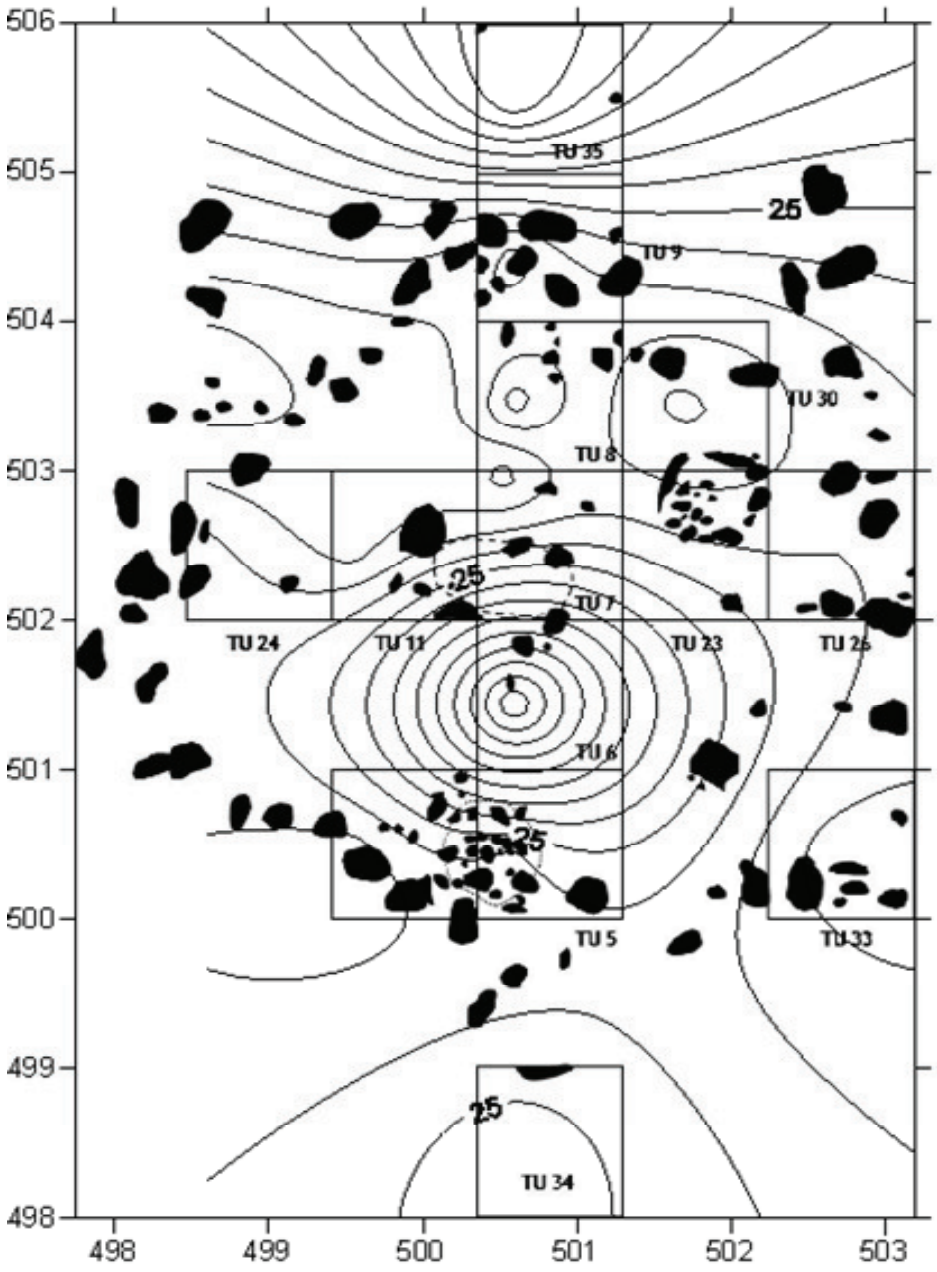


Figure 23. Feature 4 Lithic Distribution Density Map, 24YE537.

The 350 lithic artifacts from Feature 4 were plotted by overlaying a Surfer software generated distribution map on a base map of the test units. A kriging gridding method was used with 100 lines in both the x and y axis directions. Distributions of lithic artifacts denote two main lithic production areas within Feature 4, one in the far southern edge of

the circle (TU 6) and another immediately exterior of the circle to the north (TU 35) (Figure 23). Due to the way artifacts are collected on a level to level basis, actual distributions of test unit artifacts do not exist and cannot be plotted. One difficulty arises with using Surfer generated maps as the test units are slightly offset from their actual position on the grid. The north to south test units should all have a southwest corner based on 500 of the x axis. Aside from the shift in gridding, the distribution overlay displays an accurate distribution.

The concentration noted directly to the left of Test Unit 6 and the other to the left of Test Unit 35 indicate the high number of artifacts recovered from each test unit. The concentrations should actually fall inside the test units and not outside of them. The southern lithic concentration in TU 6 included the Middle Archaic obsidian Oxbow projectile point. TU 6 yielded 71 lithic artifacts, mostly produced from obsidian (n=60), with lesser amounts of Crescent Hill (n=6) and dacite (n=2). Two tiger-striped obsidian and one dacite-shaping flake were among the other material types in the TU 6 assemblage. This lithic concentration is immediately south of a likely hearth (Feature 4.1).

Immediately to the south of the lithic concentration in TU 6 is another probable feature which lacks a definable soil stain and, thus, was not given a feature number; however, it is a dense concentration of fire-cracked rock (FCR) immediately adjacent to the southern wall of the stone circle. A working interpretation of this FCR concentration is that it may be a dump of FCR from the cleaning of Feature 4.1, which lacked abundant FCR but is clearly the location of a fire feature. The lithic concentration is in between these two features and is largely comprised of small flint knapping debris likely associated with the reduction of one or more bifaces or projectile points. This lithic concentration is likely primary refuse, given the small size of

Photograph 17. Fire Features from Stone Circle Feature 4 (Feature 4.2 upper left while Feature 4.1 is right of the photo board).

the debris, and most likely represents one or more related episodes of stone-tool production adjacent to the fire feature to the north (Feature 4.1).

The northernmost lithic concentration in TU 35 included 59 lithic artifacts, but no diagnostic projectile points. It is possible that the flint knapping concentration located to the north of Feature 4 is the location of a primary episode of flint knapping during a warm season or may represent a clean-up episode after tool production inside the tipi during a cool season. The latter interpretation seems most likely, as two fire features—identified as Features 4.1 and 4.2—were excavated within the interior of the circle itself (Photograph 17). Interior fire hearths are common in cooler seasons; during warm seasons, fires were generally exterior of tepees. Early stone circle investigations by Kehoe (1960) noted the presence of very few inside hearths out of 100 or more stone circle from several sites leading him to suspect there was a reason for this trend. Later ethnographic studies conducted by Kehoe (1960: 446) provided an internal perspective as his informant described to him that the use of inside hearths for cooking was limited only to times when weather was bad.

As such, our working hypothesis is that Feature 4 was a late-Fall-winter occupation and that the lithic production area to the north of Feature 4 is a secondary dump after cleaning up the lodge's interior. While the age of the stone-tool production episode in the northern portion of Feature 4 is uncertain as of this writing, the most proximate diagnostic projectile point is the base of a Late Prehistoric side-notched arrow point found one meter to the north in TU 9. As discussed below, however, Feature 4.2 was radiocarbon dated to 4,500 B.P. suggestive of a Middle Archaic occupation. The dump area could be results of both the Late Prehistoric and Middle Archaic occupations as there is no differentiation between the two occupation episodes.

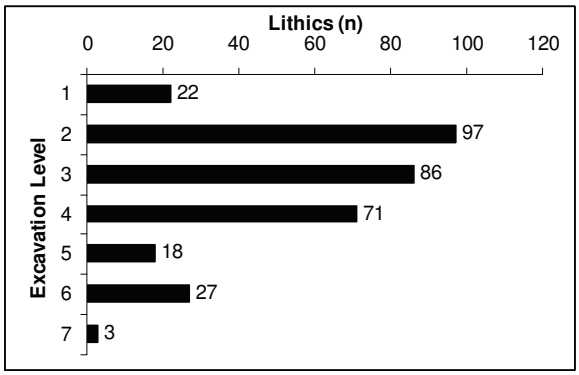
Table 20. Summary of Lithic Artifacts by Excavation Level within Feature 4.

Exc. Level	Test Unit														Total Lithics
	5	6	7	8	9	11	14	23	24	26	30	33	34	35	
1	0	1	1	0	0	3	0	11	0	1	0	0	3	2	22
2	4	4	16	9	0	12	6	5	7	6	2	1	12	13	97
3	4	8	0	9	4	5	6	1	2	4	2	2	10	29	86
4	11	10	4	5	5	-	-	-	9	4	-	4	4	15	71
5	-	17	-	-	-	-	-	-	-	-	-	-	-	1	18
6	-	27	-	-	-	-	-	-	-	-	-	-	-	-	27
7	-	3	-	-	-	-	-	-	-	-	-	-	-	-	3
Total	19	70	21	23	9	20	12	17	18	15	4	7	29	60	324

An arbitrary depth of 5 cm was used when digging test unit levels except in test units outside of the rings where 10 cm levels were used. Table 21 shows a fairly uniform vertical distribution of lithic artifacts across Feature 4 as well, with a single peak in excavation levels 2-4 and a subsequent fall-off distribution with depth. The low number of artifacts in excavation level one reflects excavation method, in which partial levels were often excavated to level them out to an even depth; thus, the overall volume of excavation was significantly less for level 1 than deeper levels. TU 6 was excavated deeper than other units in Feature 4 to explore stratigraphy and revealed a slightly deeper artifact peak than other units; the cause of this is uncertain but may reflect its location in the southern portion of the feature with increased colluvial sediment accumulation adjacent to the steep upslope to the south. Additional work aimed at taking all of the test units to a similar depth may have uncovered a pattern associated with the settling of artifacts indicating the maximum depth of past occupations. Without further testing of the site, this single peak in artifacts around 30-35 cm below ground surface in Test Unit 6 cannot provide validation for any interpretations concerning ring artifact patterning.

Alternatively, it also could have denoted the edge of the ring if Feature 4.2 was a central hearth associated with a previously existing stone circle moved by later visits to the site. The only way to know for sure is if more test units were put in over the northeast section of Feature 4 to determine whether artifact patterning was similar to other known assemblages. If the artifact counts dropped off after testing an equal distance away from the hearth feature assuming it was a central hearth inside a lodge, as the count does past TU 6, it would provide evidence substantiating claims for one of the oldest dated stone circle sites.

Table 21. Graph showing Lithic Artifacts by Excavation Level, Stone Circle Feature 4.



Nevertheless, the single peak in artifacts within Table 21 is significant, as it indicates only one living surface within stone circle Feature 4. As discussed below, one of the hearths in Feature 4—Feature 4.2—was dated to the Middle Archaic period, ca. 4,500 B.P., while later occupations are also indicated by portions of Late Prehistoric projectile points and a Late Prehistoric date on Feature 4.1. The unimodal vertical artifact

distribution indicates that all site occupations were likely on the same living surface, more or less the equivalent of the modern surface. In other words, there is no discernable vertical separation between the occupations occurring in Feature 4.

Fire Features, Stone Circle Feature 4

As noted above, two fire features were excavated within the interior of stone circle Feature 4. The features were identified as Feature 4.1 in the very center of the stone circle and Feature 4.2 in the northeast corner of the stone circle. Feature 4.1 was initially identified as a dark brown to gray soil stain with surrounding fire-cracked rock within TU 7 of Feature 4 (

Photograph 18).

Photograph 18 . Feature 4.1 prior to feature excavation (Stone Circle Feature 4, 24YE357). View northwest

Feature 4.1 yielded a conventional radiocarbon date of 340±40 B.P. (Beta-251175). The radiocarbon date associated with Feature 4.1 was achieved using the AMS method on wood charcoal from the feature fill. The Late Prehistoric occupation episode is

substantiated by the recovery of two diagnostic obsidian projectile points associated with Feature 4.

Prior to excavation, the entire surface of Feature 4.1 was exposed to determine its opening plan shape and size. Overall, the feature was determined to be oval in plan, measuring approximately 95 cm east-west and 45 cm north-south. Seven large FCR surrounded the feature, however only a handful of small FCR fragments were recovered from the interior of the feature. After conducting opening planview and photography of Feature 4.1, it was bisected on its east-west (long) axis to provide a cross-section. Given the feature's shallow depth, only a single 5-cm level was excavated to the base of the feature, which was a very shallow basin.

Photograph 19. Hearth Feature 4.1 Planview, 24YE357. View North.

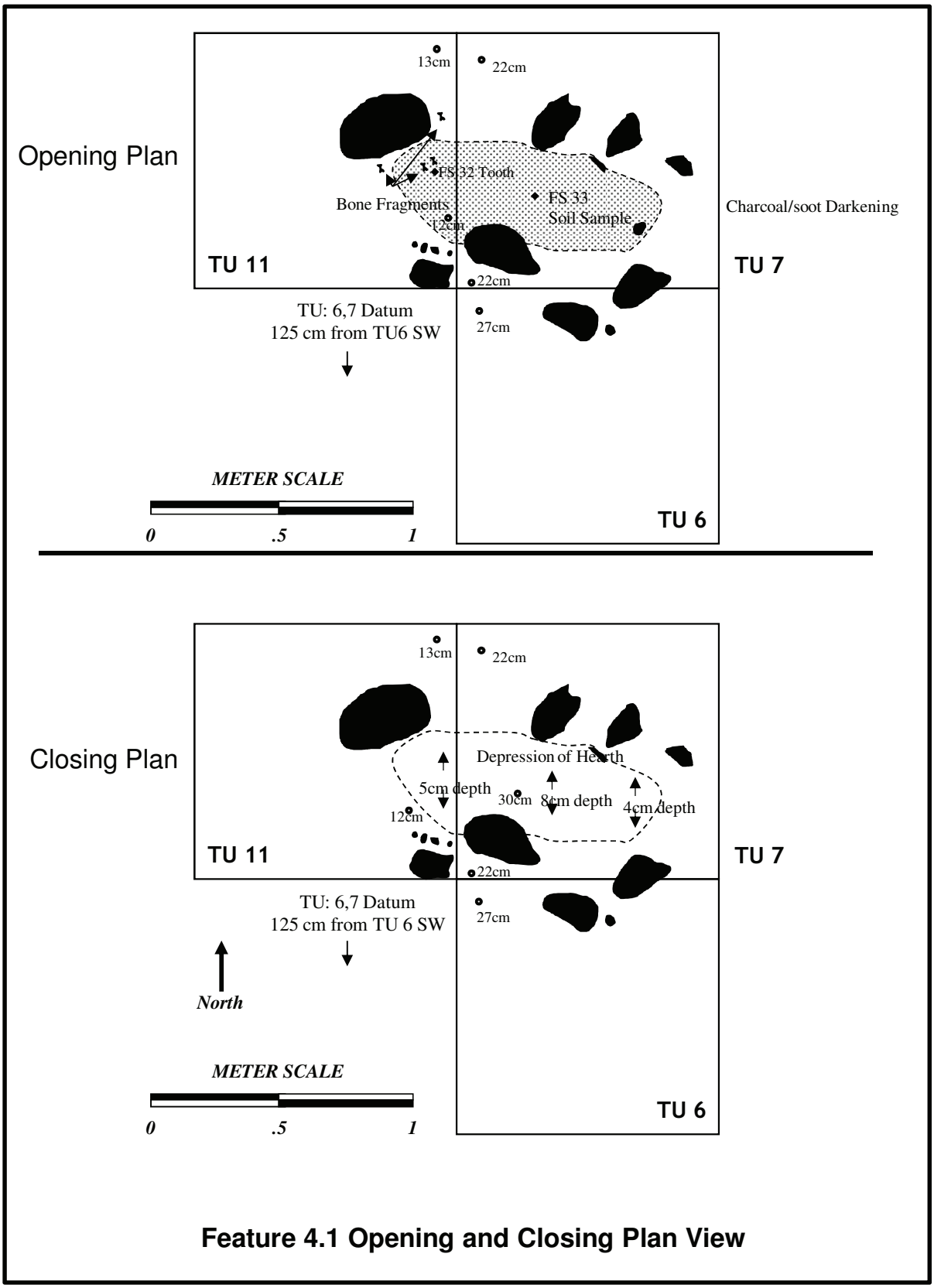


Figure 24. Feature 4.1 Opening and Excavated Planview

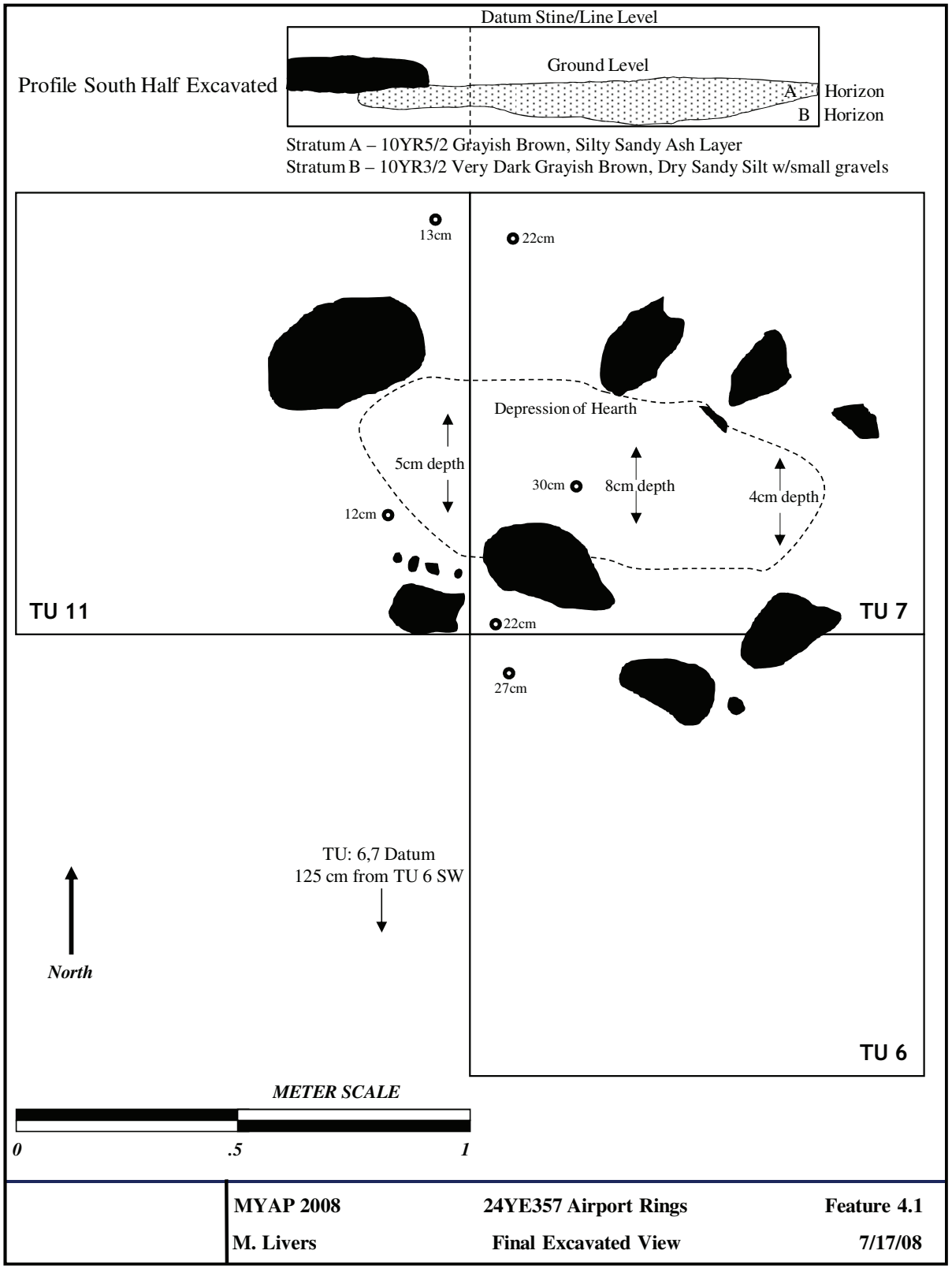


Figure 25. Feature 4.1 Planview with Feature Bisection

A 2-liter soil sample was retrieved from Feature 4.1 and was analyzed by Paleoresearch, as was a charcoal sample by Beta Analytic. Charcoal was uncommon and of small size in the feature fill which was comprised of dark brown to grayish sandy loam. No diagnostic projectile points or any tools were recovered from Feature 4.1, with lithic artifacts restricted to only 10 lithic debitage produced from Crescent Hill chert (n=8), obsidian (n=1) and untyped chert (n=1). Seven of the eight Crescent Hill chert flakes are from bifacial reduction (biface thinning and shaping flakes), while the remainder of the flakes from Feature 4.1 are untyped flake fragments.

Photograph 20. Feature 4.1 Bisection (Stone Circle Feature 4). View north.

Overall, Feature 4.1 appears to be a fairly-ephemeral, basin-shaped hearth feature at the very center of the stone circle Feature 4. The shallow maximum depth around 5 cm, the presence of very few rocks lining the hearth, low density of FCR, charcoal, and artifacts indicates a short-term use episode. The dominance of Crescent Hill chert indicates some finishing of bifaces of that material. Alternatively, the low density of artifacts indicates that the feature was cleaned after use. The stones used in many roasting or cooking pits were placed on a bed of hot coals and eventually the rocks would crack from overheating. Once this occurred, a new pit would be dug or the rocks would be cleaned out for reuse (Francis 2000; Frison 1991).

Evidence for the latter interpretation is the FCR pile in the southern edge of the stone circle feature, although there is no direct evidence to associate this dump with the hearth

feature 4.1. The presence of the stone tool production area and the hearth within its interior may indicate that the stone circle Feature 4 was a winter lodge, since both activities (lithic reduction and fires) generally were exterior of lodges except in winter. Further archaeological evidence that would provide the support for a winter encampment would be storage or cache pits, none of which have been discovered at Airport Rings, and some sign of dried plant remains.

Ethnobotanical Analysis

Table 22. Feature 4.1 Ethnobotanical Results, (Stone Circle Feature 4, 24YE357).

Sample			Charred		Uncharred		Weights/
No.	**Identification**	**Part**	**W**	**F**	**W**	**F**	**Comments**
3	Liters Floated						0.6 L
Fill from Feature 4, Hearth in Tipi Ring	Light Fraction Weight						
	FLORAL REMAINS:						
	Spine			2			
	Alyssum-type	Silicle				17	
	Amsinckia	Seed			1		
	Chenopodium	Seed			4		
	Moss	Leaf				2	
	Poaceae	Floret				4	
	Rootlets					X	Numerous
	CHARCOAL/WOOD:						
	Total charcoal ≥ 2 mm						0.02 g
	Artemisia	Charcoal		12			0.01 g
	Pinus			3			<0.01 g
	NON-FLORAL REMAINS:						
	Bone					2	
	Insect	Chitin				X	Moderate
	Insect fecal pellet					X	Moderate
	Flake ≥ 0.5 mm					X	Few
	Rock/Gravel					X	Few

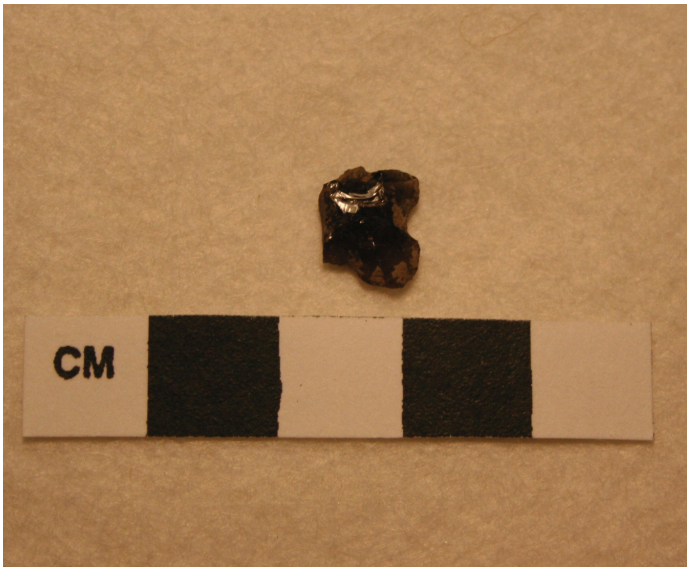
Key: W=Whole, F=Fragment, g = grams, X= presence in sample

A soil sample from the hearth fill in Feature 4.1 was submitted for flotation and macrofloral identification. The sample was taken from the fill at the center of the hearth during the excavation of the first and only 5cm level inside the feature around a depth of 22-30 cm below the test unit datum. The sample results showed a domination of *Artemisia* charcoal, with a smaller amount of *Pinus* charcoal present, suggesting that sagebrush and pine wood were burned as fuel during the Late Prehistoric occupation of Feature 4 (Table 22). Two charred spine fragments were found in the sample, but could

Photograph 21. Final Feature 4.2 Excavation Photo, view south (24YE357).

not be identified to any taxonomic level and there are several plants native to the region exhibiting protective or hard structural spines. The sample also consisted of several uncharred material types that likely represent modern vegetation growing on or near the site included *Alyssum*-type silicles, *Amsinckia* and *Chenopodium* seeds, moss branch fragments, and Poaceae florets. As well as plant remains, a few small lithic flakes were recovered from the sample indicating the manufacturing of tools inside the stone circle during the period of hearth use. Other remains recovered from the fill sample include insect chitin and fecal pellets, uncharred animal bone, and rootlets suggest some bio-turbation disturbance occurred in the feature. The surface of the feature indicated by soil discoloration was located only 7-8 cm. below the modern ground surface and would have been easily disturbed by natural processes, such as weathering, insects, and burrowing rodents.

Feature 4.2 The presence of a second hearth within the interior of stone circle Feature 4 may corroborate a winter occupation. Feature 4.2 was identified approximately one meter to the northeast of Feature 4.1 at an approximate depth below surface around 12-14 cm, a difference of only 4-5cm in the depth from the surface of Feature 4.1 (ca. 10 cm). Feature 4.2 measures approximately 75 by 75 cm and is more or less circular in plan. This fire feature resembles the construction of other Archaic age rock or sandstone slab-lined roasting pits recorded by Frison (1991) and



Photograph 22. Possible Middle Archaic Oxbow Point Base collected from Stone Circle Feature 4.

Wandsnider and Camilli (1992) in the northwest uplands of Wyoming. Although the pit was not “slab” lined per say, large rocks were placed around the hearth walls and several sandstone pieces do line the northern interior of the pit.

Much older than Feature 4.1, Feature 4.2 yielded a conventional radiocarbon date of 4,520±40 B.P. (Beta-250333). The radiocarbon date associated with Feature 4.2 was achieved using the AMS method on wood charcoal from feature fill. The recovery of diagnostic projectile points, including a possible obsidian Middle Archaic Oxbow point base, substantiates a Middle Archaic occupation episode for Feature 4.2 and possibly even for Stone Circle Feature 4 (Photograph 22).

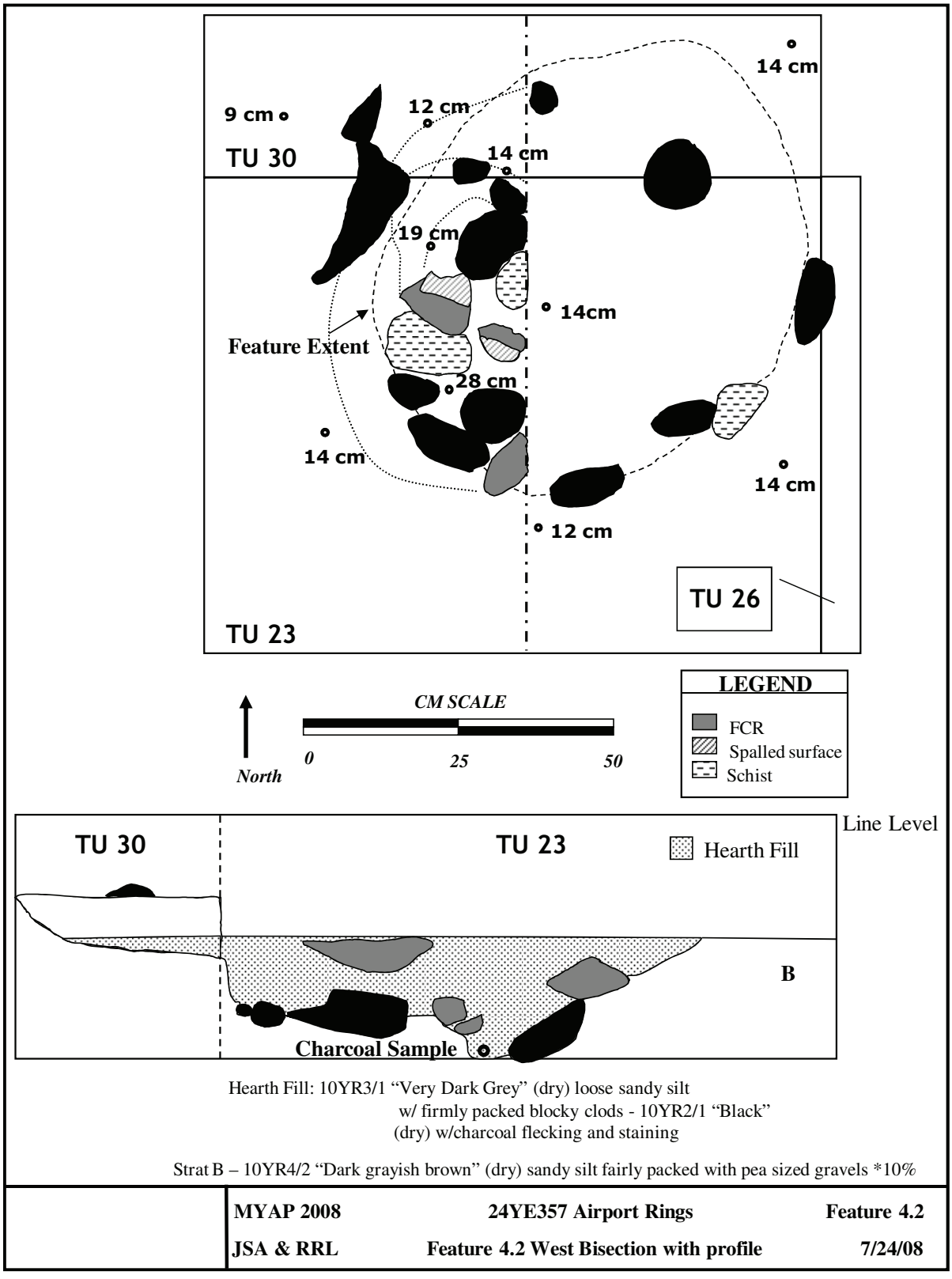


Figure 26. Feature 4.2 Planview with Bisection (Stone Circle Feature 4, 24YE357).

As with Feature 4.1, the MYAP 08 team exposed the entire surface of Feature 4.2 in plan prior to excavation. Feature 4.2 was comprised of a dark grey to black soil stain and was densely-packed with FCR and very small charcoal fragments and occasional bone (Photograph 23). Feature 4.2 was bisected to provide a north-south cross-section, revealing it to be considerably deeper (ca. 20+ cm) than Feature 4.1 (Photograph 24). Charcoal and FCR (n=13) was more common within Feature 4.2 as well, but flaking debris was uncommon (n=2). Soil (ethnobotanical) and charcoal samples analyzed for Feature 4.2 have provided corroborating dates with the projectile points recovered during feature excavation.

Photograph 23. Feature 4.2 prior to excavation (Stone Circle Feature 4, 24YE357). View north.

Photograph 24. Feature 4.2 Bisection

Ethnobotanical Analysis

Table 23. Feature 4.2 Ethnobotanical Results (Stone Circle Feature 4, 24YE357).

Sample No.			Charred		Uncharred		Weights/
	Identification	**Part**	**W**	**F**	**W**	**F**	**Comments**
FS 99	Liters Floated						0.5 L
Feature 4.2	Light Fraction Weight						39.37 g
	FLORAL REMAINS:						
	Alyssym-type ≥ 2 mm	Silicle				14	
	Alyssum-type < 2mm	Silicle				X	
	Moss	Branch				X	Few
	Poaceae	Floret				1	
	Rootlets					X	Few
	CHARCOAL/WOOD:						
	Total charcoal ≥ 2 mm						0.30 g
	Juniperus						0.21 g
	NON-FLORAL REMAINS:						
	Insect	Chitin				X	Few
	Rock/Gravel					X	Few

Key: W=Whole, F=Fragment, g = grams, X= presence in sample

A soil sample was also taken from the hearth fill in Feature 4.2 and was submitted for flotation and macrofloral identification. Results from this submitted sample taken from feature excavation level 2 or 3 resulted in quite a different composition than that of Feature 4.1 (Table 23). Data from the floral analysis of the sample revealed the presence of several fragments of *Juniperus* charcoal, indicating that juniper wood was burned as fuel. Besides the juniper source, no other charred remains were recovered from the soil sample. A few uncharred plant remains reflect components of the modern vegetation community at the site, while a few insect chitin fragments note limited disturbance to the feature.

Soil samples submitted from similar hearths located at 24YE356 during the 2007 field season returned a mixture or combination of the results similar to those from all the fire features sampled from Airport Rings. The two hearths sampled from 24YE356 contained juniper charcoal as well as small amounts of pine and willow, all sources readily available in the area around the Yellowstone River or other water sources in the Boundary Lands (MacDonald 2007). The results also noted seeds and berries in one of the samples suggestive of a late summer or fall occupation of the site.

Francis (2000) recorded multiple Middle Archaic hearths in the Intermountain region, similar to Feature 4.2, where submitted soil samples contained traces of sage, cottonwood, willow, and juniper. The results of this study showed that the juniper had

been brought into the region by the groups. The plant remains recovered from 24YE357 are all from local sources and there is no indication to why certain sources were specifically used over another. Francis's study may indicate the importance of juniper as a fuel source during the Middle Archaic if groups were transporting it with them and the high reliance of juniper noted from the remains recovered from Feature 4.2 may be the result of a Middle Archaic trend.

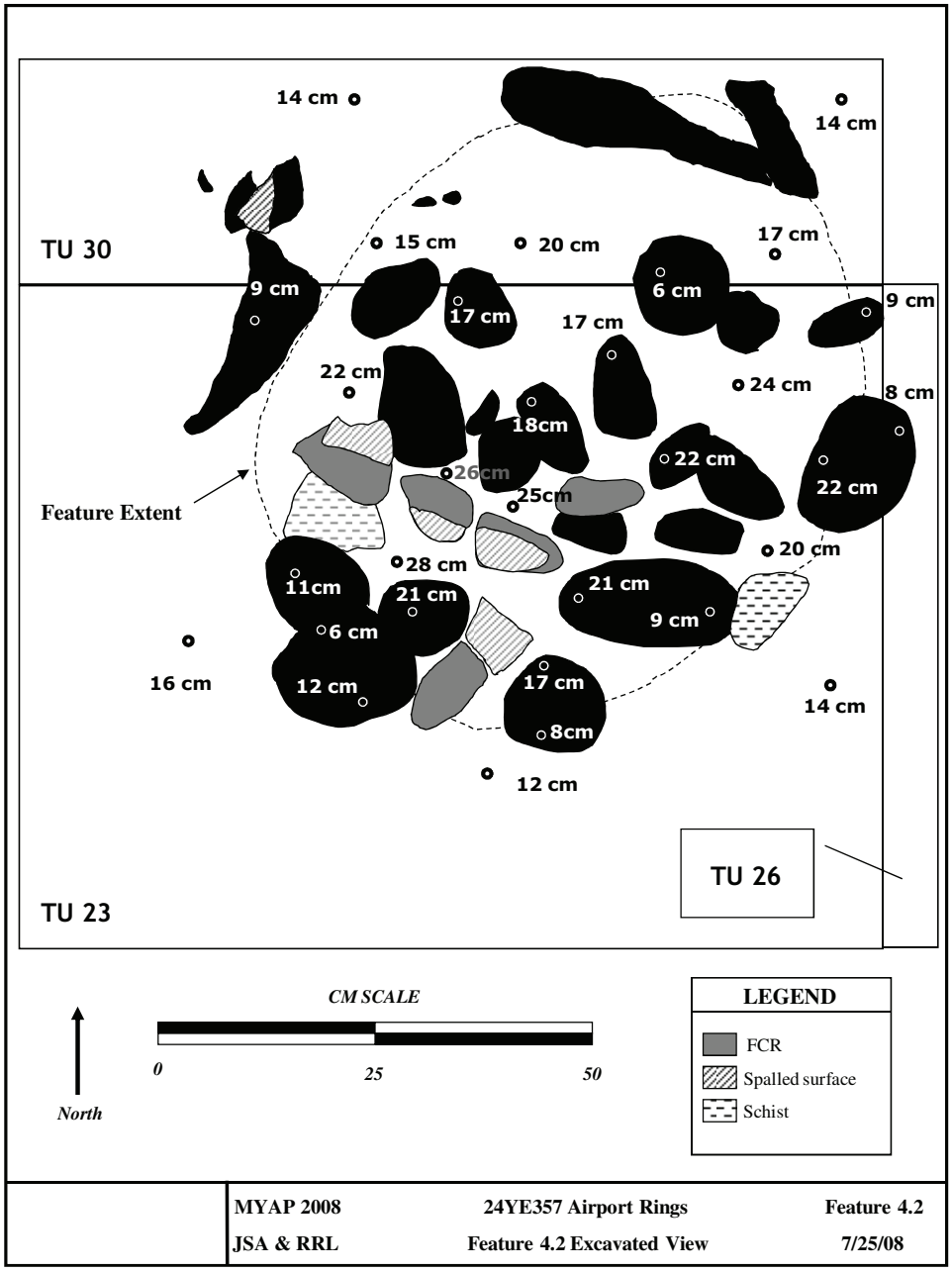


Figure 27. Feature 4.2 Closing Planview (Stone Circle Feature 4, 24YE357).

Ultimately, stone circle Feature 4 appears to have been occupied on at least two and probably three occasions beginning as early as 4,500 years ago. Each of the occupations likely was during the late-Fall to Winter, as indicated by two interior hearths, as well as lithic reduction activity areas inside the former lodge area. The presence of three projectile points of probable Late Prehistoric age as well as the Late Prehistoric dated Feature 4.1 provides strong support for an occupation approximately 500-1500 years ago, while the Oxbow projectile point and the Feature 4.2 date indicate a substantially earlier occupation ca. 4,500 years ago. Results of ethnobotanical, faunal, and XRF also provide data by which to interpret the specific function of stone circle Feature 4.

Feature 6 Excavation Results

The MYAP 08 team excavated a total of 12 1x1-m test units associated with stone circle Feature 6, located approximately 2 meters east of Feature 4 (Photograph 25, Figure 28). The overall dimensions of Feature 6 are approximately 4.5 by 5.2 meters, or approximately 19.6 m^2, approximately similar in size to Feature 4. Feature 6 appears smaller than Feature 4 in plan due to the large number of exterior rocks that mark its limits and encroach upon its interior. The overall shape of Feature 6 is more difficult to interpret due to the large number of rocks, several of which have rolled into the interior of the stone circle. No features were identified during excavations within Feature 6. Artifacts were generally concentrated at approximately 10-20 cm below surface, likely marking the living surface during occupation. No definite soil differences were observed between interior and exterior test units, nor were there significant differences in artifact counts between interior and exterior units.

Photograph 25. Stone Circle Feature 6 Excavation Overview. View north.

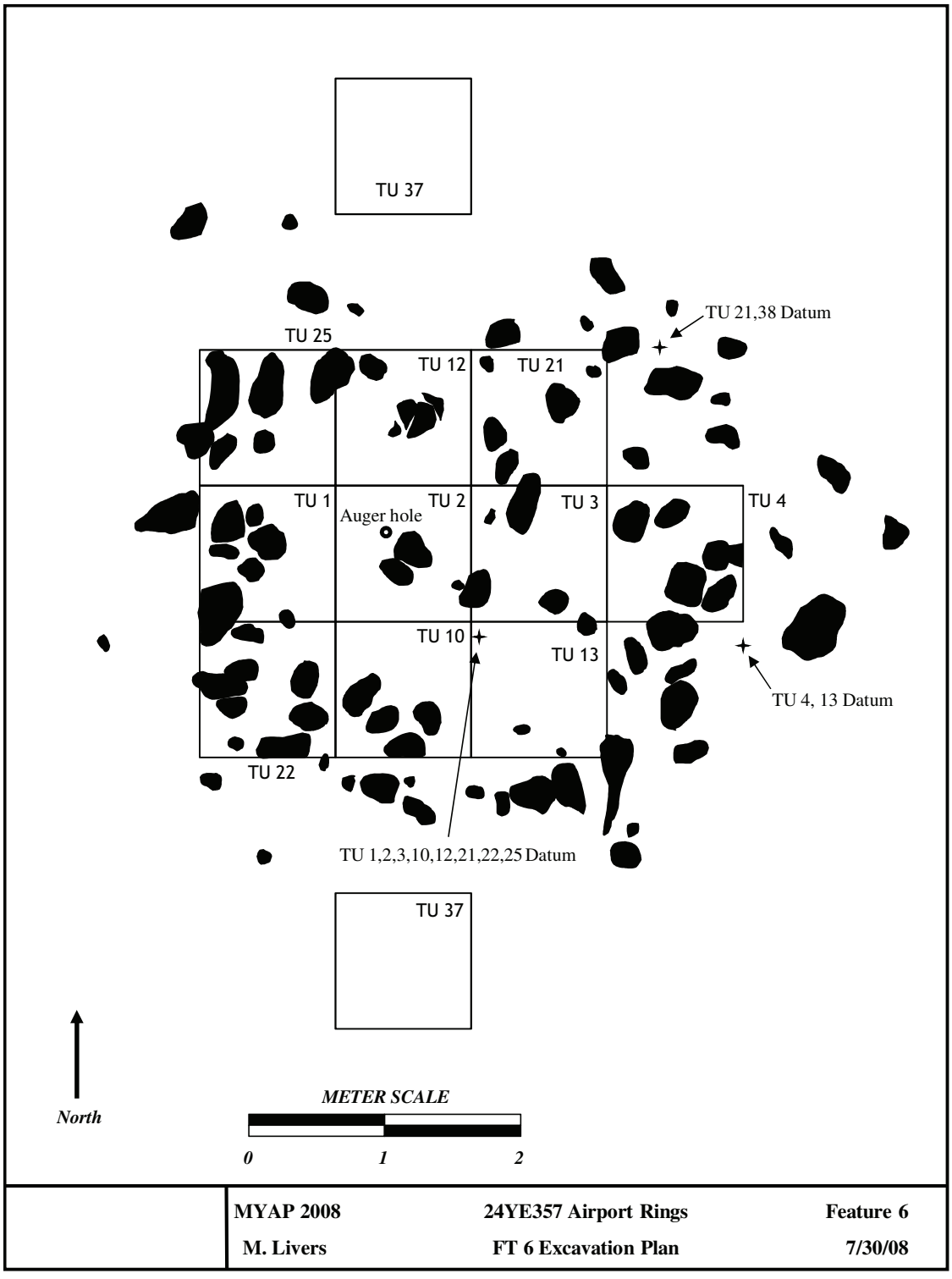


Figure 28. Stone Circle Feature 6 Excavated Planview (24YE357).

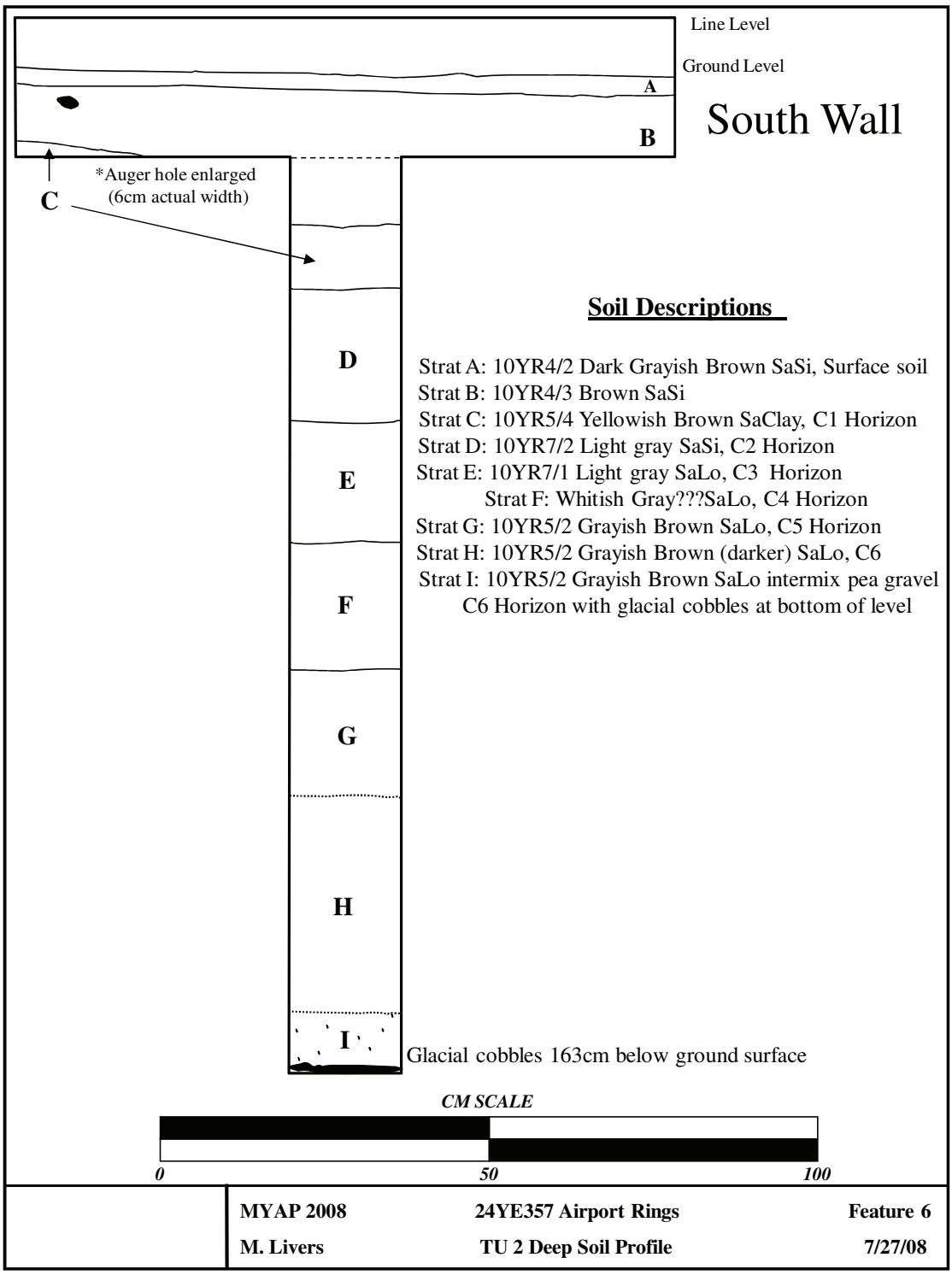


Figure 29. Comparative Soil Profile, Test Unit 2, Stone Circle Feature 6 (24YE357).

A representative sample of site stratigraphy was taken from Test Unit 2 near the center of Feature 6. An approximately 6 cm wide auger hole was placed in the center of

the test unit to test for buried soils and to better define the type of deposition on the landform after digging three 5 cm levels. The auguring of the feature went to a depth of 163 cm below ground surface before hitting a level of glacial moraine cobbles and gravels. The topsoil from Feature 6 is comprised of a dark gray brown sandy silt stratum with remains of surface vegetation. Beyond the first two strata comprising the silty sandy A Horizon, the Bt Horizon is comprised of a hard yellowish brown, blocky sandy clay layer. The remaining 148 cm are various colors of brown and gray sandy loam deposits, the results of glacial outwash activities on the terrace probably during the Late Pleistocene.

Table 24. Lithic Type Count for Feature 6 by Test Unit (24YE357).

Test Unit	BF	BS	DF	FF	IF	LB	MB	PP	SF	TU Count
1	2	0	0	2	0	0	0	0	2	6
2	1	0	0	7	0	0	0	1	0	9
3	4	0	0	7	0	0	0	0	6	17
4	3	1	0	10	3	0	0	1	9	27
10	0	0	0	4	0	1	0	0	2	7
12	3	0	0	6	1	0	0	0	3	13
13	0	0	0	4	0	0	0	0	1	5
21	3	0	0	18	1	0	1	0	11	34
22	2	0	0	5	1	0	0	0	1	9
25	1	0	0	2	0	0	0	0	1	4
37	1	1	0	15	2	0	0	0	4	23
38	1	0	1	13	2	0	0	0	7	24
Type Count	21	2	1	93	10	1	1	2	47	178

Key: bs=blockshatter; df=decortication flake; bf=biface reduction flake; sf=shaping flake; ff=flake fragment; if=indeterminate flake; lb=late stage biface; mb=mid stage biface; pp=projectile point

Feature 6 yielded comparatively few artifacts (n=178), or approximately 14.8 per m^2. Lithic artifacts are comprised of 174 flakes and four biface fragments (Table 25). The four biface fragments were classified as projectile points (n=2), a late stage biface (n=1), and a mid stage biface (n=1). The remaining lithic artifacts consist of either indeterminate flakes (n=10) and flake fragments (n=93). The flaking debris recovered during excavation indicates production of a variety of bifaces and projectile points, as biface thinning (n=21) and shaping flakes (n=47) dominate the typed flake assemblage in Feature 6.

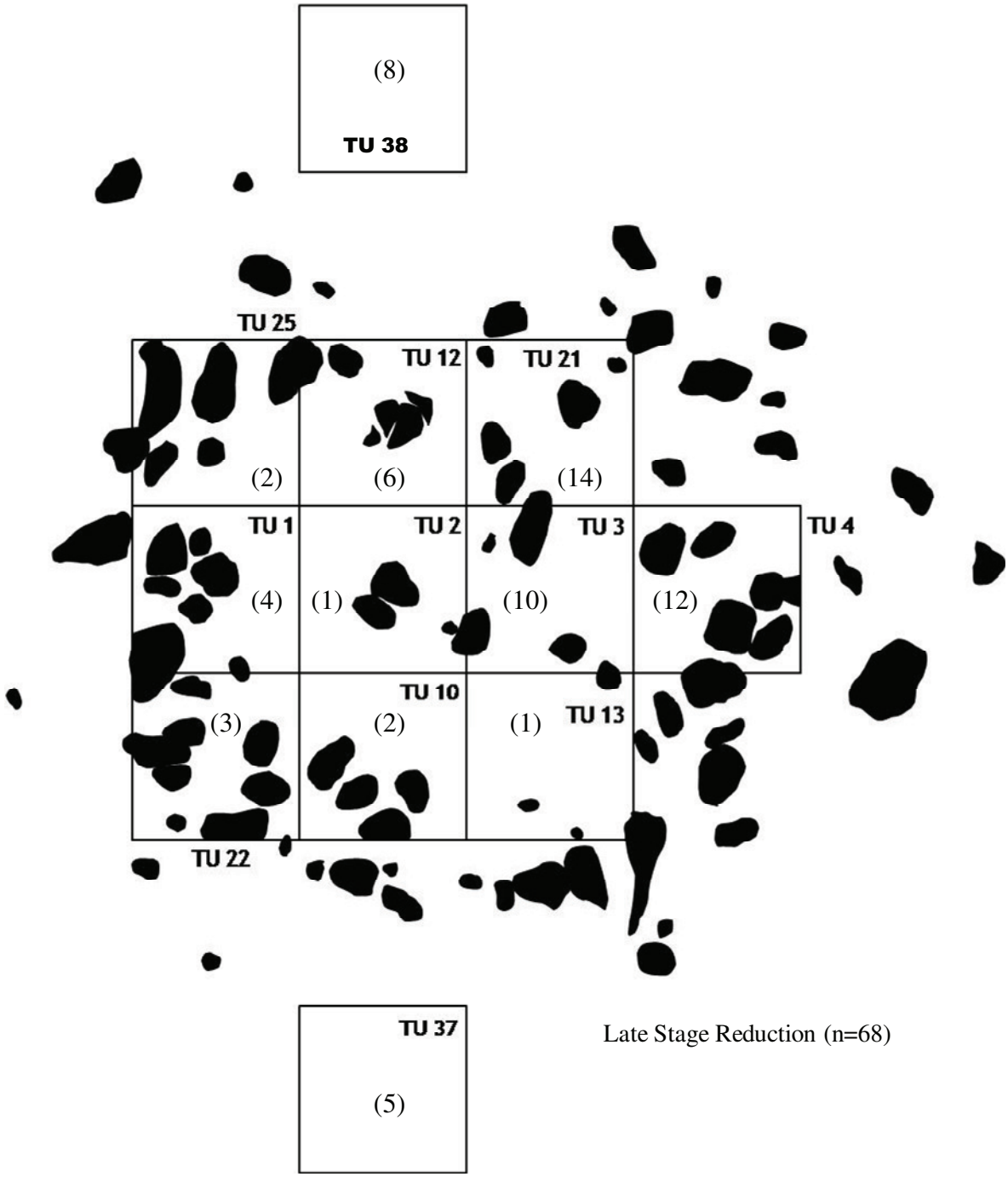


Figure 30. Feature 6 Lithic Reduction Flake Counts by Test Unit (24YE357).

A majority of the late stage reduction flakes are concentrated towards the northeast corner of the feature in Test Units 3, 4 and 21 (Figure 30). This evidence suggests that the northeast corner of the feature was the location of a lithic reduction activity area. The possibility of a lithic reduction area within Feature 6 is discussed further in later

paragraphs of this section. No decortication or other early-stage flaking debris were recovered in Feature 6, indicating an emphasis on production of bifaces and projectile points. The lithic artifacts collected from test units outside of Feature 6 (Test Unit 37 and 38) signify that lithic reduction activities were also taking place outside of the feature at some point during occupation of the landform. These artifacts may not be associated with the use of Feature 6 but provide evidence of a wider area of use on the landform than just within the present stone circle features.

Table 25. Feature 6 Lithic Artifacts.

Lithic Material	Biface	Debitage	Total
Crescent Hill	0	13	13
dacite	1	0	1
jasper	0	1	1
obsidian	2	156	158
orthoquartzite	1	0	1
quartz	0	1	1
untyped chert	0	3	3
Total	4	174	178

Materials used in biface production include obsidian (89%) and Crescent Hill chert (7%). Two of the four bifaces are comprised of additional material type besides the already noted obsidian source. The other two bifaces were produced from dacite and orthoquartzite.

Table 26. Bifaces, Stone Circle Feature 6 (24YE357).

FS	Material	L (mm)	W (mm)	Th (mm)	Description
5	Obsidian Cliff	-	9.81	3.35	untyped base; possible Avonlea
16	Orthoquartzite	22.74	20.55	5.36	Late Prehistoric Avonlea
31	Dacite	20.24	18.66	4.11	untyped biface fragment Dacite
45	Obsidian Cliff	26.19	35.93	13.81	midsection of biface

Three of the four bifaces were submitted for XRF analysis indicating Obsidian Cliff as the obsidian source for both of the obsidian bifaces (FS 5 and 45) while the Grasshopper Knob dacite formation is the lithic material source for FS 31. Two of the four bifaces were untyped fragments while the other two bifaces were most likely Avonlea projectile points.

Table 27. XRF Results for Lithic Artifacts Submitted from Stone Circle Feature 6.

FS #	Feature	TU	XRF Results	Type Code
5	6	4	Obsidian Cliff	PP
10	6	1	Obsidian Cliff	BF
31	6	10	Grasshopper Knob	LB
36	6	12	Obsidian Cliff	BF
45	6	21	Obsidian Cliff	MB
70	6	25	Obsidian Cliff	BF
117	6	37	Obsidian Cliff	FF
128	6	37	Obsidian Cliff	BS

A total of 8 artifacts from Feature 6 were submitted for XRF analysis. The XRF results returned two locations from where the raw materials could be obtained to make the artifacts. All seven of the obsidian artifacts submitted for analysis were sourced back to the local Obsidian Cliff obsidian source within the park interior (Table 27). One artifact, a late stage biface, was sourced to the Grasshopper Knob dacite formation in Southwestern Montana. This outcrop is approximately 100 miles west/northwest from the Airport Rings Site.

Table 28. Summary of Lithic Artifacts by Excavation Level within Feature 6.

Exc. Level	Test Unit										Lithic Totals
	1	2	3	4	10	12	13	21	22	25	
1	0	3	0	0	0	0	0	1	0	0	4
2	1	1	2	0	3	8	0	4	5	0	24
3	5	4	11	3	2	5	0	20	2	2	54
4	0	0	4	2	2	0	5	9	2	2	26
5	-	-	-	22	-	-	-	-	-	-	22
Total	6	8	17	27	7	13	5	34	9	4	130

Looking at the summary of lithic artifacts by excavation level in Feature 6 (Table 28), level five of the feature appears largely sterile because it was the only test unit taken to the fifth excavation level. Only one test unit within the rock wall of the feature contained a significant number of obsidian flakes compared to the number of artifacts found in the excavation levels of other test units. The high number of artifacts from Test Unit 21 supports the idea of a brief, single occupation event for the ring. This high artifact count is perhaps the result of using that portion of the space inside the tipi as a dump area during clean up activities.

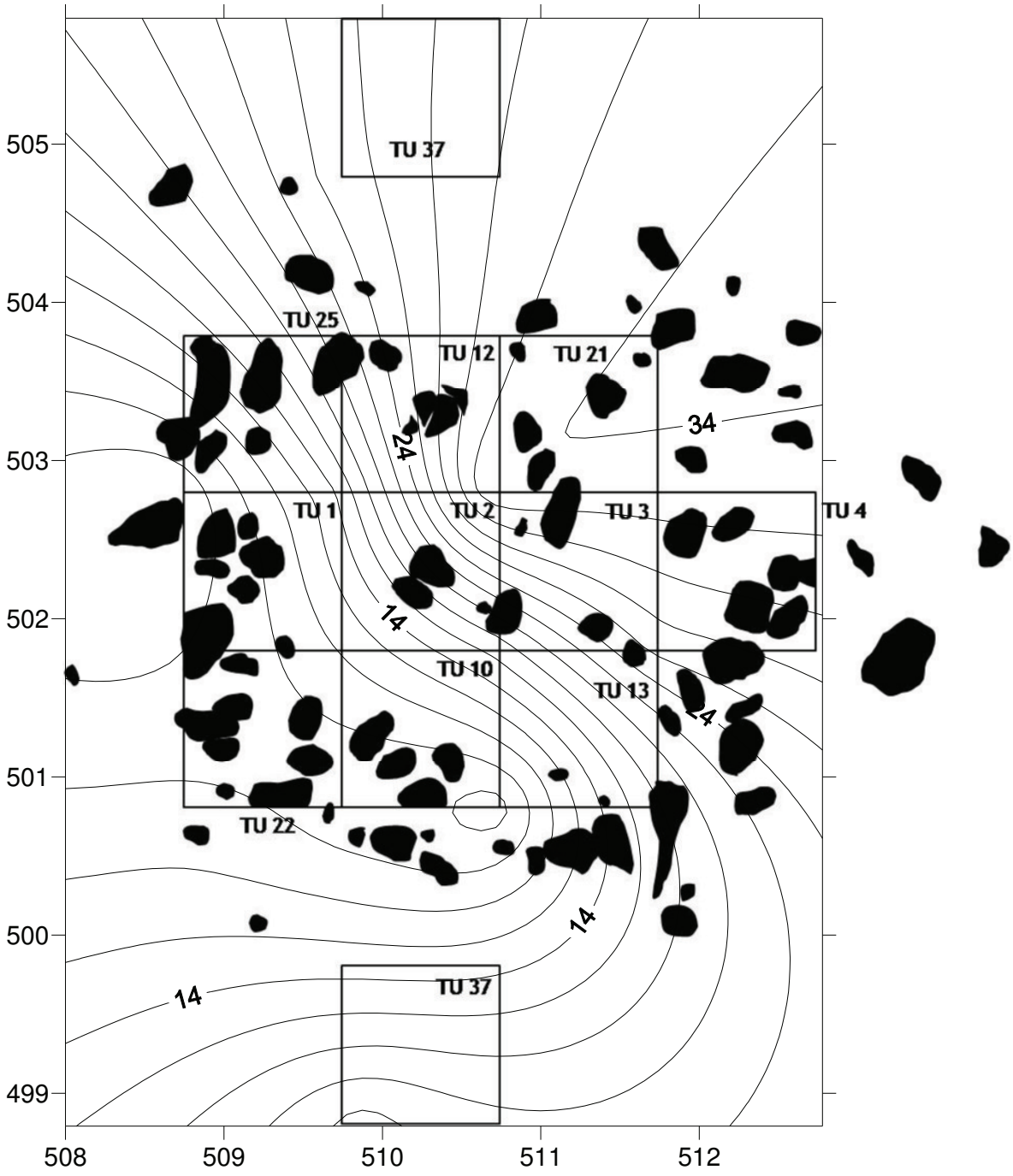


Figure 31. Feature 6 Lithic Distribution Density Map

Again a kriging method was used in creating the distribution overlay with 100 lines in both the x and y axis directions. An increase in lithic artifacts is clearly visible towards the northeast section of the feature interior. Interior test units generally possessed fewer

artifacts than those around the edges and on the exterior, perhaps suggesting some clean-up activity. Cleaning behavior might include the collection of lithic and other debris with its subsequent deposition around the interior edges. This may indicate a winter or cold-weather occupation in which activities occurred inside the lodge with some clean up to keep the living area clear of sharp debitage. Nevertheless, the lack of a hearth or other fire feature inside the lodge may indicate that stone circle Feature 6 was occupied during a warm season, with a hearth located exterior of the lodge in an unexcavated portion of the site. The high number and larger size of rocks on the edge to hold down the tipi could also point to a winter occupation, but again the lack of any hearth remains inside the ring would suggest otherwise.

No definite activity areas were observed within Feature 6, although TUs 37 (south), 4 (east), 21 (northeast), and 38 (north) each yielded greater than 20 lithic artifacts each (Figure 31). Interpretations could possibly point to a classic, family member specific, use area though an area cleanup may also be likely. However, if the inside of the tipi were set up in this classic cross-cultural manner from the Plains, the space to the right of the entrance (generally placed to the east or southeast to greet the rising sun) would be designated for the eldest male child of the family (Oetellaar 2004). With the higher amount of artifacts concentrated to the northeast this very well could have been the workspace of the oldest son still residing in the same lodge with the family. If the northeast section of the lodge was reserved for the eldest son, it is strange that a lithic reduction workspace would occupy the same location. Possible variation in family structure or group type could result in similar artifact patterning. The high artifact density in the northeast section could also be indicative of a winter occupation as sharing inside space for both sleeping and tool making could pose problems in terms of having to sleep on sharp lithic debitage.

Feature 6 Summary

The period of occupation of stone circle Feature 6 may have been the earliest portion of the Late Prehistoric period, as denoted by the presence of a nicely worked Avonlea arrow point from a tan, fine-grained orthoquartzite (FS 16) (Photograph 26).

Another fragment (FS 5) of a possible Avonlea or other Late Prehistoric arrow point was also recovered within the interior of Feature 6. Both of these projectile points indicate a Late Prehistoric occupation, perhaps between 1000-1500 years ago.

Unfortunately, no fire features were excavated within Feature 6 to corroborate this period of occupation; however, the fairly low density of lithic debris and the two projectile points may indicate a single occupation or series of occupations dating to the early portion of the Late Prehistoric period.

Photograph 26. Airport Rings (24YE357), FS 16, Feature 6.

Feature 8 Excavation Results

Finally, excavation of stone circle Feature 8 included 13 1x1-m test units. Test units 15-20 were excavated in a south-north transect across the stone circle's center, while TUs 27, 28, 31, and 32 provided an east-west cross-section (Photograph 27, Figure 32). TU 29 was excavated to explore the perimeter of Feature 8.1 in the east-central portion of the stone circle, while TU 36 was excavated immediately north of and overlapping the northern edge of the circle to explore the distribution of an ash layer observed within the interior of the circle. Excavations within stone circle Feature 8 resulted in the identification of a single fire feature (Feature 8.1), as well as 153 lithic artifacts.

Photograph 27. Stone Circle Feature 8 Excavated Overview. View south.

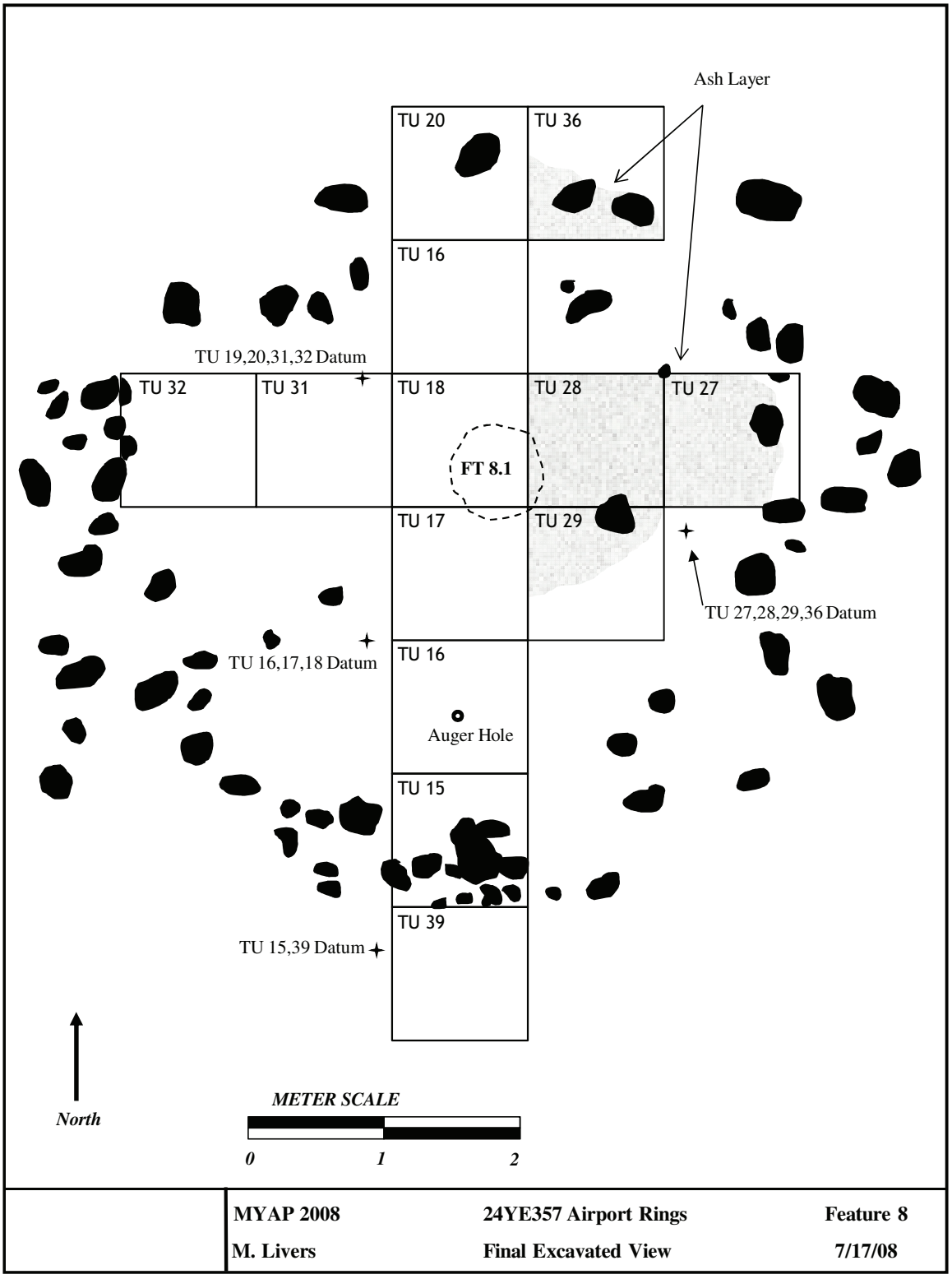


Figure 32. Stone Circle Feature 8 Excavated Planview (24YE357).

Stratigraphic Analysis

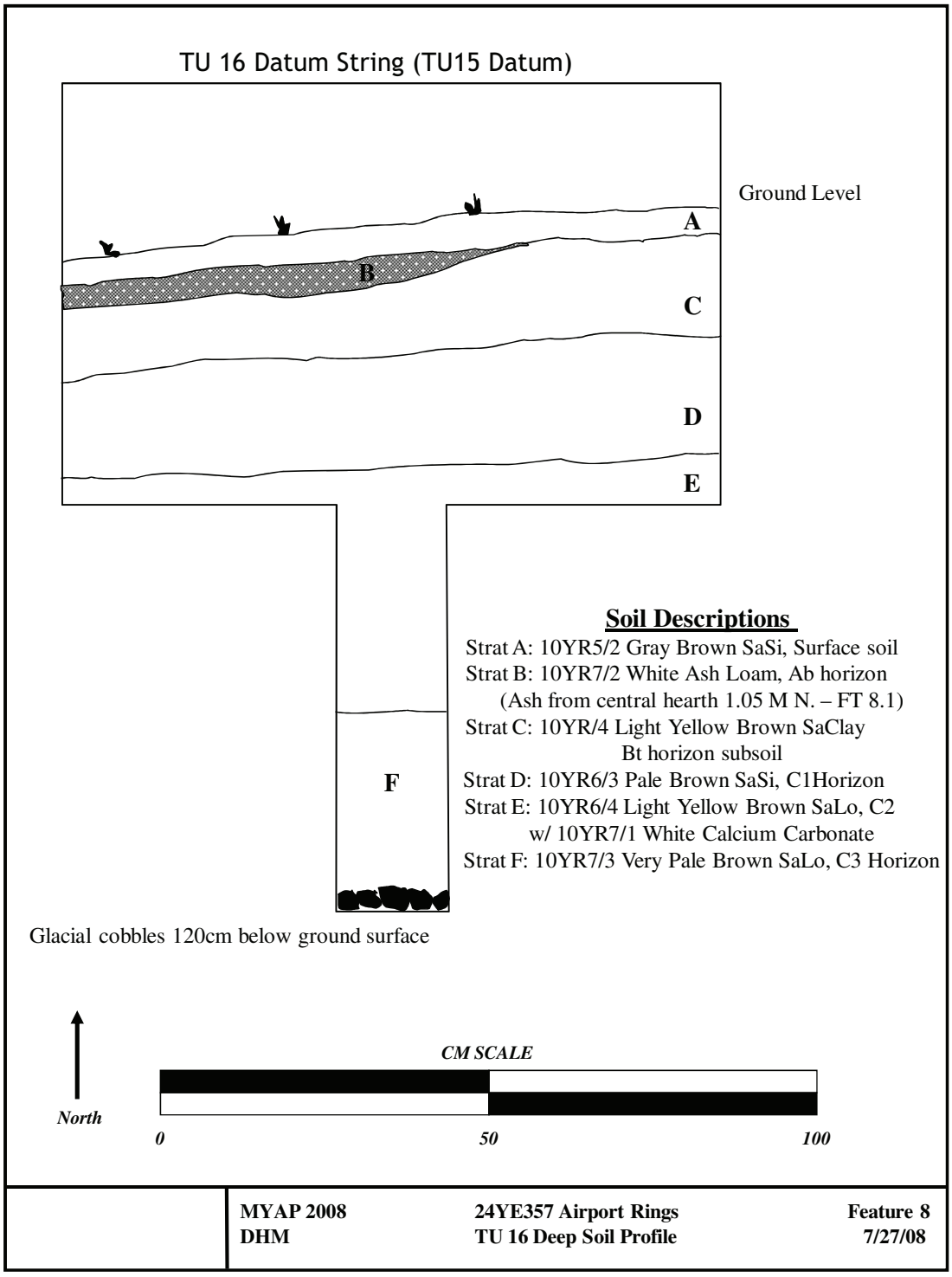


Figure 33. Comparative Soil Profile from Test Unit 16, Stone Circle Feature 8.

A representative sample of site stratigraphy was taken from Test Unit 16 placed towards the south end of Feature 6. An approximately 6 cm wide auger hole was placed in the center of the test unit to test for buried soils and to better define the type of deposition on the landform after digging seven 5 cm levels. The auger extended to a depth of 120 cm below ground surface before hitting a solid level of glacial moraine cobbles and gravels. The topsoil from Feature 8 is comprised of a gray brown sandy silt with remains of surface vegetation, similar to the rest of the terrace. Below the first stratum, a buried living floor (Ab) consisting of a partial ash layer was uncovered. Following the ash layer, the Bt Horizon is comprised of a light yellowish brown, blocky sandy clay layer. The remaining depth is comprised of various colors of brown sandy loam deposits, the results of glacial outwash activities on the terrace probably during the Late Pleistocene.

Photograph 28. Test Unit 16 East Wall Soil Profile (Stone Circle Feature 8, 24YE357).

Table 29. Lithic Type Count for Feature 8 by Test Unit.

Test Unit	BF	BS	ER	FF	HS	IF	SF	UF	FCR/Rock	TU Total
15	1	0	2	3	0	1	4	0	0	11
16	3	0	0	11	0	0	7	1	1	23
17	2	0	1	2	0	0	2	2	10	19
18	2	1	0	8	0	0	6	0	0	17
19	1	0	0	13	0	0	7	0	0	21
20	2	0	0	6	0	1	0	0	0	9
27	1	0	0	2	0	0	1	0	0	4
28	0	0	0	0	0	0	0	0	1	1
29	1	0	0	5	0	0	1	0	0	7
31	0	0	0	13	0	0	6	0	0	19
32	0	0	0	3	2	0	0	0	0	5
36	0	0	0	2	0	0	1	0	0	3
39	1	0	0	10	0	0	5	0	0	16
Type Count	14	1	3	78	2	2	40	3	12	155

Key: bs=blockshatter; df=decortication flake; er=early reduction flake; bf=bifacial reduction flake; sf=shaping flake; ff=flake fragment; if=indeterminate flake; uf=useware retouch flake; hs=hammerstone

Among the lithic artifacts from Feature 8 are 138 flakes, three unifacially retouched flake tools, and one possible hammerstone. Fire cracked rock and two natural rock pieces make up the rest of the lithic material collected from Feature 8. The identifiable flaking debris is dominated by biface thinning (n=14) and shaping flakes (n=40), indicating a focus on late-stage biface and projectile point manufacture, similar to both other excavated stone circles. The remaining lithic debitage consists of one piece of shatter, two indeterminate flakes, and 78 flake fragments.

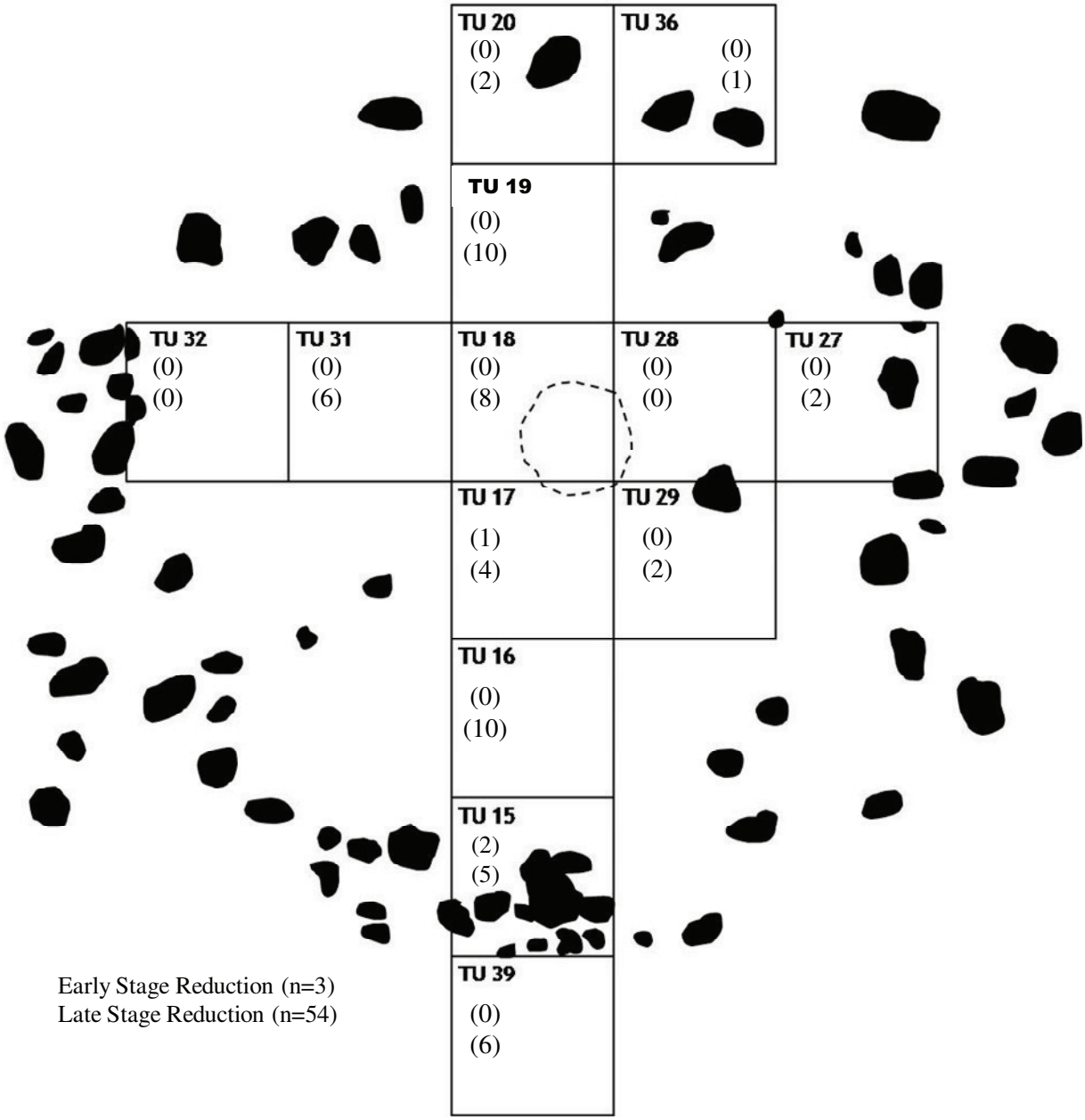


Figure 34. Feature 8 Lithic Reduction Flake Counts by Test Unit.

Based on the distribution of late stage flaking debris, even with the small numbers per test unit, it may suggest a similar type of reduction activity focused towards the fire at the center of the tipi. The slightly higher numbers on both the north and south edge of the ring may point to episodes of cleaning but may not as lithics seem to have a higher concentration as one moves towards the middle of the feature. There is an increase in the number of lithics recovered from Test Unit 16 to the south of the Feature 8. Similar to the results of Feature 4, this increase in artifact number may be due to deeper

excavations resulting in the appearance of a concentration when it is simply an increased sample size.

Table 30. Lithic Artifacts, 24YE357 Feature 8.

Lithic material	Flakes	FCR	Unifaces	NatRock	Total
Crescent Hill	17	0	0	1	18
dacite	2	0	0	0	2
Moss Agate	1	0	0	0	1
obsidian	114	0	3	0	117
orthoquartzite	1	0	0	0	1
sandstone	0	10	0	0	10
untyped chert	5	0	0	1	6
Total	140	10	3	2	155

Lithic artifacts were mostly produced from obsidian (75%), Crescent Hill chert (11%), and a variety of other materials, including dacite, Moss Agate and untyped chert. No diagnostic projectile points or bifaces were recovered, with tools restricted to three obsidian unifaces and a possible hammerstone. Two natural chert pebbles were collected during excavations as it was unknown at the time whether the items were natural or the result of prehistoric activities in Feature 8.

Table 31. Sourcing Results for Artifacts Submitted from Feature 8 (24YE357).

FS #	Feature	TU	XRF Results	Type Code
38	8	20	Grasshopper Knob	BF
56	8	17	Obsidian Cliff	UF
62	8	17	Obsidian Cliff	UF
69	8	19	Obsidian Cliff	FF
78	8	16	Obsidian Cliff	UF
81	8	19	Obsidian Cliff	BF
111	8	36	Grasshopper Knob	SF
138	8	18	Obsidian Cliff	FF
146	8	17	Obsidian Cliff	BF

A total of nine lithic artifacts from Feature 8 were submitted for XRF analysis. The results from Feature 8 are similar to the sourcing results of Feature 6. All seven of the obsidian artifacts sent for sourcing were sourced back to the highly utilized raw material obsidian source at Obsidian Cliff (Table 31). The other two artifacts submitted for sourcing were identified with chemical signatures of the Grasshopper Knob dacite formation in southwestern Montana. One of the Grasshopper Knob artifacts is a biface thinning flake, while the other is a shaping flake. These data clearly show the curation of Grasshopper Knob dacite bifaces and projectile points to Airport Rings.

Table 32. Summary of Lithic Artifacts by Excavation Level within Feature 8.

Exc. Level	Test Unit												Total Lithics
	36	32	31	29	28	27	20	19	18	17	16	15	
1	0	1	0	0	1	0	0	4	1	1	0	0	8
2	0	4	1	3	0	0	5	4	1	3	0	3	24
3	3	0	0	4	0	0	4	4	0	3	6	4	28
4	0	0	8	0	0	2	0	9	1	2	9	2	33
5	-	-	8	-	-	2	-	-	0	-	1	2	13
6	-	-	-	-	-	-	-	-	12	-	3	-	15
7	-	-	-	-	-	-	-	-	-	-	4	-	4
Total	3	5	17	7	1	4	9	21	15	9	23	11	125

Looking at the summary of lithic artifacts by excavation level in Feature 8, levels six and seven of the feature appear largely sterile because Test Units 18 and 16 were excavated deeper (Table 32). Test units placed outside the ring and artifacts from the hearth were not included in Table 32 and is why the total lithic count differs from earlier lithic counts. Excavations were taken to a deeper depth in Test Unit 18 to test for the absence of flaking debris below the maximum depth of fire Feature 8.1 at the center of the stone circle. Test Unit 16 was also dug to a deeper depth than the other test units to gain a representative soil profile as well as to test vertical artifact density within Feature 8. The high number of artifacts from Test Unit 16 (>20 artifacts) is likely due to the test unit's excavation depth. The lithic density from Test Unit 16 is 3.3 artifacts per $5m^3$ where the average density per level in Feature 8 is 2.12 artifacts. Additional spikes in the artifact count (>15 artifacts) occur in the test units neighboring the central fire feature (Test Unit 18, 19, and 31). Lithic densities for Test Units 18, 19, and 31 are 2.5, 4.75, and 3.4 artifacts per $5m^3$ respectively.

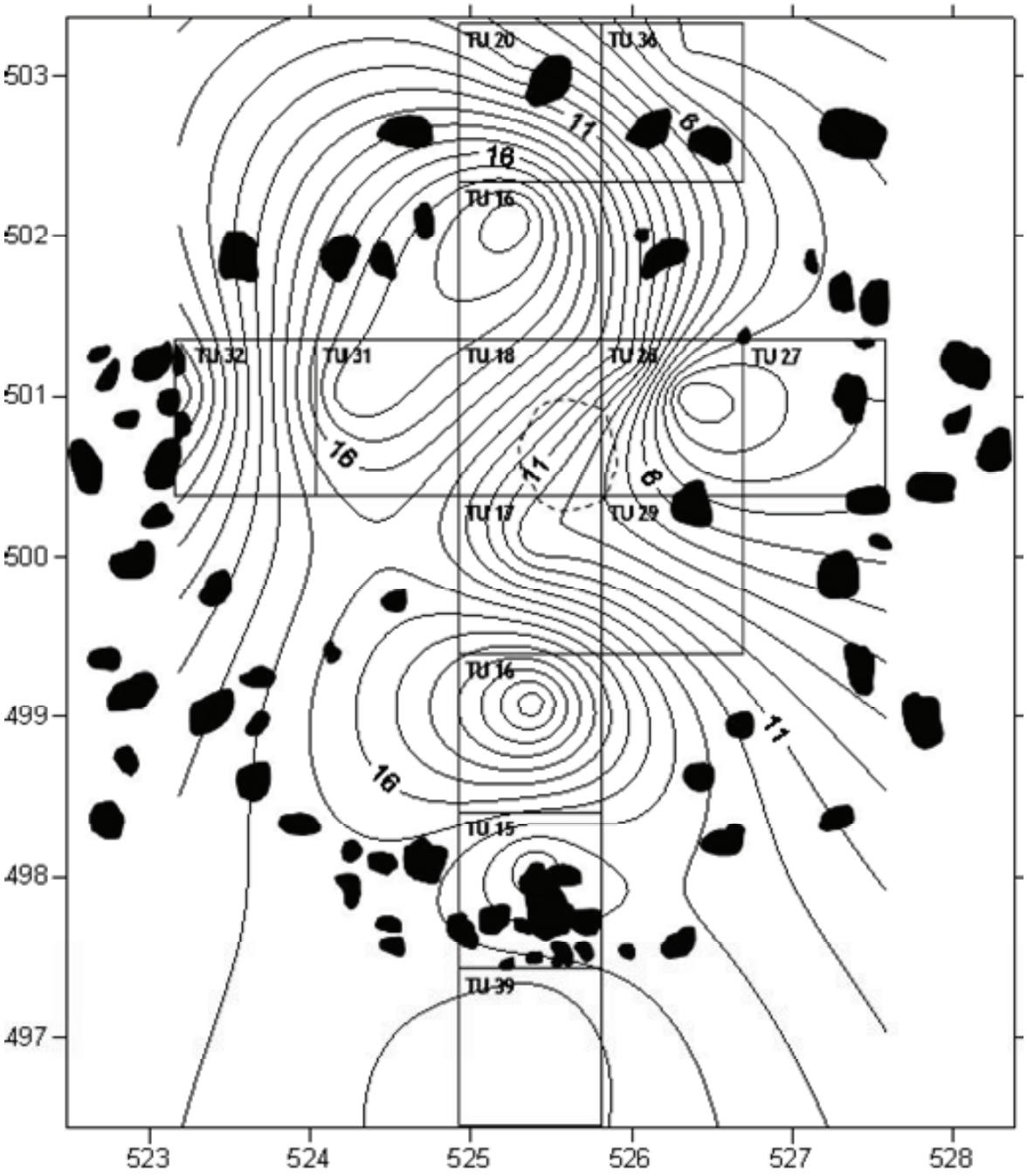


Figure 35. Feature 8 Lithic Density Distribution Map.

As with the other features, a lithic distribution overlay map was plotted on a base map of the feature. The kriging method was used with 100 lines in both the x and y directions. The lithic distribution density map for Feature 8 shows concentrations toward the bottom of the ring in Test Unit 16 as well as an increased lithic density in the test units around the central fire feature.

Feature 8 Fire Feature

In addition to lithics, excavations within Feature 8 yielded a fairly intensively-used fire feature, likely a hearth or roasting pit, at its center. The feature measured approximately 75 cm north-south and 65 cm east-west within the center of the stone circle. In plan, the feature was circular and in north-south profile measured 15 cm deep in its central portion. The feature profile has been enlarged in the figure above to show detail (Figure 35). The feature was packed with charcoal and FCR, indicating an intensive and hot fire within the stone circle. Charcoal collected from the feature was submitted for radiocarbon dating, resulting in a conventional radiocarbon age of 270±50 B.P. or AD 1630-1730 (BETA-250334). The 2-sigma calibrated radiocarbon age is CAL AD 1480 to 1680 and CAL AD 1770 to 1800. These radiocarbon data indicate an occupation of Feature 8 and use of Feature 8.1 during the terminal portion of the Late Prehistoric to the Contact period.

Photograph 29. Hearth Feature 8.1 Planview. View east.

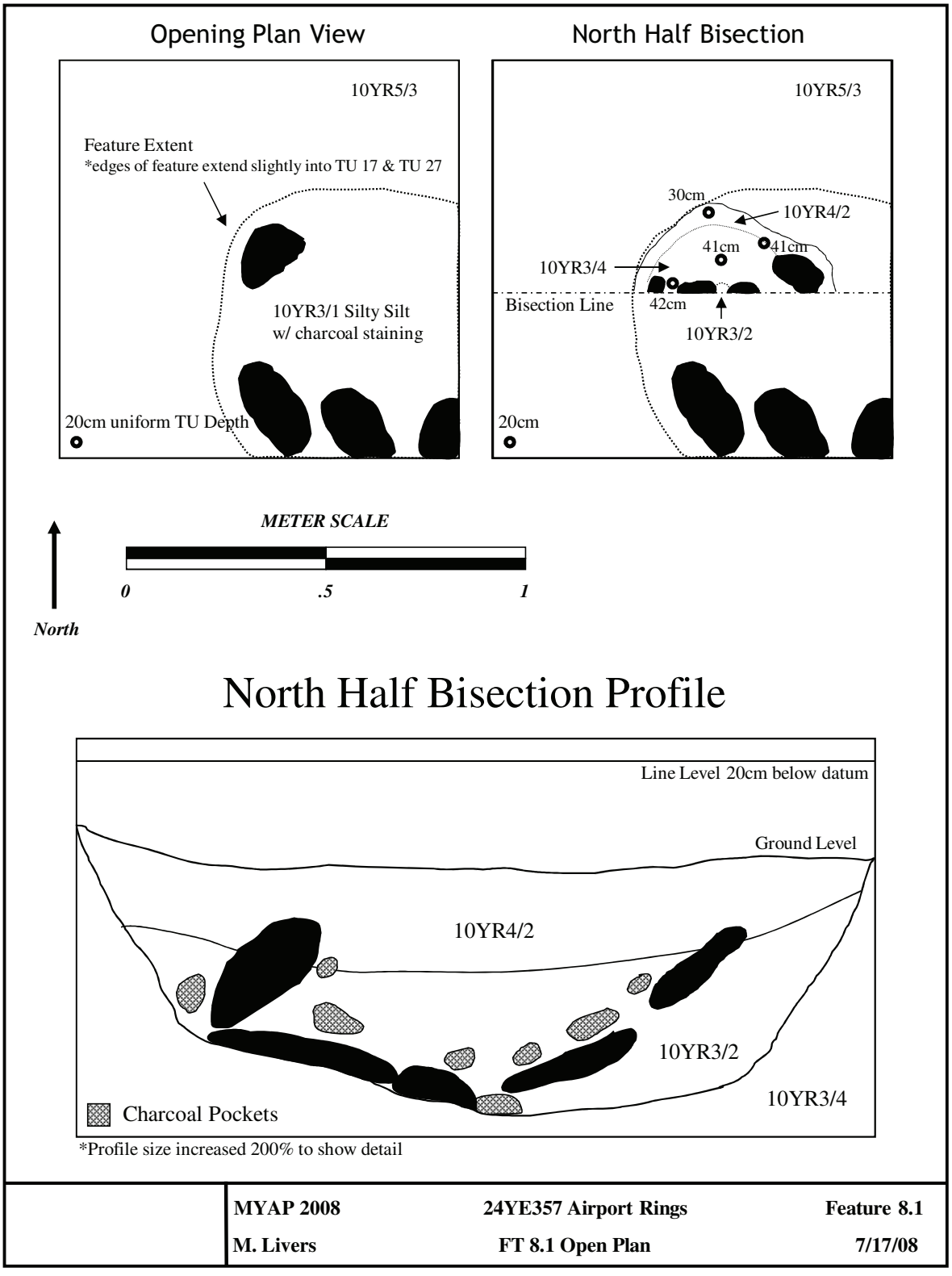


Figure 36. Feature 8.1 Planview with Feature Bisection (Stone Circle Feature 8, 24YE357).

In association with the hearth feature, excavations revealed the presence of a thick ash layer (ca. 15 cm thick at its deepest) in the northeastern portion of the stone circle. The ash extends like a plume from the fire feature northeastward. Excavations in TUs 15, 17, 21, 27, and 28 revealed thick layers of ash immediately surrounding the feature and extending in the northern and eastern portion of the circle (Figure 32, Figure 37). Excavations within all other test units to the west and south revealed only sporadic lenses of the ash, if any at all. In addition, excavations within TU 36 overlapping the northern edge of the circle indicated that the ash layer extends to the interior edge of the stone circle but does not extend exterior of the circle. These data suggest that the ash layer accumulated within the interior of the lodge during its use. One plausible interpretation is that a small family burned a very hot fire during a winter storm, while a southwesterly wind blew through the lodge pushing ash against the east-northeast portion of the interior of the lodge.

Photograph 30. Ash Layer ending outside northern edge of Stone Circle Feature 8.

At least two large cobbles in TU 27 rest on top of the ash layer itself, indicating that the ash layer formed initially, with the subsequent movement of the cobbles onto the ash surface, perhaps after the occupation of the lodge (Photograph 30). Once the lodge

hides were taken up by the Native American inhabitants the rocks could have rolled onto the leftover ash layer.

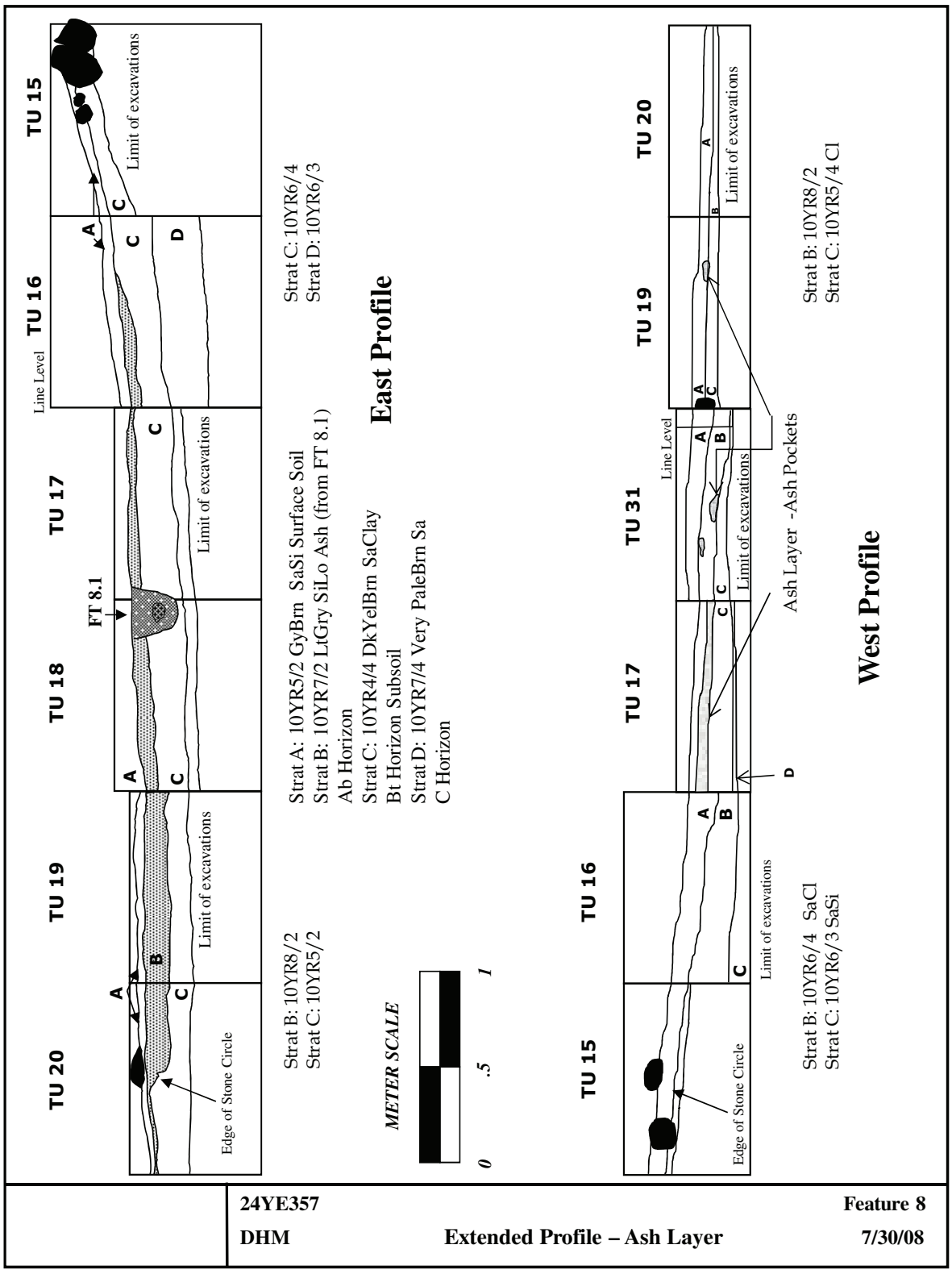


Figure 37. Feature 8 Extended Wall Profile detailing Ash Layer (Buried Living Floor).

Ethnobotanical Analysis

Table 33. Ethnobotanical Results from Feature 8.1 (Stone Circle Feature 8, 24YE357).

Sample No.			Charred		Uncharred		Weights/
	Identification	**Part**	**W**	**F**	**W**	**F**	**Comments**
FS 113	Liters Floated						0.8L
Feature 8.1	Light Fraction Weight						39.85 g
	FLORAL REMAINS:						
	Monocot/Herbaceous dicot	Stem		3			.01 g
	Vitrified tissue			14			.08 g
	Alyssum-type	Silicle				22	
	Opuntia – prickly pear	Seed				1	
	Poaceae	Floret				2	
	Rootlets					X	Moderate
	CHARCOAL/WOOD:						
	Total charcoal ≥ 2 mm						2.61 g
	Artemisia	Charcoal		13			0.10 g
	Betula	Charcoal		16			0.52 g
	Juniperus	Charcoal		1			0.02 g
	Salicaceae	Charcoal		11			0.35 g
	NON-FLORAL REMAINS:						
	Bone > 2 mm					3	
	Bone – calcined ≥ 2mm			16			
	Flake ≥ 1 mm					5	
	Insect	Chitin				X	Few
	Insect fecal pellet			x			Few
	Insect fecal pellet					x	Numerous
	Rock/Gravel					X	Few

Key: W=Whole, F=Fragment, g = grams, X= presence in sample

Floral analysis from a fill sample submitted from excavation level two of Feature 8.1 resulted in the recovery of three charred monocot/herbaceous dicot stem fragments (Table 33). Small plant stems might have been used to help start the fire or were the remains of plants used as a protective layer between food being processed and the rocks heated in the hearth. Several fragments of charred vitrified tissue were recovered but no interpretations were presented by the macrofloral analysis. Charcoal fragments identified from the floral sample posit the use of other plants located in the riparian zone in which the site is located. The other plants used for fuel during the occupation of the site during the Late Prehistoric Period were willow, birch, and small amounts of sagebrush.

Faunal Analysis

Faunal analysis identified several tooth and bone fragments associated with test units comprising the area of the hearth and those around it. This analysis did not go beyond the taxonomic identification of medium and large mammals, again due to the lack of diagnostic or sizeable pieces from which to make interpretations. However, the presence of animal remains in the hearth clearly indicates Feature 8.1 was a food-processing feature (Table 34).

Table 34. Total Faunal Count for Burned and Unburned Typed Specimens from Feature 8, Feature 8.1

Feature	Burned (Y/N)	large mammal	mammal	unidentified	FT Total
8	N	0	1	0	1
	Y	2	1	11	14
8.1	Y	3	0	54	57
Total Type Count		5	2	65	72

The distribution of ash in association with the hearth indicates that stone circle Feature 8 likely experienced a single winter-period occupation during the terminal Late Prehistoric to Contact period, or approximately AD 1480 to 1630. The low density of lithic debris (ca. 12 per m^2), most of which is concentrated around the fire feature, supports a brief occupation in which inhabitants kept warm by the hot fire and waited out a storm. During this time, they maintained their lithic tool kit and conducted other daily tasks while the west-to-east moving storm blew through the Yellowstone Valley. The lack of stratification within Feature 8.1 also indicates a single occupation, rather than multiple uses over time.

Additional evidence leading to the conclusion of the seasonality from stone circles studies is often associated with the distribution of rocks around the ring. Often, the season of occupation is interpreted by the rock weight distribution (Aaberg 1995) around the ring, where the areas of the rings with the most rocks denoted the most frequent wind direction. Wind pattern data from areas in southwest Montana, east of the MYAP area, show trends of wind coming from the southwest on a year-round basis where the strongest and most frequent winds blowing from the north or northwest occur during the spring (Aaberg 1995: 115). As such, a winter occupation is supported by the presence

of the ash layer accumulated in the northeast portion of the stone circle, suggestive of a southwesterly wind.

Summary and Comparison, Airport Rings Site Excavated Features

The 2008 MYAP crew conducted a rewarding reconnaissance of the site in order to recover additional data for verification of certain hypotheses pertaining to age, spatial usage patterns, and overall intrasite patterning. Excavations at the site removed just about 9 m^3 soil from test units inside and outside of three of the 11 features present at the site. The breakdown of excavations in each feature is provided below (Table 35).

Table 35. Feature Excavation Results for 24YE357.

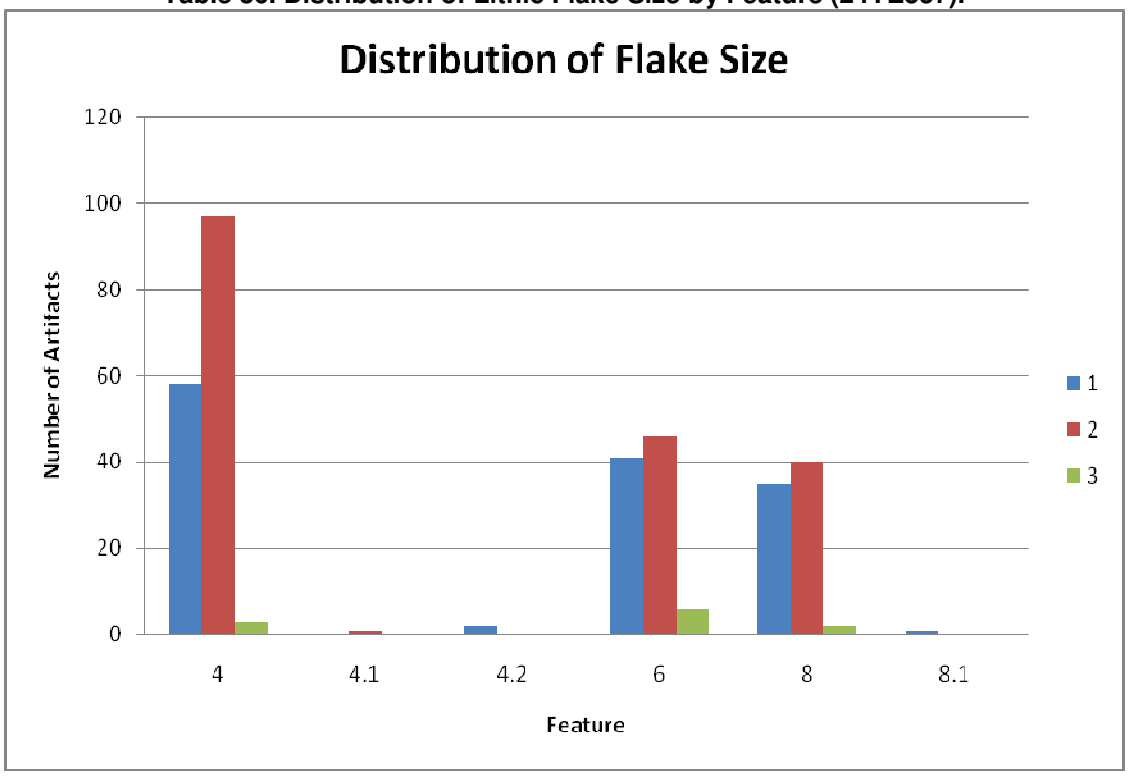
	Feature 4	*% of Total*	**Feature 6**	*% of Total*	**Feature 8**	*% of Total*
# of Test Units	14	*36*	12	*31*	12	*33*
Area exc. inside FT	219 cm^3	*66*	190 cm^3	*70*	245 cm^3	*84*
Area exc. outside FT	113 cm^3	*34*	80 cm^3	*30*	45 cm^3	*16*
Total Area exc.	332 cm^3	*37*	270 cm^3	*30*	290 cm^3	*33*

Some interpretations we were able to address concern period of use (age), probable seasonality, type of subsistence strategies being used at the site, and some comparative intersite patterning. Excavation of the three stone circles at the Airport Rings Site suggests multiple prehistoric occupations over the last 5,000 years. Beginning during the Middle Archaic period, Oxbow site occupants were possibly the first to build a stone circle with an interior fire hearth, yielding a single Oxbow bifurcate projectile point in association with a fire hearth dated to a conventional radiocarbon age of 4,520±40 B.P. Evidence supporting the occupation of stone circle Feature 4 points towards the stone circle likely remaining unutilized until a Late Prehistoric occupation around 340±40 B.P. if the circle was originally created by Middle Archaic people.

Feature 6 yielded two Late Prehistoric points, including an Avonlea point, suggesting occupation ca. 1500 years ago, although no fire features were excavated to corroborate the period of use. Finally, Feature 8 yielded a Late Prehistoric to Contact period date (AD 1480 to 1630) associated with an intensive winter occupation that produced a thick ash layer in its northeast corner. Both stone circle Features 4 and 8 likely are indicative of winter occupations, while Feature 6's occupation season is uncertain.

With not only relative but also absolute dates for the two periods of occupation discovered in Feature 4, the artifact evidence also supports the two-occupation interpretation. Roughly, twice as many artifacts were recovered from the excavations of Feature 4 than the number of artifacts produced from either Feature 6 or Feature 8. The higher number of artifacts recovered from Feature 4 could just be a coincidence or provide the direction needed for the study of new comparative methods in future stone circle excavations to test for multiple use occupations. Provided this idea is validated with stone circle data it could aid the process of verifying multiple occupations of the same ring or landform.

Table 36. Distribution of Lithic Flake Size by Feature (24YE357).



The distribution of flakes by size also provides evidence for two occupations of Feature 4. When comparing the flake size to the other two ring features (Features 6 and 8) there is a significant increase in the number of size grade 2 flakes. This increase causes a lower proportion (roughly 5:8) to the proportion of size grade 1 and 2 flakes from the other two rings at an approximate ratio of 8:9 (Feature 6) and 7:8 (Feature 8). Looking at the absence of grade 1 flakes in Feature 4.1 and grade 2 flakes in Feature 4.2 may indicate that the apparent variation in flakes size from Feature 4 is due to the

difference in lithic reduction activities performed during the Middle Archaic and Late Prehistoric occupation of the site. If the Late prehistoric lithic reduction activities were similar, as suggested by the type of reduction flakes recovered from each of the three features in the previous sections, then the difference in size grade may point to a trend of early stage reduction during the Early Archaic occupation. If this follows Stevenson's three phase occupation model, the increase of early stage reduction flakes may indicate that the landform was used as a staging area before a move into the uplands of the park interior by a Middle Archaic group.

CHAPTER 7. STONE CIRCLE COMPARISONS

By Michael C. Livers

Many questions concerning stone circle sites simply cannot be answered or asked due to the negative impacts associated with the introduction of European agricultural practices on the Plains. The information potential for the area no longer exists. Much of the plains, prairie, and parklands have been cleared and plowed for farming "obliterating all traces" of previous archaeological evidence (Brasser 1982: 313). This continuous clearing of land for agricultural practices has significantly affected the number of stone circle sites existing on the Plains, as the features are comprised of rocks sitting on the surface of the ground, the exact thing a farmer would get rid of when creating a field for cultivation. Even if sites were present on agricultural land, there is little chance of existing cultural layers exhibiting integrity (Shott 1995). Sites at elevations much higher than this have been noted ethnographically to be associated with religious and non-domestic purposes meaning that the chances of finding data or evidence needed to answer certain questions pertaining to function or use are unknown (Arthur 1966). Even though these higher elevation sites may have limited excavation potential they should at least be recorded.

Past researchers complained about stone rings lacking artifacts and features, as noted before, yet many of the report findings automatically associated these sites as containing no information potential, without testing. This process of automatically classifying stone circle features as unimportant to the development of prehistoric knowledge is simply furthering the misconceptions associated with tipi rings. As a result, comparing known stone circle sites within the Upper Yellowstone River drainage across the board in terms of physical location, probable habitation date, and site-specific details has been quite difficult in terms of the amount of data available.

These stone circle sites pose a number of problems due to inconsistent and limited information recorded during the original and subsequent surveys, including the lack of data pertaining to site type, locational landmarks, artifacts, and the general description of the landform, among other things. These missing details make it difficult to overcome what many archaeologists assume are the inherent problems with interpreting stone circle sites. A majority of sites listed from the following surveys and state records are

missing such details as elevation, site maps, photos, testing, artifact collection/recording, feature mapping, feature counts, even basic site descriptions.

Stone circle sites recorded for the Upper Yellowstone Valley range from private to public land with all but a dozen or less being recorded within six miles of a buffalo jump site, suggesting an oversight in survey practices or an infatuation with buffalo jumps. Along with missing site data, probably due to the assumed lack of importance of stone circle sites, at least half of the sites located in this valley were recorded after some type of looting or human disturbance took place at the site. This data set is average at best when considering the temporal span associated with sites in this valley system. Regardless of this problem, enough data are available to compare stone circle trends in the Upper Yellowstone Valley.

The following comparisons focus on temporal range of stone circles in the Upper Yellowstone drainage, size of circles, number of circles recorded at a site, and elevation of stone circle sites. The reasons for choosing these four categories for comparison come from the types of questions researchers look to gather from stone circle archaeological data. Looking at the Montana State Historic Preservation Office's standards and guidelines for surveying stone circles, research questions fall under four major categories of interest. These categories consist of multiple questions pertaining to individual rings, inter-site variability, intra-site patterning, chronology of use, and cultural affiliation (SHPO 2002).

Of the 64 stone circle sites recorded in the region, six sites have no information pertaining to the number of rings per site. Fourteen of the sites do not have the dimensions of individual rings and therefore an average dimension of rings per site in unavailable. Time diagnostics were only found with 21 of the 64 sites providing information pertaining to the relative age of the various sites. Elevations were provided for all but 16 of the stone circle sites identified by previous archaeological inventories of the region.

Average Size vs. Occupation Period

When referring to the size of a tipi ring, size is a reference to the average diameter of all the ring measurements recorded at a site. This is not a perfect form in assessing an average size because many of the site forms have unavailable data for rings too scattered for proper measure, or the only measurement taken was the north-south measurement from the inside of the ring. The reason for measuring the inside diameter

of a ring is due to the belief that when the lodge cover was removed from the frame, it would be pulled up from under the rocks causing the rocks to roll outwards. Thus, the measurements taken may not represent the actual placement of the rock during the time of use, but actually the final resting place after the rock rolled off of the cover.

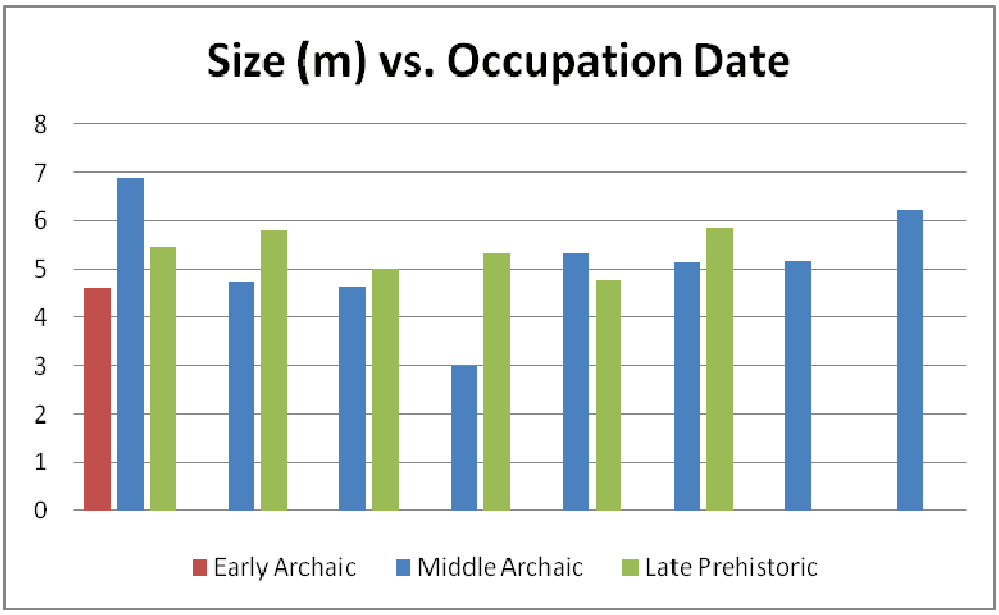


Figure 38. Graph showing distribution of sites when comparing relative age to average diameter.

Of the 64 recorded stone circle sites, only 21 of the sites have had relative periods of occupation associated with the present surface features. Of these 21 sites with associated relative dates based on collected projectile points, only 14 have both average size of all stone circles at the site and a relative date. The average diameter was taken from those site features with measurements, meaning the actual number of rings measured per site may not be the total number of rings listed for the site in the table. The sample size is low and results would be more reliable with a higher population. No significant correlation exists between the average size of rings and relative age of the site. After finding the correlation coefficient between the two variables to be .22, a number too close to zero to represent any significant correlation, performing a simple linear regression test of average diameter to occupation was ruled out.

A chi square test (χ^2) of the data comparing size to age achieved interesting results. Grouping the data into occupation periods versus small and large average sizes, a significant correlation does exist. Average sizes for rings at a site were classified into small (rings with an average diameter less than or equal to 5 meters) and large (rings

with an average diameter greater than 5 meters). The results show the observed chi square value falling within the normal range of the distribution *(p*=.05; df=2; $\chi^{2\,(critical)}$= 5.991; $\chi^{2\,(obtained)}$= 1.632). The test suggests no significant correlation exists between the average size of all rings at a site and the relative age of the site. To test the validity of the chi squared results, a single variable *ANOVA* test was run (*p*=.72; df=14; *F*= .34; *F critical*= 3.89*).* Results of the *ANOVA* test show a normal distribution of values meaning the results of the chi squared test are correct and there is no correlation between the variables.

Relative dating is the only technique that has been used to assign dates to stone feature sites in this study save one, site 24YE357. The Airport Rings site is the first stone circle site to be dated using absolute, radiocarbon dating techniques in YNP and the entire upper river valley. After reviewing the stone circle site reports for the valley, it is evident that several attempts were made in the 1990s by Deaver and Deaver, among others, to locate subsurface features at several sites within the valley system. However, no regional literature is available to ascertain whether any of these attempts were successful.

Understanding ring morphology is an important factor in establishing answers for the age-size hypothesis (Aaberg 1995: 113). A common notion with tipi ring research is that with the arrival of horse use on the plains, tipi size increases for a variety of reasons. Prior to the introduction of the horse into Plains culture, archaeological as well as ethnographic information provide signs of domesticated canines. Most archaeologists agree that tipi size increased with the introduction of the horse due to their increased pack-load capabilities compared to dogs (Ewers 1955; Finnigan 1982; Malouf 1961; Wedel 1963). Another idea for the increase in tipi size is based on the increased mobility the horse offered for these groups. Based upon the ability for increased foraging efficiency from using a horse it seems likely that the time spent camping in one location would increase significantly. With a horse, foraging parties could exploit resources farther away from a camp location for a longer period of time benefiting from the decreased rate of energy loss associated with these activities. These groups could make up for the distance by maximizing their return rates with heavier pack loads, a strategy less efficient in pre-horse days as the load size was limited to how much people and their dogs could carry.

Being one of the first domesticated animal in North America, dogs play an important role in estimating the age of tipi use and mobility patterns. Canine domestication has

been noted across the world and dogs are the only animals ever domesticated in Canada with evidence of domestication as early as 4500 B.P. based upon faunal remains at the Baker Site on the Fraser Plateau (Crellin and Heffner 2000: 151). Crellin and Heffner's (2000) analysis provides a unique perspective related to the evidence pertaining toward the actual use of dogs for transportation and economic purposes. Canine vertebrae recovered in the faunal remains from the Baker Site provide evidence of heavy load stress suggesting that these animals were more than just pets, but were an integrated part of plateau life allowing for increased transportation benefits.

Dogs were used as pack animals as noted in historic accounts from the Spanish during the 16th and 17th centuries (Wedel 1963). Ewers (1955) believes the size of a tipi was limited to how much a dog could carry. While probably an overestimate, Ewers believed the weight to be around 50-75 pounds for a strong, healthy dog. Observations across the Plains region point to a trend of rings smaller than 4.3 meters in diameter tending to be strictly pre-horse rings (Light 1984). Light (1984) believes this trend is incorrect or, that if true, the trend is only accurate in certain areas of the Plains. If the trend is true it is possibly the result of differences between cultural groups even though it is almost impossible to establish cultural affiliation based on size or remains.

One account during the period of known horse use on the Plains may explain Light's skepticism. Buffalo Bird Woman provides ethnographic information from an oral history of her tribe using dog and travois during a buffalo hunt as late as 1870 (Brink 2004). Though rings are assumed large once the horse was introduced to the Plains, Light's (1983) statistical observations from five sites, several with 100 or more individual rings, do not explicitly verify the link between larger rings and later dates associated with horse use. It is evident that there were groups on the Plains that were not utilizing horses at all or only in certain situations. Malouf (1958) in his preliminary survey of the archaeology of YNP noted the presence of a Middle Archaic point with a stone circle site where the average diameter from the four rings was over 6 meters, a diameter usually associated with horse use. There is a good chance that a trend between the size and age of stone circles is conjectural. Until further work and comparisons are done to study the matter, caution is suggested when using data addressing the age-size hypothesis.

Number vs. Size

There seems to be a small trend between the number of rings recorded at a site and size variation. Looking at the sites plotted on the graph, sites with a smaller number of rings appear to have greater size variation. As the number of rings increases, the average size of all rings becomes less variable. Sites with less than 10 rings have a size variation greater than one meter. Sites with ten or more rings have a general range variation of one meter. The 60+ sites included in the comparison table represent a large enough sample size to determine some small general trends associated with the number of rings and average size within the Upper Yellowstone River valley. The average size for the sites with more than ten rings is a result of a sufficient population allowing for the concise size range of exactly one meter. Provided more sites are surveyed in the future, the possibilities to apply more accurate comparisons based on better sample sizes are increasingly possible.

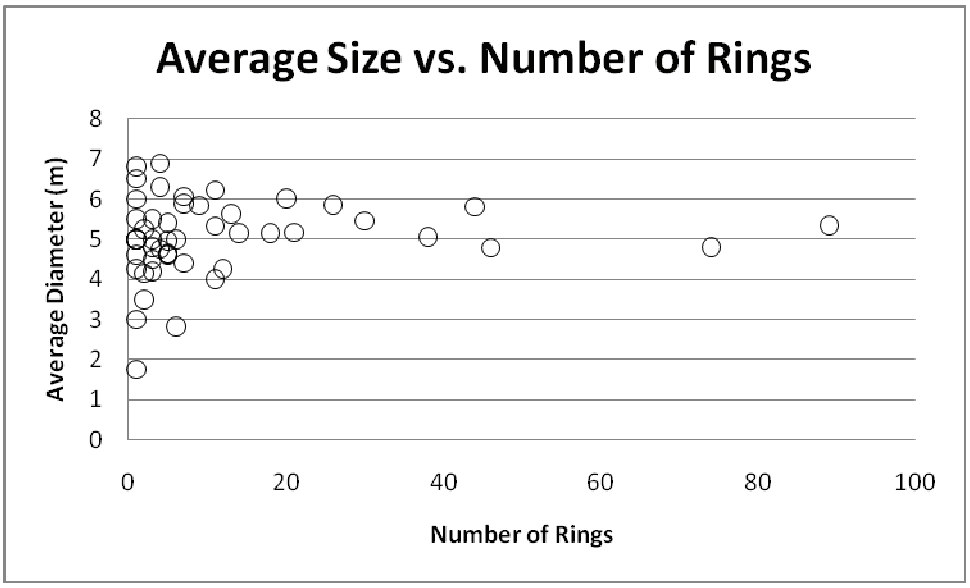


Figure 39. Graph showing distribution of sites when comparing number of rings to the average size of all rings.

Looking at the data for the average size of all rings compared to the total number of rings is an attempt to establish whether there is any difference in site patterning between larger and smaller sites in terms of possible patterns associated with site utility or camp type. Out of the 64 sites, 13 do not have enough information to determine the average size of the rings allowing comparison with the number of rings per site. After finding the correlation coefficient between the two variables to be .11, a number too close to zero to

represent any significant correlation, performing a simple linear regression test of average diameter to number of rings was ruled out. A chi square test (χ^2) was used comparing the average size of all site rings to the number of rings.

To test the correlation between the variables, sites were divided into high number sites (greater than or equal to 7 rings) and low number sites (less than 7 rings). Again, average sizes for ring at a site were classified into small (rings with an average diameter less than or equal to 5 meters) and large (rings with an average diameter greater than 5 meters). The results of the test show the observed chi square value falling within the critical range of distribution (p=.05; df=1; $\chi^{2\,(critical)}$= 3.841; $\chi^{2\,(obtained)}$= 12). There is a significant correlation between the average size of all rings at a site and the number of rings per site as the obtained value lands within the critical region of the distribution. The test indicates that the number of rings at a site does correlate with the average size of the rings. The bivariate table created for the test shows a trend of small sites having smaller rings (n=21) and large sites have larger rings (n=16). There appears to be a difference in site patterning concerning site utility or camp type.

To test the validity of the chi squared results, a single variable *ANOVA* test was run (p=.95; df=49; F= .49; *F critical*= 1.95*).* Results of the *ANOVA* test show a normal distribution of values meaning the results of the chi squared test are incorrect and there is no correlation between the variables. The significance in the chi square test was the result of bias data concerning the high number outliers.

Elevation vs. Occupation Period

The comparison of stone circle elevation versus occupation period is possibly significant to land use patterns throughout prehistory. Though temporal data are lacking on a majority of the sites included in the table, site variables pertaining to the association of site elevation and relative age were still tested. For those sites containing relative or absolute dates, all of the Late Prehistoric sites are roughly situated between an elevation of 5000 and 5400 amsl. Stone circle sites associated with Archaic components, based on relative dating chronologies for projectile points, are located within the lower river valley terraces all the way up to the glacial benches and intermountain foothills. These sites range in elevation from the lowest recorded elevation in the drainage system around 4000 feet amsl, to an upland creek valley in YNP around 6600 amsl.

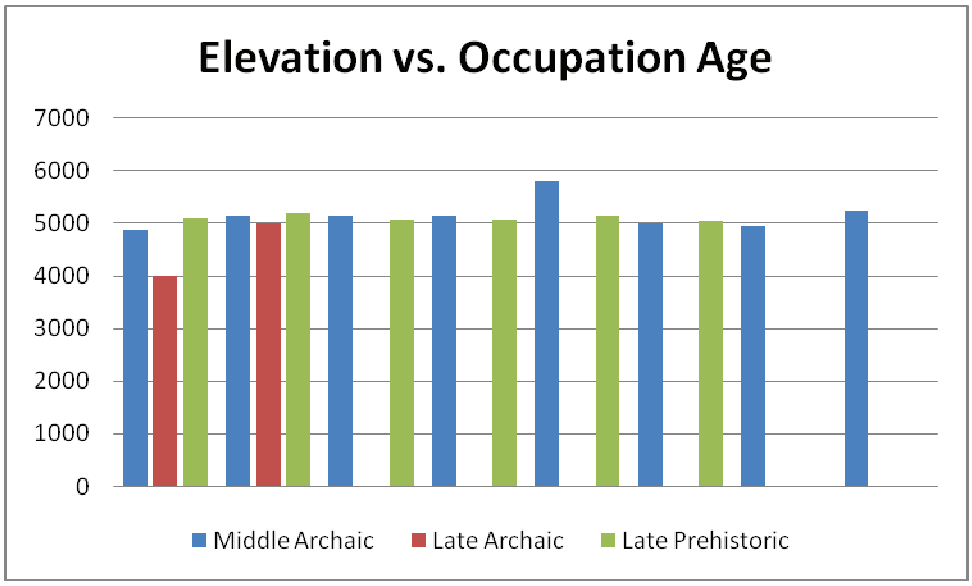


Figure 40. Graph showing distribution of sites when comparing relative age to site elevation.

Out of the 21 sites having relative occupation dates only 16 have recorded elevations, allowing comparison but with too small of a sample to test variable significance accurately. After finding the correlation coefficient between the two variables to be .11, a number too close to zero to represent any significant correlation, performing a simple linear regression test of elevation to relative site age was ruled out. A chi square test (χ^2) was used to test the data comparing relative age to site elevation. To test the correlation between the variables, sites were divided into high elevation sites (greater than or equal to 5,150 ft. amsl.) and low elevation sites (less than 5,150 ft. amsl.). The results of the test show the observed chi square value falling within the normal range of distribution *(p*=.05; df=2; $\chi^{2\,(critical)}$= 5.991; $\chi^{2\,(obtained)}$= 2.812). The test suggests no significant correlation exists between the elevation of sites and the relative age of the site. Possible sampling error aside, the data indicates a decreasing trend, showing that as the age of sites becomes older (Middle Archaic to Late Prehistoric) the site elevation becomes lower. To test the validity of the chi squared results, a single variable *ANOVA* test was run (*p*=.03; df=15; *F*= 4.50; *F critical*= 3.81*).* Results of the *ANOVA* test do show a normal distribution of values meaning the results of the chi squared test are possibly incorrect and there is a positive correlation between the variables. However, two additional *Anova* tests, one throwing out Late Archaic sites and the other throwing out the outliers, suggests the data is bias and that no correlation exists (Late Archaic: *p*=.66; df=13; *F*= .20; *F critical*= 4.75; Outliers: *p*=..53; df=13; *F*= .67; *F critical*= 3.98).

Research of Early Archaic populations proposed a "hiatus" of hunter-gatherers from the Plains as a response to the general warming and drying trends associated with the Altithermal climatic period (Mulloy 1958; Wedel 1963). A movement off the Plains is possible based on current research but there appears to have been varied responses by Plains Native Americans depending on the areas they utilized (Meltzer 1999). Water sources would have dried up in some places and not others (Meltzer 1999; Yansa 2007), while bison populations might have varied in location and size based on available resources (Frison 1976; Reeves 1973). Pollen samples from the greater Yellowstone region show a warming trend during the Altithermal period beginning around 7000 B.P. and becoming increasingly drier with the evidence from increased grass pollen counts while tree pollen decreased (Whitlock and Bartlein 1993: 232). Pollen samples from other locations on the Northern Plains also suggest aridity of upland regions with the retreat of tree lines around 6500 – 6000 B.P. (Greiser, et al. 1985), dates consistent with Yansa's work on the Eastern Plains region showing the greatest drought period occurring on the upper Plains starting around 6000 B.P. (2007: 135). Even though the Altithermal period affected the entire Plains region in some fashion, "The impact of middle Holocene climate change seems relatively inconsequential" in the Northern Plains region (Meltzer 1999: 413).

Chronological problems exist in the archaeological record of the Upper Yellowstone when using relative and absolute dating (Wright 1982). When looking at stone circle and other prehistoric sites, deposits have returned wide-ranging absolute dates with occupation gaps roughly during the Middle Archaic in addition to the first 1000 years of the Late Archaic period. Relative dating based on projectile point typology provide periods of occupation cutting across all of the suggestive hiatus dates for the area. Observations from site reports and surveys of the area note the presence of Pelican Lake, Bitterroot/Hawken, Agate Basin, Hanna, Duncan, Elko, Oxbow, McKean, Avonlea and Old Woman phase projectile points associated with stone circles in the valley. Numerous sites in the region indicate Archaic use of high altitude locations during the Altithermal perhaps indicative of a push into the uplands by lower-elevation Plains Native Americans (Baumler et al. 1996; Bender and Wright 1988; Kornfeld, et al. 2001; Shortt 1999a).

Archaeological evidence from the greater Yellowstone region and other upland areas show general trends thought to be a result of Altithermal stresses. These trends include increased diet breadth based on resources requiring heavy processing (Greiser, et al.

1985; Meltzer 1999), a move to higher elevations or resource rich areas (Bender and Wright 1988; Frison, et al. 1976; Meltzer 1999; Smith and McNees 1999; Walthall 1998), and decreased mobility with the introduction of pit houses (Meltzer 1999) or other semi-permanent features like stone lined ovens (Bender and Wright 1988; Meltzer 1999; Smith and McNees 1999). Briefly returning to domestic structures, Archaic occupation of permanent or semi-permanent structures is also well documented not only in the greater Yellowstone system but also across the world. Early populations utilized permanent rock shelters in North America over the last 10,000 years (Walthall 1998) even though many of these hunter-gatherer groups, especially those of the Plains, are considered highly mobile groups subsisting on migrating game herds, specifically buffalo (Frison 1991). Semi-permanent pit houses were originally used in the Plains during the Altithermal some time around 6,000 B.P., suggesting reduced group settlement mobility (Meltzer 1999).

If Frison (1991) is correct that groups in the region were heavily reliant on migratory game, it seems unwise to utilize permanent or semi-permanent structures for long periods during the Altithermal when resources were possibly patchy across a large landscape. As noted before other than stone circles in the valley, strong evidence for the use of other types of domestic shelters like rock shelters, cave sites, and pit houses is not present within the region of the Upper Yellowstone. The lack of such structures supports the notion that the greater Yellowstone ecosystem was used predominantly by highly-mobile hunter-gatherers (Binford 1990). However, numerous works in the Teton area and south of Yellowstone Lake do exhibit almost a reverse trend where pit houses and cave/rock shelters are more common than stone circles (Frison 1991; Larson 1997; Smith and McNees 1999). This trend suggests a more centralized camp location, possibly the result of differing regional or temporal subsistence patterns, because these semi-permanent or permanent groups would have need to exploit a wide range of elevations if dependant mobile resources.

Size vs. Elevation

All of the stone circle sites in the Yellowstone Valley are on upland terraces and foothills within 200 meters or less from a water source. An exception to this trend consists with several single ring sites that are at slightly higher elevations within the valley. These higher elevation rings have no associated dates or artifacts noted on the site forms suggesting an alternative use to the structure than a domestic one. These sites could have special ceremonial or religious purposes such as vision quest structures

(Fredlund 1969) and would typically be smaller than rings associated with a domestic structure (Malouf 1961). A 2005 survey of the mountain ranges in the Bighorn National Forest of Wyoming recorded many of these stand-alone stone circle structures at high elevations overlooking valleys and known prehistoric camp locations (Hartley and Vawser 2005).

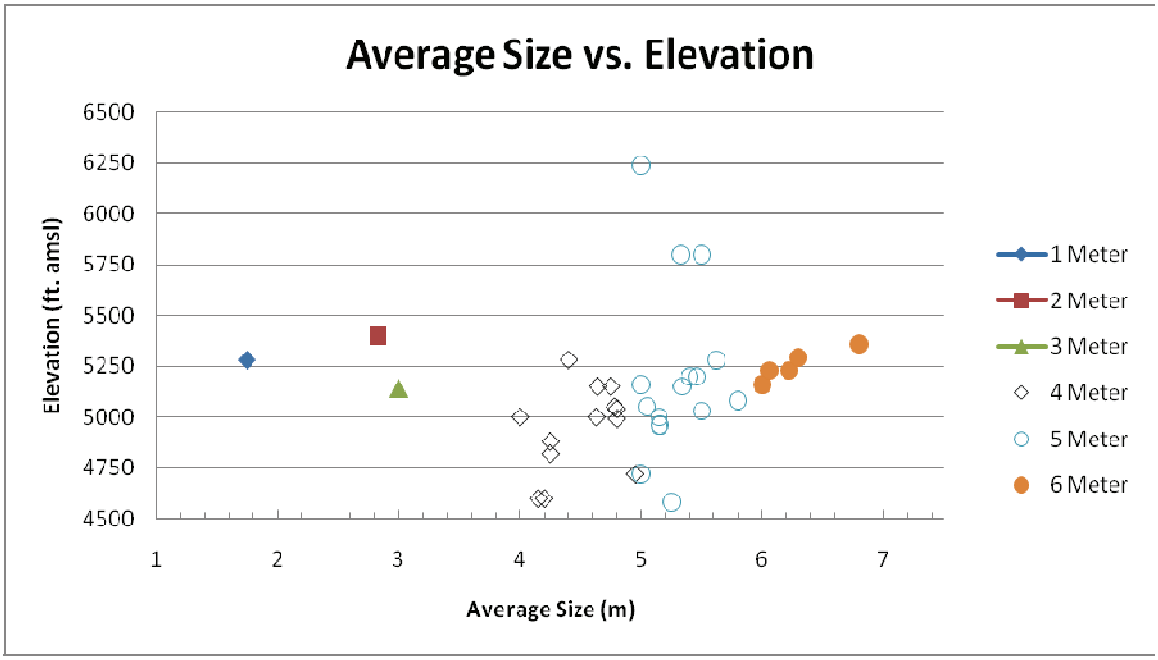


Figure 41. Graph showing distribution of sites when comparing average size of all rings to site elevation. Sites are plotted by size (ex. 1<2 Meter, 2<3 Meter, etc.).

Out of the 48 ring sites that had recorded site elevation, only 37 sites have enough data to establish the average diameter of all rings for the site. After finding the correlation coefficient between the two variables to be .14, a number too close to zero to represent any significant correlation, a simple linear regression test comparing elevation to average size was ruled out. A chi square test (χ^2) was used to compare data of average ring size to site elevation. To test the correlation between the variables, sites were divided into high elevation sites (greater than or equal to the median elevation of 5,150 ft. amsl.) and low elevation sites (less than 5,150 ft. amsl.). Again, average sizes for rings at a site were classified into small (rings with an average diameter less than or equal to 5 meters) and large (rings with an average diameter greater than 5 meters). The results of the test show the observed chi square value falling within the normal range of distribution (p=.05; df=1; $\chi^{2\,(critical)}$= 3.841; $\chi^{2\,(obtained)}$= 2.173). According to the chi square results, there is no significant correlation between the elevation and the

average size of all the rings at a site. Sites with smaller rings tend to be at elevations below 5,150 ft. (n=11), while sites with a larger average ring size tend to be at elevations higher than 5,150 ft. (n=12). To test the validity of the chi squared results, a single variable *ANOVA* test was run (*p*=.27; df= 36; *F*= 1.35; *F critical*= 2.52*).* Results of the *ANOVA* test show a normal distribution of values meaning the results of the chi squared test are correct and that no correlations exist between the variables.

One inference into size ties into the belief, based on site location and ethnographic information, that these prehistoric groups utilized the valley floors as wintering locations (Hale 2003). Late Prehistoric sites fall within a small elevation range consistent with those elevation ranges associated with valley floors. This trend provides a size, date, and elevation connection consistent with Late Prehistoric stone circle sites. If these groups used the valley floors as wintering locations, habitation structures would show an increased size due to the extended stay in one location (Binford 1980).

In addition to the increase in structure size from a longer stay in an area, the afforded mobility of horses would facilitate larger settlement patterns. If these groups did not have to move constantly, they could afford a larger structure to accommodate a longer stay in a resource area in terms of increased work and living space. Looking at the pattern of larger rings associated with Late Prehistoric dates all confined within a small elevation range confirms the likelihood that Late Prehistoric groups used larger stone circles within the valley floors.

Number vs. Elevation

Only 59 of the 64 stone circle sites have the number of rings recorded. Out of these 59 sites, 14 of the sites did not have an elevation recorded. Forty-five sites were used to determine a correlation between the number of rings of a site and site elevation. After finding the correlation coefficient between the two variables to be .06, a number too close to zero to represent any significant correlation, a simple linear regression test comparing elevation to the number of rings was ruled out. A chi square test (χ^2) was used to compare average ring size to site elevation. To test the correlation between the variables, sites were divided into high elevation sites (greater than or equal to the median elevation of 5,150 ft. amsl.) and low number sites (less than 5,150 ft. amsl.). Also, sites were divided into high number sites (greater than or equal to 7 rings) and low number sites (less than 7 rings). The results of the test show the observed chi square value falling within the normal range of distribution *(p*=.05; df=1; $\chi^{2\,(critical)}$= 3.841; $\chi^{2\,(obtained)}$= .04). There is no significant correlation between the elevation and number of

rings at a site. The graph indicates a similar bottleneck pattern as the earlier graph comparing average ring size to the number of rings, also suggestive of a normal distribution range. To test the validity of the chi squared results, a single variable *ANOVA* test was run (*p*=.79; df=43; *F*= .69; *F critical*= 2.04*)*. Results of the *ANOVA* test show a normal distribution of values meaning the results of the chi squared test are correct and there is no correlation between the variables.

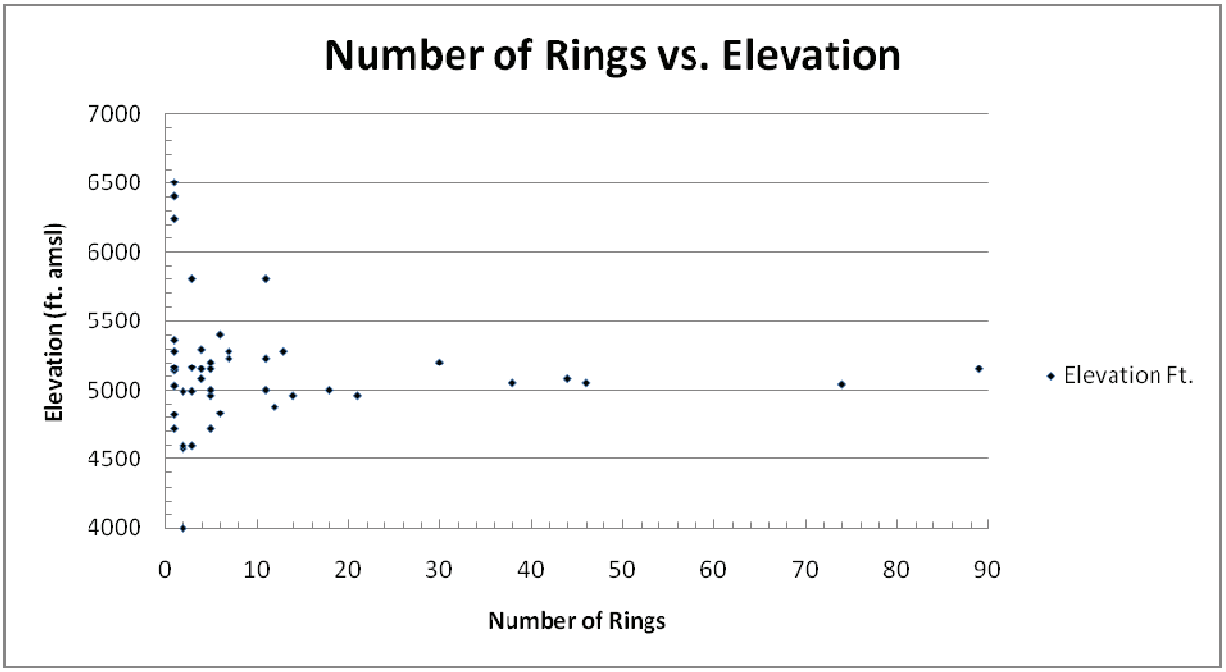


Figure 42. Graph showing distribution of sites when comparing number of rings to site elevation.

Looking over the comparative data, several slight patterns emerge concerning the number of rings at a site and the elevation at which the site is located. All of the stone circle sites at the highest end of the elevation scale, 5800 feet and up, contain one stone circle, again suggesting an alternative function. Only one or two of these single-ring sites had recorded surface artifact finds, further confirmation that these sites likely were not domestic. The sites with one or two rings also held up the lower end of the elevation scale at elevations around 4200 ft. Sites with three to four rings suggest that these groups were exploiting varied expanses of the landscape for reasons unlike those sites with more rings. These smaller count stone circle sites vary at elevations between 4600 and 5800 feet amsl, a difference of 1200 feet. Moving up to sites with more than four stone circles but less than ten shows a slight decrease in elevation range to a difference

of 700 feet between 4700 and 5400 feet amsl. Sites with up to 30 rings break the trend of a decreasing range in elevation due to a site at 5800 feet. However, save the site located around 5800 feet the other ten sites all fit into the 4880 to 5280 ft. range, a difference of 400 feet.

Based on the data available, a trend is noticeable when comparing the number of rings to the site elevation. The data suggest the larger the site is, the more localized or centralized the camp location will be relative to the highest and lowest habitable locations within a given valley. Groups utilizing a portable, tipi like structure would not camp at the highest or the lowest habitable elevations when in larger groups. This suggests Binford's theory of hunter-gatherer foraging strategies utilizing strategic resource parties is correct (1980). The groups would localize camp in an intermediary location relative to the type of resources available. From this localized camp, smaller task specific hunting or gathering groups would forage out to exploit resources across the range of elevations. This trend also fits in with the assumed use patterns associated with prehistoric hunter-gatherers utilizing intermountain regions and those assumptions on use patterns of regions in as well as around YNP.

Number vs. Occupation Period

Out of the 21 sites that have relative dates associated with diagnostic artifacts, only 18 of the sites have had the number of rings recorded. To test the correlation between the variables, a chi square test (χ^2) was performed comparing relative age to the number of rings per site. Sites were divided into large sites (greater than or equal to 7 rings) and small sites (less than 7 rings). The results of the test show the observed chi square value falling within the normal range of distribution (p=.05; df=3; $\chi^{2\,(critical)}$= 7.815; $\chi^{2\,(obtained)}$= 2.036). There is not a significant correlation between the relative age of a site and the number of rings. The data indicates an increasing trend meaning the older the site's relative age (i.e. Early Archaic to Late Prehistoric), the more rings or larger the site should be. To test the validity of the chi squared results, a single variable *ANOVA* test was run (p=.15; df= 17; *F*= 2.08; *F critical*= 3.34*).* Results of the *ANOVA* test show a normal distribution of values meaning the results of the chi squared test are correct and no correlation exists between the variables.

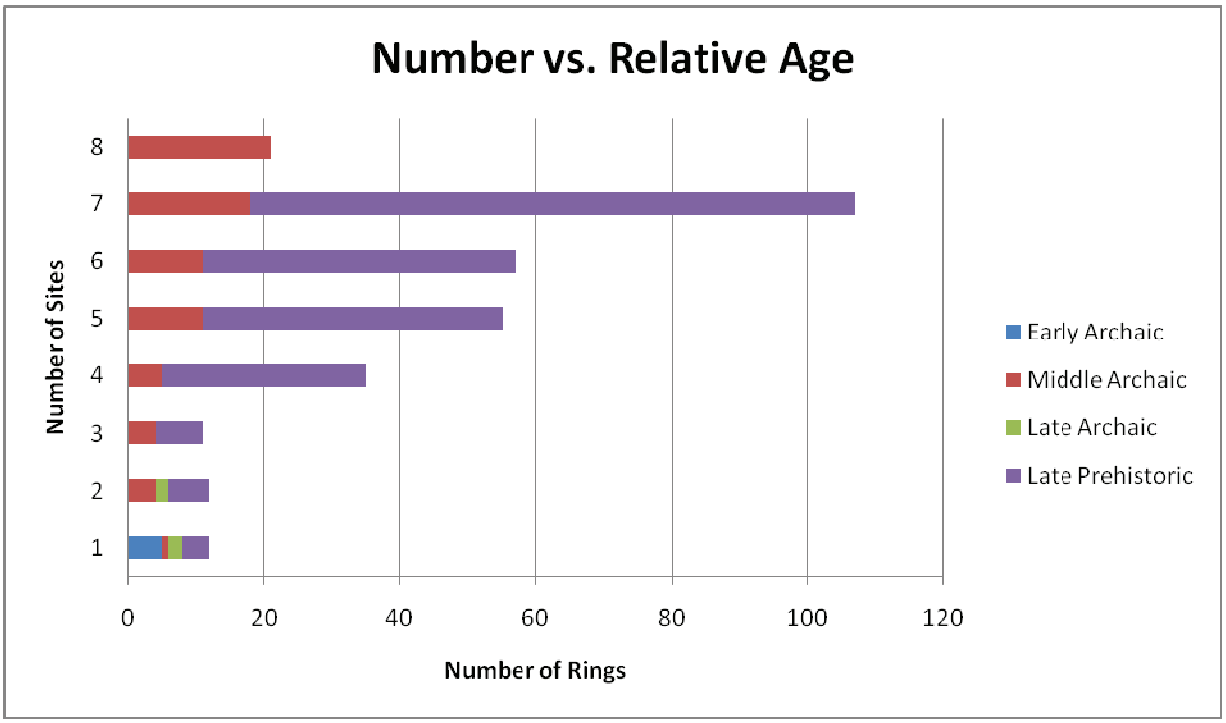


Figure 43. Graph showing site distribution when comparing number of sites to relative age.

As noted above, a majority of the sites with a small number of rings do not have temporal data according to the site reports. Of the 28 sites that have less than five rings, only five have relative dates based upon diagnostic projectile points. All of these sites, apart from one Late Prehistoric site, are relatively dated with projectile point chronologies for Middle Archaic points associated with Hanna and Duncan typologies (circa 3500 -3000 B.P.) (Davis et al. 1996). Moving up in number to the 12 sites with five to ten rings, only four have relative dates consisting of two Late Prehistoric dates, another Middle Archaic Hanna Phase date, and one possible Early Archaic site evident by the discovery of a Bitterroot or Hawken Side-notched Point. The dates for the Bitterroot or Hawken Side-notch fall within the Mummy Cave Complex dating around 7500 -5500 B.P. (Davis et al. 1996) and the chances of this point's association with the stone ring on the surface is highly unlikely due to the human disturbance reported at the site.

There are nine reports noting between 11 and 30 rings, again with a small number providing dates. Four of these sites are relatively dated on point typology, two sites dated to the Late Prehistoric Period and two sites associated with the Middle Archaic Hanna Phase. Airport Rings, the last site with dates, has been dated using both relative

and absolute dating techniques providing dates for two different components. Both Late Prehistoric and Middle Archaic dates are present at the site but discerning if both are associated with the stone circles on the surface is a common problem associated with dating tipi rings. The final five sites consisting of more than 30 rings, up to 89 rings, are all Late Prehistoric sites based upon relative point type chronologies. These last sites are the only ones providing support to supposed models of settlement associated with the use of tipi rings by Plains Hunter-gatherers. The general assumption held for the use of tipi rings on the Plains is that with the rise of buffalo hunting came a population explosion. The basic result and belief from this is that there were more people, meaning more tipis being used resulting in larger campsites (Light 1984). The test of this data could also suggest that Late Prehistoric populations favored the same locations as the Middle Archaic groups. In the event this trend is accurate, it would provide evidence of the same groups passing down information and repeatedly utilizing the same landform.

Locations

As mentioned earlier, all of the sites in the valley, except four, are within a 200 meter distance from a water source. Most sites are located on relatively flat benches or terraces no matter their specific location within the valley, congruent to known patterns of settlement by tipi using peoples. The sites in the Yellowstone Valley typically match the trend in location of stone circle sites found on the Plains. Benches, terraces, escarpments, ridges, and other elevated, yet protected landforms in proximity to various resources are the most common places to find stone circle sites (Dooley 2004; Kehoe 1960; Malouf 1958, 1961; Oetellar 2006). A majority of wikiups located by Malouf (1958: 5) were at high or almost “inaccessible” elevations signifying a difference in structure use in the park proper whose remains would not be confused with those stone circles left by tipis. Another common theme in location of these sites is that they provide an extensive view of the surrounding lowlands (Dooley 2004) possibly for protective or economic purposes.

Except for the single rings sites exhibiting no domestic indicators within the Yellowstone Valley, north of Gardiner, other high altitude sights are still located within the main channel or valley created by a moving water source. The Yellowstone River Valley was used as a travel corridor (Hale 2003) and this suggests the importance of water systems being utilized not only as natural travel routes, but also for the reliance on migrating food sources. “All populations experience differential availability of food, and therefore variation in consumption patterns, depending on phases of the agricultural

calendar, the seasonal movement of animal species, growth cycles of animals, maturation period of plants, and climatic and other temporally patterned ecological hazards" (Roy 1982: 154). Changing ecosystems create the need for population to vary their strategies necessary for survival. In order to manage resources, these groups might have changed their settlement or mobility patterns, created environmental modifications like drive lines, utilize areas of specialization in terms of food procurement strategies, or develop technologies like the mobile tipi to assist in changing mobility patterns (Roy 1982: 123)

The Yellowstone area, like many others comprising the Northern Rockies Intermountain region, is an area of seasonally compressed resources affecting the movement patterns or seasonal cycles of prehistoric peoples (Hale 2003; Light 1984; Madsen and Metcalf 2000; Reeve 1980; Zeanah 2000). Archaic mobility was based on seasonality (Kornfeld 1997) and the exploitation of resources in the Yellowstone region still followed this seasonal trend into the Historic Period (Reeve 1980). In warmer seasons, food resources are generally more diverse and available (Roy 1982) allowing for increased production at higher elevations (Reeve 1980). Hunter-gatherers with a wide diet breadth would have issues during the late summer or early fall with the location of these abundant resources. Groups would be forced to choose which resources to exploit locally (base camp location) and logistically (foraging parties) (Zeanah 2000: 7).

Site location is an important factor when considering the application of seasonally and/or elevation based subsistence models. According to Zeanah (2000: 10), it would make more sense for an optimal thinking hunter to place a domestic camp closer to the optimal hunting resources than farther away. In this case, for hunting to have a maximum profit potential, the camp needs to be closer to the higher profit food source to cut down travel time. If the high profit food source happens to be plant resources, the camp would most optimally have a location closer to the plant.

Within a domestic site, there are further units of classification archaeological remains can be broken into for purposes of statistical analysis. The easiest way to explain the difference in subsistence strategies is to look at the information available in the variation of faunal and floral remains. Sites showing a pattern with a higher reliance on hunting would have the remains of larger game species such as elk, bison, deer, and pronghorn more prevalent than subsistence strategies focused less on hunting. Using similar faunal classification techniques such as Lubinski (2000), MNI (minimum number of individuals) studies would show the number of individuals present at a site and are more

important in the analysis of subsistence strategies employed at a site than NISP (number of individual specimens) studies due to the deteriorative nature of bone (Lyman 1994). General assumptions of site components relaying subsistence strategies are not concerned with the quantitative results of bone compared to floral remains, but rather the qualitative differences. Sites showing a higher reliance on plant foraging should have stone tool evidence such as grinding stones as well as charred floral remains consistent with root or seed processing, similar to other known high altitude plant gathering and processing sights (Frison 1991; Francis 2000). Specific seed types of known high altitude plants gathered by prehistoric people, like camas root, would also provide the evidence needed to determine plant gathering as the major subsistence strategy at a site (Reeves et al. 1981).

Depending on the season the site was occupied and the availability of key resources such as food, wood, or water are the factors that would affect site location (Light 1984). Groups using the uplands of YNP during the warmer months would move from higher elevation to surrounding lowland valleys for wintering camps (Hale 2003). This move from higher to lower elevation is a common trend of the seasonal mobility cycle of Intermountain populations and occurs on the Plains when winter encampments move to the river bottoms (Light 1984; Vickers and Peck 2004; Wedel 1963). Wood becomes the critical resource necessary for survival of not only Plains groups, but for Intermountain groups as well, it is the factor influencing winter camp locations. Historic and ethnographic evidence documents the importance of wood or fuel needs for native groups during winter as there was no alternative to wood for winter heating (Vickers and Peck 2004; Wedel 1963). Wood is confined to certain areas of the Plains and Intermountain regions, specifically to the parkland periphery, segments of river valleys, and upland flanks, providing an additional interpretation for why higher elevation camps exhibit shorter occupation events at least for Late Prehistoric groups (Vickers and Peck 2004: 98-99).

Wintering sites would then provide evidence of a mixed hunting and gathering strategy at lower elevations due to the inability to utilize higher elevations during winter months from heavy snowfall. In terms of evidence from 24YE357 supporting this idea, there is none, as no artifact directly related to plant processing or storage caches indicative of wintering were discovered. Lower elevation sites in the valley bottoms offer mobility if needed during winter and provide the resources necessary for survival.

The excavations at Airport Rings attempted to answer many questions and the preceding comparisons are only a few examples of the research that can be done from surface data collected at stone circle sites. Further investigations from 24YE357 and other sites within the valley could eventually shed light onto the current issues concerning the lack of knowledge pertaining to intermountain region settlement patterns, especially Archaic adaptations (Baumler 1996).

Summary

Testing the data collected from previously recorded stone circle sites from the Upper Yellowstone River Valley provides insight into the effect of a range of variables. After performing chi square tests for six different hypotheses, five were found to have no significant correlations. One significant correlation was seen in the chi square test using variables of average ring size and number of rings, determining the variables are independent of each other. However, *ANOVA* tests used to check the validity of the chi square test results all point to no correlations between variables. The results of the other chi squared tests are biased either due to a sampling error or a fluke in the application of the test.

According to the *ANOVA* results, only one of the six chi square tests confirmed a significant correlation. Upon further testing of the data concerning site elevation and occupation age, no significant correlations were found to exist when omitting the small sample of Late Archaic sites or the data outliers. Based on these data and data collected by the MYAP crew at 24YE357, the site was likely used multiple times between the Archaic and Late Prehistoric as a seasonal hunter-gatherer camp for Native Americans moving between the Yellowstone Plateau and the Yellowstone River.

CHAPTER 8. CONCLUSION

by Michael C. Livers and Douglas H. MacDonald

Stone circle documentation and research procedures have varied over many decades. Researchers today still face challenges connected with the CRM processes related with stone circle sites that differ from the early archaeologists of the Plains. The biggest obstacle in understanding stone circle site types has shifted away from the original questions of function and use to inconsistencies inherent in laws governing the practice of archaeology on federal land. There are problems associated with the study of tipi rings and these problems will persist until Federal agencies adequately address consistency and standardization practices involved with CRM. The public and CRM practitioners should remain wary of these differences in interpretation of what is required by law. Let neither group forget that the practice of cultural resource management consists of using more investigative fields than just archaeology and that these other fields are just as important to consider in the CRM process (King 2002).

MYAP FINDINGS

The 2007 MYAP team documented stone circles at three sites in 2008, including 24YE0182 (GMS 1), 24YE204 (HRC Rings), and 24YE203 (JLF 1). A total of 14 circles were identified at those sites (Table 37). As reflected in Table 37, the 2007-2008 survey identified a total of 32 stone circles at five sites in the Boundary Lands. The setting of the five sites varies from upper terraces overlooking the Yellowstone River—Stephens Creek (24YE356) and Airport Rings (24YE357)—to upland flats and high benches adjacent to springs and low-order feeder streams (all three sites in 2008). All of the sites are in well-protected settings, generally with water and a good view on one side and a hill or enclosed valley on the other.

Table 37. Summary of Stone Circle Sites in Boundary Lands, MYAP 2007-2008.

Year of	Site Number	Site Name	Stone Circles (N)	Period of Occupation	Site Setting	Nearest Water	Type of Work
2008	24YE182	GMS-1	5	Late Archaic	High Bench	Reese Cr.	Surface survey
2008	24YE203	JLF-1	6	Unknown	Upland valley	Unnamed crk	Surface survey
2008	24YE204	HRC Rings	3	Unknown	High Bench	Unnamed crk	Surface survey
2007	24YE356	Stephens Creek	7	Unknown	Upper terrace	Yellowstone	Surface survey
2007	24YE357	Airport Rings	11	L. Prehistoric	Upper terrace	Yellowstone	Excavations

Overall, the chronological trend supports long-term use of stone circles in the Boundary Lands, with sites dating to the Late Archaic—GMS-1 (24YE182)—and Late Prehistoric—Airport Rings (24YE357). The latter site also yielded a Middle Archaic hearth within one of the stone circles, leaving open the possibility of the earliest dated stone circle in the Northern Plains. However, it is possible that the Late Prehistoric stone circles simply overlay an early Middle Archaic occupation of the site.

The University of Montana excavations at Airport Rings provided crucial information to understand prehistoric use of stone circles in Yellowstone National Park. Previous to MYAP's work at the site, no excavations had ever been conducted at a stone circle site in the park's boundaries, or within the Upper Yellowstone Valley for that matter. Results of the excavation at the Airport Rings site have provided sufficient data to answer several important questions pertaining to the larger picture of stone circles studies.

In general, archaeological investigations and work in the Intermountain regions of the Northern Rockies in Montana and Canada are quite recent compared to other Intermountain regions. Research in the various other Intermountain regions such as California's White Hills (Zeanah 2000), Wyoming's Teton Valley area (Frison 1991; McKibben 2000, Wright et al. 1980), Utah's Uinta Mountains (Madsen et al. 2000), the Colorado Rockies (Magennis et al. 2000) and the Great Basin (Bettinger 1982, 1983) have all provided insight into prehistoric life. Research in these geographic areas has provided substantial information on similar behaviors patterns among the hunter-gatherers residing in this expansive place. However, this research on mobility, subsistence strategies, and resource use in Intermountain regions lacks a perfect model applicable across the whole of the Intermountain Zone covering almost the entire Western half of the continent. As a result, there is a wide area of potential in the development of hypothesis and models relevant to Intermountain studies something the author hopes to address in another venue.

Even though the authors feel that more work should take place at the Airport Rings site in the future to fully understand the site, the data available provided some insight into the use of this landform up to 5,000 years ago. The site itself has been in use over several thousand years as evident by the projectile points and radiocarbon dates collected from the excavation of three out of eleven stone circles present at the site. This geographic location would have been a perfect camp for any prehistoric group's travels into the park during late spring to late fall.

Small groups of maybe two or three families at most visited Airport Rings per occupation event based upon the current site formation. Although there are a total of 11 rings the probability of all of them being occupied at the same time is highly unlikely due to indication of rock reuse and the wide range of dates associated with artifacts. A general trend based upon the current formation of the rings suggests a decrease in age from west to east across the landform. Rings farther west are less complete and appear imbedded deeper into the soil than those encountered past Feature 6 suggesting they are older. However, Feature 4 did have a Late Prehistoric component suggesting that different parts of the landform were used during different periods of occupation. The size of the rings also show a trend of increased size from west to east again suggesting the age use of the terrace, but as discussed in an earlier section, determining the age of a stone circle based upon the size could prove an inaccurate method. A majority of the rings as one travels to the east are fairly intact and other data recovered from the sight implies the landform saw increased use during the Late Prehistoric Period.

Many different cultural phases are present within the archaeological record of YNP and at the Airport Rings Site. The excavations from the three stone circle features at 24YE357 resulted in the evidence for Middle Archaic, Late Archaic, and Late Prehistoric occupation events at the site. Three hearths were uncovered providing charcoal samples from each, which were analyzed to provide absolute radiocarbon dates pertaining to the associated occupation of the ring. These samples provided one date around the beginning of the Middle Archaic Period, and two dates for the Late Prehistoric Period within 100 years of each other, more evidence for the implications of increased use during this period. The temporal ranges from projectile points recovered during excavation support the dates from radiocarbon samples from the hearths.

However, the projectile point chronology also covers dates not supported by the charcoal sample dates, signifying that the points may not have been associated with the use of the features. In all likelihood, the projectile points are probably associated with

the radiocarbon dates but this hypothesis is one possibly valid, alternative interpretation worth mentioning. All of the points recovered from the site were incomplete after having suffered some type of damage associated with its use. The best type affiliations associated with these point fragments put the seven points into five possible phases covering the range of dates from 5000 B.P. to 400 B.P. One of the points was classified as a Middle Archaic Oxbow type; another was determined to be a Late Prehistoric Avonlea, two were linked to the Late Archaic Pelican Lake phase, and the others were all untyped Late Prehistoric forms.

The results of lithic analysis show an increased use of raw material sources farther away from the Boundary Lands during the Archaic periods and an intensification of more local resources in later periods. The lithic sourcing from the Airport Rings showed a high reliance on local obsidian material with over 90% of submitted artifacts originating from the Obsidian Cliff inside the park. While other materials were recovered at the site (Crescent Hill Chert, Grasshopper Knob Dacite, and Bear Gulch Obsidian) these artifacts accounted for very little of the artifact assemblage.

Speculation of this trend might be the result of differences described by Frison at the beginning of this volume pertaining to the use of the greater Yellowstone area by Foothills-Mountain groups or Plains groups. If Foothills-Mountains groups remained more centralized to the Intermountain region around Yellowstone, the minimal use of exotic resources recovered from Airport Rings makes sense. The Yellowstone region may have just been an addition or extension of the Mountain-foothills cultural landscape where as groups coming from the Plains into the area would not have been as familiar with the interior of the Intermountain region. This is just one interpretation gleaned from the lithic results and many more questions could be asked pertaining to the shift in resource procurement locations. These differences could be the result of divergence in mobility patterns between the Archaic and Late Prehistoric groups, signify differences in cultural or social groups, or even signify a shift in the technological organization between prehistoric groups.

Subsistence information based upon the floral and faunal analysis of recovered artifacts remains relatively unexplored for the site as the excavations turned up sparse amounts of data from which to draw conclusions. The one observation that did come from the analysis of plant and animal remains was the lack of plant remains generally associated with hunting and gathering suggesting that the site was in a better area for hunting. Hunter-gatherer archaeology on the Great Plains over the past several

decades has established the general acceptance of subsistence, or survival, activities based upon the hunting of large game species. Subsistence models of intermountain archaeology (Madsen and Metcalf 2000) indicate seasonal rounds of travel more focused on gathering plant resources during peak growing periods at elevations above 7-8,000 ft. for the Greater Yellowstone Region. Taking the lack of plant resources recovered from the site and the evidence of large game species like deer and bison in the faunal remains, it is highly likely that this seasonal strategy was utilized in this region. The remains from the Airport Rings site represent an example of a subsistence strategy that could be interpreted as confirmation that the site was used as a seasonal stop over location for travel in and out of YNP uplands.

"Usually a single population will employ a range or such techniques which together constitute a mode or subsistence or – emphasizing its adaptive and coping aspects – a subsistence strategy" (Roy 1982: 128). Roy (1982) lists six aspects or techniques related to obtaining food, of which four are possible factors in the development of the subsistence strategies used by prehistoric groups in the Upper Yellowstone River Valley. The four techniques Roy lists as non-domestic techniques are: gathering plant resources (gathering), collecting animal and their products (foraging), fishing, hunting and trapping (1982: 128). All four of these examples could have been used by past groups in the area as little is know about the exact forms of subsistence utilized by Rocky Mountain hunter-gatherer groups. To date, no evidence of fishing has turned up in the archaeological record of the Upper Yellowstone and other work in the area has not been able to contribute a full picture of subsistence strategies in use (Hale 2003).

The excavations during the 2008 MYAP Field Season at Airport Rings Site (24YE357) were just the first step taken in developing data sets pertaining to the many unanswered questions about occupation of the Greater Yellowstone Region. The goal of the project was exploratory and allowed for the interpretation of recovered archaeological data answering questions on a small scale pertaining to prehistoric life specific to the site. These interpretations paint the picture of daily life and purpose of the site over an extended stage of tenancy by those native groups living in the Greater Yellowstone Region. Site-specific and small-scale questions need to be addressed before the grand scheme is unveiled in studies directed towards understanding stone circle use of the past. Results of the varied analyses conducted from Airport Rings data have provided preliminary explanations to such questions like what subsistence strategies were employed in the area, whether resources were exploited on a seasonal

basis or by task groups, and one of the more important questions regarding the lack of stone circles in the Park uplands.

So, to continue our story so rudely interrupted in Chapter 1. The family built a fire, laid out their hides on the lodge's floor, and began to cook the remains of a deer they had taken while hunting before the vicious winter storm rolled over them. It was now getting dark out. Luckily, they had collected a fair amount of drift wood and they were able to keep the fire burning all night long, while they waited out the storm. During the night, however, a small crack formed in the windward wall of the lodge. A cold breeze inched its way through the crack, blowing ash from the fire against the back wall of the lodge. By morning, about three inches of ash had accumulated along that back wall. Father, who had been sleeping over there, had moved to the opposite side next to his children. He didn't want to be covered in ash. In morning when day broke the storm's energy had dissipated, father went outside to assess the situation. A foot of snow had fallen over night, but the morning was beautiful with a pink light encompassing the Yellowstone Valley. Father woke up his wife and children and they embraced the day.

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