2015

Engendering the Past: An Archaeological Examination of the Precontact Lifeways of Women at Yellowstone Lake, Yellowstone National Park

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By

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B.A., Anthropology, University of Montana, Missoula, MT, 2011

Thesis Paper

Presented in Partial Fulfillment of the Requirements
for the Degree of Master of Arts Anthropology

The University of Montana
Missoula, MT
Fall 2015

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Abstract

Beecher, Cathy Jo, M.A., *Winter 2015 Anthropology*

Engendering the Past: An archaeological examination of the lifeways of women in precontact Yellowstone National Park, Wyoming

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This thesis examines three lines of evidence within the precontact archaeological record around Yellowstone Lake, focusing on elucidating female-specific lifeways. This work is undertaken as a means to explore concepts of gender within precontact archaeological contexts. This aim is accomplished using statistical analysis of lithic tool distribution patterns, ethnohistoric information on plants found through archaeobotanical assays and the microspatial examination of cultural fire features.

Variation in the use of obsidian and chert for unifacial tool manufacture indicates potential restrictions on the manufacture of gender specific tools as these stone resources become less available. In addition, a frame-of-reference is built by associating archaeobotanical remains with their ethnohistoric uses, including unique female-specific uses for pregnancy, menstruation and spiritual purposes. Finally, a microspatial analysis of cultural fire features reveals intentional creation of roasting and/or boiling pits, which indicates the processing of plant foods. Because these types of features require a greater investment of time and energy, and the processing of plants is typically a female-specific domain, the inference is that these were female-specific activity areas.

The focus of this research is novel, in that it is the only work focused specifically on questions of gender and gender dynamics in precontact Yellowstone. Because gender is often overlooked or deemed too ephemeral to be gleaned from the archaeological record of hunter-gatherer societies, the implications of these findings are three-fold. First, there is a clear demonstration of the effective use of common methodological approaches in archaeology (statistical, ethnography, spatial analysis) in order to answer a question that is not commonly asked: “where are the women?” Second, the importance of understanding the lifeways of precontact people in the social context of group relations not only provides more nuanced understanding, but also breathes life into chronically depersonalized archaeological interpretations. Third, this work demonstrates the importance of utilizing previously collected archaeological data in order to build upon past research interpretations, which is in the interest of the sustainability of the archaeological enterprise.

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Chapter 1: Introduction

This research attempts to identify and define the relationship between cultural materials and the expression of gender within the precontact archaeological record from the Yellowstone Lake area in Yellowstone National Park (YNP) in Wyoming. The objective is to define how gender played a role within activity areas and with particular components of these activity areas, in order to define the role gender distinctions played within these precontact societies. This objective is met using multiple lines of archaeological evidence and various established archaeological methods, within a blended theoretical framework. Elucidating gender-specific task and space differentiation for semi-nomadic precontact plains Native American populations assists in understanding the construction and influence of gender dynamics as it pertains to subsistence, mobility, proclivity for particular resources and resource areas, as well as the demographics and function of groups frequenting the lake.

The exploration of gender as assigned to material remains is a relatively new research avenue in archaeology (c. late 1970s) (Conkey and Gero 1997:411-437), especially for precontact plains archaeology (Kornfeld 1991; Claassen 1997). Inferences made based on gendered activity areas in archaeological contexts can be used to illuminate gender relations and the dynamic social processes involved. It also provides for richer interpretations of prehistory by attributing social agency to individuals, thus allowing for more nuanced understandings of the people whose material culture we study (Gero and Conkey 1991:5). Without viewing and exploring gender in archaeological contexts as a “historical process”, we are left with flat, disembodied interpretations of the past (Gero and Conkey 1991:5; Claassen and Joyce 1997:4-12; Wright 1996:83).

Proposing ways to engender the archaeological record such as that of precontact hunter-gatherers around Yellowstone Lake is challenging, and susceptible to "biased or implied gender reconstructions" (Brettell and Sargent 2012:56; Conkey and Spector 1984). The hunter-gatherer lifestyle leaves very little behind in terms of a material culture that unambiguously denotes how gender was conceived in these societies. Hallmark indicators of gender performance such as art (mobile or monumental) and gender specific structures (Claassen and Joyce 1997, Gero and Conkey 1991) are rarely recovered; the exception is rock or cave art, which is present but infrequent in this region.

This lacuna in material remains readily associated with gender is exacerbated by preservation issues specific to the Yellowstone region, such as extremely acidic soil, which breaks down organic materials quickly, and environmental factors such as fluctuating lake shore levels, wildfire, erosion and human impacts which destroy archaeological remains. Organic materials susceptible to destruction include textiles, nets, bone, sinew and wood, which are commonly associated with food procurement and processing activities. Women are commonly associated with the processing of most food stuffs including meat and flora (roots, seeds, moss, grasses, etc.) within food preparation areas in ethnoarchaeological studies of nomadic or semi-nomadic groups, such as those who utilized the Yellowstone Lake area (Hastorf 1991: 133-134); Jarvenpa and Brumbach 2006; Brettell and Sargent 2012:56-57). A gendered division of labor for subsistence activities can be established using material culture, however this is not universal and should not be presumed in all archaeological contexts (Brettell and Sargent 2012:51-54).

Gender roles are often established via a gendered division of labor system and then perpetuated as a key component to structural inequalities or reinforcing egalitarianism. These types of assumptions about divisions of labor however may be an overextension of ethnographic data, and an inaccurate projection of contemporary gender structures onto the past. However, ethnography is still valuable in lending "insight into our reconstructions of prehistoric behavior" (MacDonald 1998:232). The intangibility of gender relations makes studying gender performance within the archaeological record, especially that of plains archaeology, ambiguous. Initiating research that focuses on answering questions of female-specific activities, tools, influence and roles within past cultures seeks to understand a key aspect of prehistory, which is not always at the forefront of research agendas (Brettell and Sargent 2012:51). Namely the androcentric bias in archaeology has created an antagonistic environment for gender-based research, although this attitude has improved greatly over the last 20-30 years (Conkey 2002) In simplest terms, gender will be treated here not as a noun, as it is commonly conceived, but as an adverb where its purpose within prehistory is that of a modifier or qualifier for lifeways evidenced in the archaeological record (Conkey and Gero 1991:9). It is in this vein that this project seeks to apply qualitative and quantitative analyses to the question of prehistoric gender dynamics among groups at Yellowstone Lake.

The hypotheses for this project center on notions of sexual divisions of labor, defined within the archaeological record through the tools and botanical remains found in relation to specific activity areas. The focus is on using the existing archaeological record recovered by the Montana-Yellowstone Archaeological Project (MYAP) at YNP in a three pronged approach to engender archaeological sites around Yellowstone Lake. Subsequently this information is used to interpret the activities of women in terms of production, mobility, and any other life-cycle dynamics as evidenced through the material remains. The research project offers the opportunity for analysis of varied aspects of lifeways for the peoples that utilized this area in precontact times.

The three areas of focus are: lithic tools, ethnobotanical remains and spatial analysis of cultural features, and how these components may inform us about gender. Each of the three lines of evidence is considered to contribute to the "lifeways" of people using the area. Lifeways are defined as: "the factors conditioning human behavior and culture –for example, constraints on foraging, factors affecting trade and territoriality, and the ecology of reproduction (Kelly 2013:22) This definition can therefore encompass anything which contributes to the social group dynamics as a whole through individual agency, as well as through collective action. It is important to keep this concept of social agency at the forefront in gender research aims. Often macroscale analysis tends to disembody the cultural material from the cultural *agent*. A multi-dimensional focus on gender can refine interpretations, as well as ask questions that may not be asked otherwise (Drobes 1995:28).

This project analyzes the Yellowstone Lake archaeological record from a gender-based perspective, using data previously analyzed from a cultural-historic and processual perspective. Greater diversity of theoretical applications and research aims for these data sets allows for both coarse grained focus on classification and chronology and fine-grained exploration of various dynamic social processes. The goal is drawing women out from behind the shadows of prehistory, demonstrating how they worked in concert with men through sophisticated gender dynamics. These men and women established successful lifeways which served the peoples of the Yellowstone region for thousands of years.

Something that should be touched upon here is the sustainability of the archaeological enterprise. Reanalysis of data from various theoretical and research perspectives is a key aspects of this. Archaeological excavation to acquire new data is destructive by design, and while places and things to excavate will not be depleted anytime soon, it should be a long-range consideration for contemporary practitioners. Another issue is that archaeological excavation is inherently expensive, so while research funding environments remain meager, archaeology as a discipline should look towards greater sustainability of the practice. Actively pursuing research topics using previously established data is one way to combat these symptomatic issues in archaeology. The analysis presented in this thesis provides evidence that using pre-existing data is a cost-effective way to conduct original archaeological research with meaningful results.

A word about word choice:

While the term "prehistoric" is part of established archaeological nomenclature, many indigenous peoples find this term offensive. In an effort to respect the indigenous of this region of study the term "precontact" is used, except where quoted from other sources or within the formalized chronology, used for dating purposes. The term "Indian" fell out of use for similar reasons, thus I refer to "Native Americans" or "indigenous peoples" when speaking in general terms; specific tribes are referred to using preferred traditional names where applicable, with the exception of quoting from other authors.

Chapter 2: Archaeological Research at Yellowstone Lake

2.1 Introduction

This thesis focuses on interpreting data from the 2009-2014 Montana-Yellowstone Archaeological Project (MYAP) site reports, in order to explore and establish gender structures and systems within the culture(s) of precontact peoples that frequented the Yellowstone Lake area. The specific aim of this thesis is to examine three distinct, but interrelated types of archaeological data in order to disentangle what is indicative of gender based lifeways within the broader subsistence based social processes.

The material remains used in this study include: lithic (i.e., stone) tools, ethnobotanical remains and cultural features (e.g., cooking hearth). Lithic and feature analysis was completed by Dr. Douglas MacDonald, RPA, Professor, The University of Montana, while Jannifer Gish, M.A. completed all ethnobotanical studies for this thesis. Combinations of quantitative, qualitative and statistical methods are used to analyze these data sets pertinent to the specific aim of this research project. In the summer of 2010, my participation in excavations at Yellowstone Lake, near the North shore/Fishing Bridge area provided direct knowledge of the research area. Working in the archaeology lab of Dr. MacDonald, cataloging lithics, recovered charcoal, fire-cracked rock and other artifacts from previous field seasons also provided implicit knowledge regarding the artifacts and cultural features associated with the Yellowstone Lake area. While this thesis includes no original artifact analyses, existing data are utilized to solve a unique research issue, the role of gender roles in the prehistory of Yellowstone, as described below.

The overarching goal of this thesis is to help develop gender-based research for precontact plains archaeology. This study is a means to demonstrate the application of already established methods and theories to interpret gender dynamics based on archaeological remains.

Bringing questions of gender dynamics, specifically that of women, and notions of precontact gender relations and ideology to the forefront of archaeological research proves to be a fruitful avenue of research in a multitude of geographic regions, cultural groups and points in prehistory (Brumfiel and Robin, eds. 2008). The primary specific aim of this thesis focuses on answering questions about the specific types of activities and related activity areas for women in relationship to Yellowstone Lake. The overarching goal is to move beyond direct interpretations of material culture, and focus on testing which methods and data sets can be used to determine the lifeways of women in this area. There is also an examination of how effectively gender research can be conducted for precontact plains hunter-gather groups, while wrestling with the ephemeral nature of gender.

Defining female specific activities at these sites is important to help determine female contributions to the lifeways of the peoples that used this area, and how they influenced these resource procurement and mobility patterns. Archaeological evidence can also point to the demographics and purpose of particular sites. Specific activities at the lake can be identified based on well-established “cross-cultural correlates” (Roux 2007) from analogous site data and “frames of reference” through ethnographic information (Binford 2001). Looking specifically at women at precontact Yellowstone Lake will provide an assessment of the data from an engendered perspective, and may aid in creating more precise interpretations about precontact occupation.

Based on ethnographic, ethnohistoric and archaeological evidence for plains hunter-gatherer groups of this region, it is certain that women played an active and vital role in a range of activities related to occupation around the lake and movement through the park. This thesis attempts to address the major research aims outlined above by focusing on three things: (1) lithic tools and distribution patterns; (2) examining the uses for recovered ethnobotanical remains; and (3) microscale spatial analysis of cultural features. This creates a scaffold using lithics/tools, ethnobotanical remains and features (space) to assist in defining activities, and possibly gender distinctions within these activities. These three lines of archaeological evidence intersect to build interpretations for the lifeways of precontact women at Yellowstone Lake.

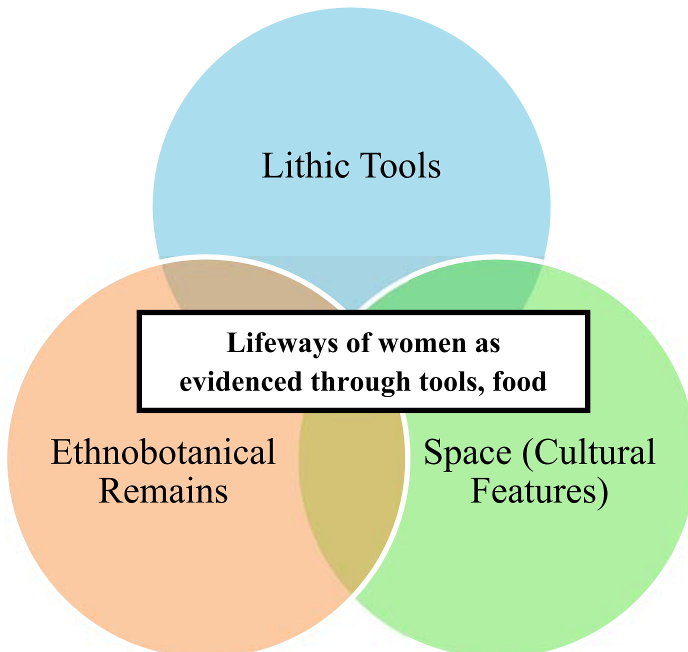


Figure 1: Venn diagram showing visual integration of data sets.

The methods and frame-of-references built to examine each of these lines of evidence are described in subsequent sections. To summarize here, methods include statistical analysis of lithic tool types and distribution, building a frame-of-reference using ethnohistoric data for interpreting archaeobotanical remains, and spatial analysis of cultural hot-rock cooking features. Data are consistent in that Professor MacDonald conducted lithic and feature analyses for all studies, while Jannifer Gish conducted all of the ethnobotanical and pollen studies for the various reports. As such, the data are of a high quality for use in the study of gender dynamics at Yellowstone Lake, Wyoming.

2.2 Culture History and Site Description

Yellowstone National Park (YNP) is America's first and most iconic national park. With picturesque landscapes, awe inspiring views and an abundance of floral and faunal resources, it is not hard to imagine that precontact peoples were attracted to this region, just as people are attracted to the area in modern times. Spanning over 11,000 years, hunter-gatherers used the park area, which is also known as the Greater Yellowstone Ecosystem (GYE), until Euro-American settlement began pushing Native Americans out of the area (MacDonald et al., 2011:2).

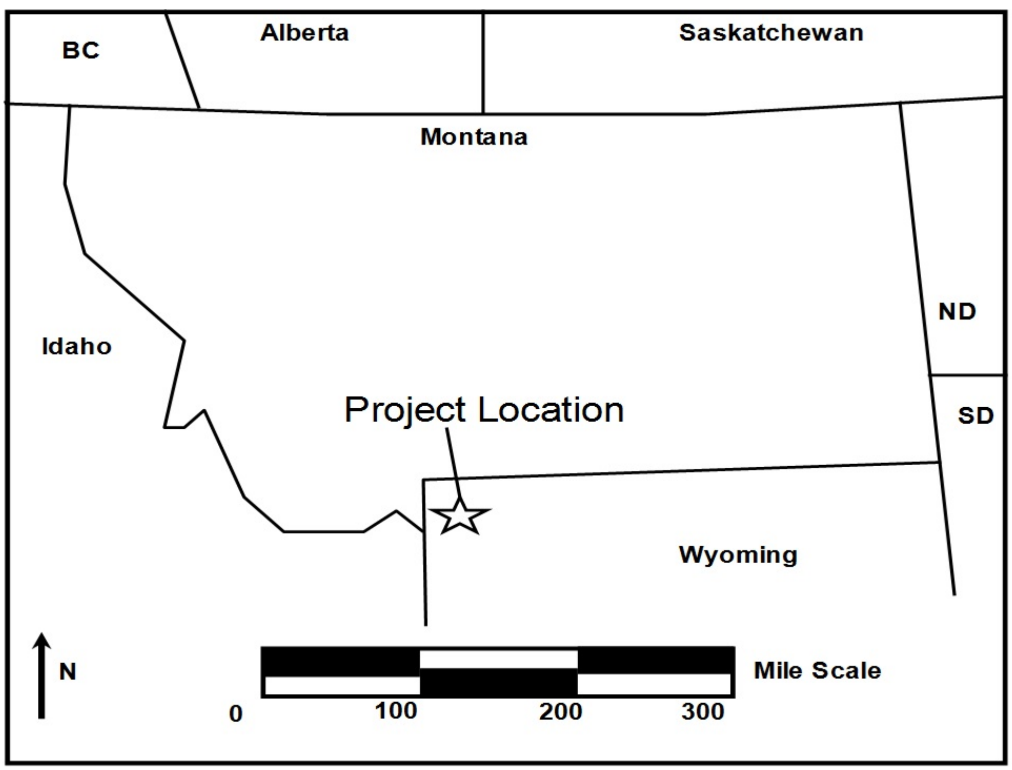


Figure 2: Map of Site Setting (Yellowstone National Park) and greater surrounding areas.

The culture history of the park is important to the holistic understanding of the lake's role in precontact peoples' subsistence lifeways. A somewhat outdated, but still relevant synthesis can be found in former YNP Park Archaeologist Elaine Skinner-Hale's 2003 Master's Thesis, "A Culture History of the Yellowstone River and Yellowstone Lake, Yellowstone National Park, Wyoming and Montana" (Skinner-Hale, 2003). Chapters from "Yellowstone Archaeology, Vol. 13(1), 13(2)", compiled by editors and experts in Yellowstone archaeology Douglas H. MacDonald and Elaine S. Hale, provide an updated overview of the culture history for the prehistory of the Yellowstone Lake area (MacDonald and Hale, eds. 2011; 2013). To date, over 2,000 cultural precontact and historic resources are identified within Yellowstone National Park and 285 sites are identified around Yellowstone Lake (MacDonald and Hale, eds. 2013:1-2). It is clear that once this area became hospitable, the rich resources, including high-quality stone material and abundant biota, provided a dynamic living environment for precontact people.

The timeline for precontact occupation of the GYE is well established with both archaeological and ethnohistoric evidence (Nabokov and Loendorf 2002; MacDonald et al., 2012). Figure 3 provides a brief overview of the six pertinent chronological periods (uncalibrated radiocarbon years before present (BP)), as established by Frison (1991) and Hale (2003), reiterated by MacDonald and Hale (2013:6-16).

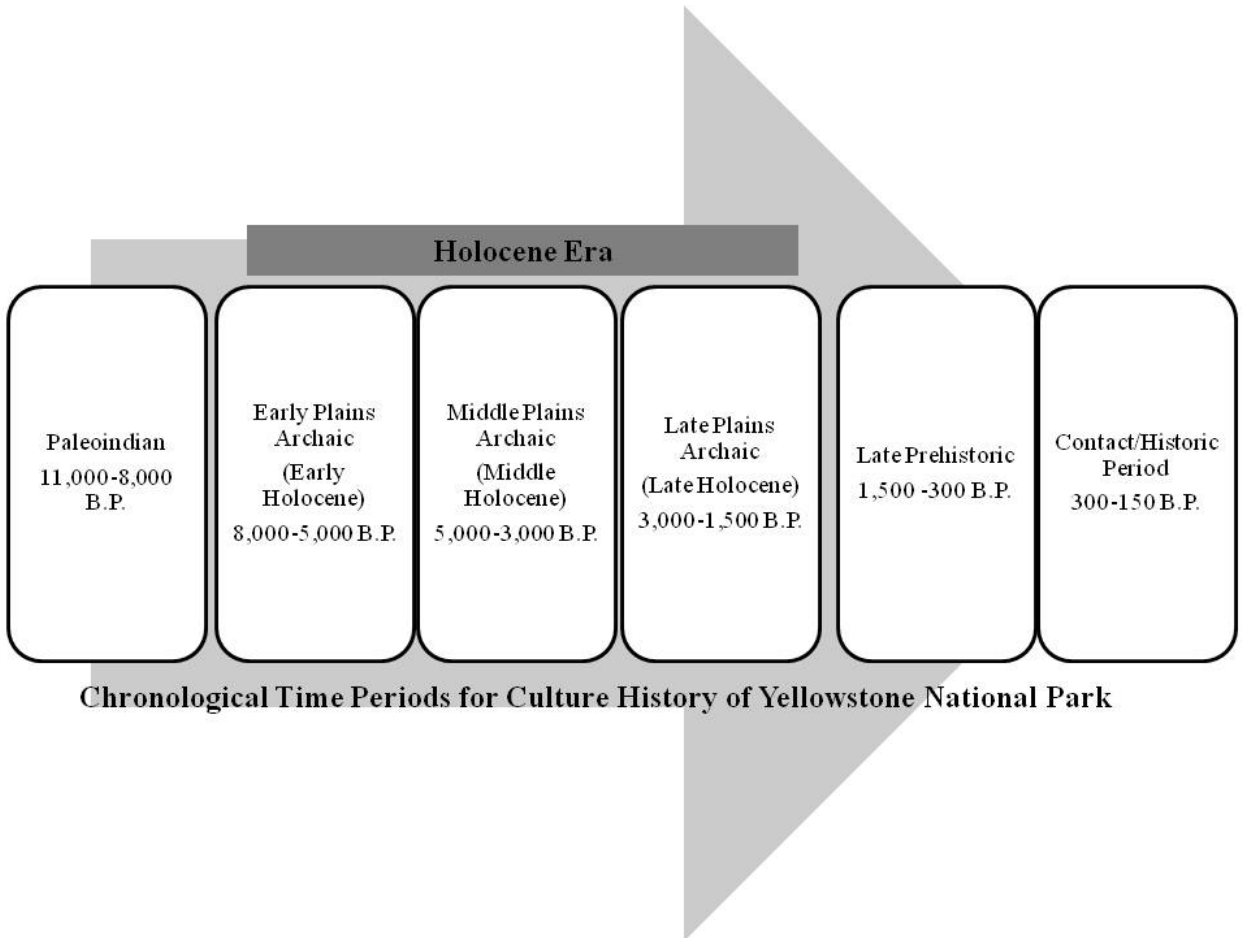


Figure 3: Chronological Time Periods for Culture History of Yellowstone National Park

Based on paleoclimatology and paleoecology studies, the vast majority of the GYE was covered by glacial ice, up until at least 12,000 years ago (Huerta et al. 2009:178-179; MacDonald et al., 2011:4). Melting glaciers and deglaciated areas, along with more year-round moisture and sunlight, allowed for increased vegetation growth, which eventually lead to habitat for animals and subsequently humans. Archaeological, ethnographic and ethnohistoric evidence establishes that the northwestern plains region of North America was occupied by nomadic or semi-nomadic societies since at least the Holocene period, starting about 11.5-10.9 KYA with Paleoindian period (Clovis) occupation (Huerta et al. 2009:179; Sanders 2002; MacDonald and

Hale, eds. 2011:41). The earliest well-dated archaeological site found around Yellowstone Lake is Osprey Beach, with an age of 9,360±60 RCYBP (Shortt 2002; Johnson et al. 2004). Previous researchers note that precontact occupation of Yellowstone lacks key site types, which assist archaeologists in forming a cultural historic knowledge of precontact lifeways in the Yellowstone region (Sanders 2002:213). The oldest accepted site dated within the region of focus, the Greater Yellowstone Ecosystem (GYE), is near Wilsall, Montana approximately 100 miles north of Yellowstone Lake Fishing Bridge Point on the northern shore. This site is known as the Anzick Site, with a radiocarbon date of about 11,040 B.P. (White 2015).

For at least the past 10,000 years, the abundant resources and biodiversity within this area surrounded by high, dry mountain plains is territory that precontact peoples expertly utilized and Native Americans are still actively involved with to this day (MacDonald and Hale, eds. 2013:8-12; Nabokov and Loendorf 2002; Tarka 2007; Roop, *pers. communication*; Fisher, *pers. communication*; Wind Boy, *pers. communication*). Much of the dating for occupation around Yellowstone Lake relies on radiocarbon dating from cultural fire features and stone tool typology, with identification of specific bifacial points from dated cultural complexes. The earliest cultural complexes are Clovis, Folsom, Goshen, Midland and Plainview; although evidence of these complexes tends to be sparse in Yellowstone (MacDonald and Hale, eds. 2011:41-42).

Formal archaeological excavations of YNP began in the 1960s, long after its formal establishment as a National Park by U.S. Congress in 1872 (National Park Service n.d., accessed November 27, 2015). However, ad hoc surveys of the area occurred since 19th century expansion into the west. Paul Sanders provides an exceptional overview of precontact land-use patterns in the Yellowstone region, summarizing obsidian utilization, subsistence practices, geomorphological factors affecting the archaeological deposits of Yellowstone and precontact land-use patterns (Sanders 2002). Several other researchers contributed extensively to the narrative of precontact Yellowstone as well (Cannon et al. 1993, 1997; Johnson et al., 2004; MacDonald 2011, 2012; MacDonald and Hale, 2013; Shortt and Davis, 2002; Hale 2003; Vivian et al., 2007).

Yellowstone National Park is a unique landscape, with an interesting history of geologic formation due to the concentrated geothermal activity, which still draws millions of visitors to the park each year. Yellowstone Lake is a large freshwater lake, the largest above 7,000 feet in North America, which sits in the southeast corner of the park boundaries nearest the East Entrance (Cody, WY) geographically. It covers 136 square miles (350 km^2) with 110 miles (180 km) of shoreline, and is 139 ft. (42 m) deep on average, but its greatest depth is at least 390 ft. (120 m) (National Park Service n.d., accessed September 1, 2015). The majority of the lake was shaped by a collapsing magma chamber, now known as the Yellowstone Caldera, approximately 600,000 years ago, with a secondary eruption about 160,000 years ago, which formed the West Thumb region of the lake (Hale 2003:7-8). Later in geological time, glacial ice that helped shaped the lake covered the area until at least 14,000-15,000 years ago (Skinner-Hale 2003:6), only to melt and become the chilly waters present today (the lake rarely gets above 66 degrees Fahrenheit).

Seasonality is an important component to the YNP region, as even in modern times much of the park becomes inhospitable with restricted travel during the winter months. The seasonality of YNP is highlighted throughout this thesis as a factor affecting how precontact indigenous peoples moved through and utilized this landscape on a cyclical basis, ultimately affecting what is now seen in the archaeological record. From early December until May or June, the lake is frozen over with nearly three feet (0.91 m) of ice, which makes the lake amenable to ice fishing or traversing on foot. Given that some areas of the lake do not freeze over due to geothermal activity hot spots it is possible that winter encampments existed at Yellowstone Lake in precontact times. However extremely low temperatures and heavy snowfall during the winter months likely deterred long-term encampment around the lake in winter months, although evidence to support this conclusion is lacking (MacDonald et al. 2012:258).

Ann Johnson, former YNP archaeologist, points to evidence of five archaeological sites on islands on Yellowstone Lake strongly suggesting the use of watercraft as a mode of transportation on the lake. MacDonald disagrees that boats were necessary, because swimming or traversing the frozen lake on foot are also possible (MacDonald, et al., 2012:258-260, pers. communication). While the debate on boat use on Yellowstone Lake is ongoing, the fact remains that there is little conclusive evidence for the use of boats on the lake (Sanders 2002:223; MacDonald, et al., 2012:258-260; Johnson et al., 2004:137). An overall emphasis on seasonal use of YNP and Yellowstone Lake, coincides with traditional hunter-gatherer seasonal-round patterns during the spring, summer and early fall months (Johnson 2002:83; Johnson et al. 2004:137-138; Sanders 2004:214).

The specific data used for this thesis comes from a collaborative effort over the last 10 years that concentrated efforts on Yellowstone Lake archaeological survey. This effort is the Montana-Yellowstone Archaeological Project (MYAP), a cooperative agreement between the University of Montana (UM), Yellowstone National Park (YNP), and the Rocky Mountains Cooperative Ecosystem Study Unit (CESU), (UM Grants 365609 & 36549, RM-CESU/NPS Reference Numbers: J1580090409 & J1580100301). MYAP is facilitated by the CESU program and operated by the National Park Service (NPS). Over the course of nine field seasons

Yellowstone Lake was surveyed in sections, dividing the lake into three main regions: the North, East and South shores. These three regions are used in this project for site evaluation purposes. One field season also hosted a field school at the Fishing Bridge location, which geographically fits in the North shore region and is included here within this region for analysis purposes.

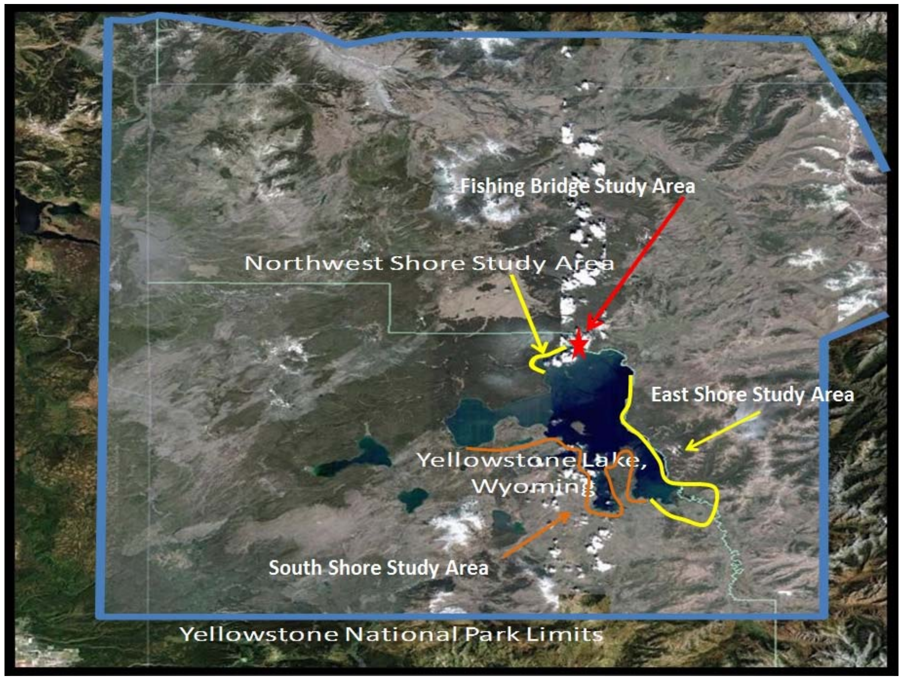


Figure 4: Map of Yellowstone Lake and designated regions of survey.

The 47 MYAP sites evaluated for this thesis project chronologically span the Early Archaic to the Late Prehistoric periods, with the majority of sites dating within the last 3,000 years and a single potential Paleoindian occupation.

The table below lists the 47 sites used for this thesis including the site identification number, region, study year, number of test units, number of cultural features, artifact count, presence of botanicals if applicable, site age (RCYBP provided if available), and source citation for the site. There are a total of 37 immobile cultural features (e.g., fire hearth, roasting pit, living surface, etc.) for all three lake regions studied by the MYAP from 2009-2014.

Table 1: Yellowstone Lake archaeological sites analyzed for this thesis.

Site ID	Region	MYAP Study Yr	Test Units (TU)	Feat.	Artifacts (Prehistoric/ Historic)	Botanicals (y/n)	Site Age RCYBP	Citation
48YE2075	East	2010-11	1	1	8/0	Y	Late Archaic 1500±40	Livers and MacDonald 2012 Livers and Hare 2011
48YE678	East	2010-11	17	2	344/3	Y	Late Archaic, Late Prehistoric 1,460±40 B.P. 1,400±40 B.P	Livers and MacDonald 2012 Livers and Kristen 2011
48YE1499	East	2010-11	2	1	56/0	Y	Late Archaic 1,220±130	Livers and MacDonald 2012 Livers and Hare 2011
48YE2080	East	2010-11	13	0	3469/1	N	Late Archaic, Late Prehistoric	Livers and MacDonald 2012 Livers and Hare 2011
48YE2082	East	2010-11	3	0	680/0	N	Late Archaic, Late Prehistoric	Livers and MacDonald 2012 Livers and Hare 2011
48YE2083	East	2010-11	5	0	727/0	N	Late Archaic, Late Prehistoric	Livers and MacDonald 2012 Livers and Hare 2011
48YE2084	East	2010-11	4	0	206/0	N	Late Archaic, Late Prehistoric	Livers and MacDonald 2012 Livers and Hare 2011
48YE2085	East	2010-11	3	0	250/0	N	Middle Archaic, Late Prehistoric	Livers and MacDonald 2012 Livers and Hare 2011
48YE2088	East	2010-11	3	0	62/0	N	Unknown	Livers and MacDonald 2012 Livers and Hare 2011
48YE2089	East	2010-11	2	0	93/0	N	Unknown	Livers and MacDonald 2012 Livers and Hare 2011
48YE2090	East	2010-11	3	0	63/0	N	Late Prehistoric?	Livers and MacDonald 2012 Livers and Hare 2011
48YE2097	East	2010-11	4	0	6/0	N	Unknown	Livers and MacDonald 2012 Livers and Hare 2011
48YE2107	East	2010-11	1	0	10/0	N	Unknown	Livers and MacDonald 2012 Livers and Hare 2011
48YE380	North	2009-10	3	3	343/1	Y	Late Archaic 1900±40 1570±40	MacDonald and Livers 2011
48YE381	North	2009-10	18	7	4814/8	N/A	Early Archaic, Middle Archaic, Late Archaic, Late Prehistoric 770±40 1720±40 2840±40	MacDonald and Livers 2011

							2920±40 3100±40 5910±50	
48YE155 3	North	2009- 10	3	1	1784/0	N/A	Late Prehistoric 1280±40	MacDonald and Livers 2011
48YE155 8	North	2009- 10	3	5	2489/3	Y	Archaic, Late Archaic, Prehistoric 1470±60 2130±40 2310±40 2790±40 3040±30	MacDonald and Livers 2011
48YE549	North	2009- 10	11	4	4220/4	Y	Late Prehistoric/Proto-historic 240±40 940±40 360±40 220±40	Livers, and MacDonald 2011
48YE155 6	North	2009- 10	8	0	330/0	N	Archaic?	MacDonald and Livers 2011
48YE417	North	2009- 10	8	0	94/1	N	-	MacDonald and Livers 2011
48YE211 1	North	2009- 10	4	0	1054/0	N	Late Prehistoric	MacDonald and Livers 2011
48YE1(41 9)	North	2009- 10	3	0	32/0	N	Prehistoric	Livers. and MacDonald 2011
48YE164 2	South	2010- 13	4	2	41	Y	Early Archaic, Middle Archaic, Late Archaic 1610±30 2890±30	MacDonald 2014
48YE166 0	South	2010- 13	7	2	164	Y	Late Archaic, Middle Archaic, Paleo. 1690±30 1850±30	MacDonald 2014
48YE219 0	South	2010- 13	3	1	52	Y	Late Prehistoric, Late Archaic, Middle Archaic 1380±30	MacDonald2014
48YE138 4	South	2010- 13	2	1	26	Y	Late Prehistoric, Late Archaic 1330±30	MacDonald2014
48YE138 3	South	2010- 13	8	1	129	Y	Early Archaic?, Late Archaic, Late Prehistoric 2290±30	MacDonald2014
48YE138 2	South	2010- 13	4	2	449	Y	Paleo?, Early Archaic, Late Archaic 1970±30	MacDonald2014
48YE138 8	South	2010- 13	3	2	341	Y	Early Archaic, Middle Archaic, Late Archaic, Late Prehistoric 1530±30 1490±30	MacDonald 2014
48YE133 2	South	2010- 13	2	1	74	Y	Middle Archaic 2880±30	MacDonald 2014
48YE158 8	South	2010- 13	6	1	210 +1 bone	Y	Paleo, Early Archaic, Late Prehistoric 780±30	MacDonald2014
48YE139 4	South	2010- 13	3	0	62	N	Middle Archaic	MacDonald 2014
48YE164 5	South	2010- 13	4	0	198	N	Late Archaic, Late Prehistoric	MacDonald2014
48YE166	South	2010-	4	0	24	N	Paleo.	MacDonald 2014

4		13						
48YE1670	South	2010-13	2	0	74	N	Late Prehistoric	MacDonald2014
48YE1608	South	2010-13	1	0	34	N	Early Archaic, Middle Archaic	MacDonald2014
48YE1601	South	2010-13	4	0	23	N	Early Archaic, Middle Archaic, Late Archaic, Paleo	MacDonald2014
48YE1337	South	2010-13	2	0	42	N	Middle Archaic, Late Archaic, Late Prehistoric	MacDonald 2014
48YE1331	South	2010-13	2	0	40	N	Paleo, Middle Archaic	MacDonald 2014
48YE1324	South	2010-13	2	0	0	N	Archaic	MacDonald2014
48YE1328	South	2010-13	1	0	46	N	-	MacDonald 2014
48YE1329	South	2010-13	2	0	158	N	Early Archaic, Middle Archaic, Late Prehistoric	MacDonald2014
48YE1707	South	2010-13	4	0	95	N	Paleo?, Middle Archaic, Late Archaic	MacDonald2014
48YE1704	South	2010-13	2	0	161	N	-	MacDonald 2014
48YE1580	South	2010-13	2	0	55	N	Early Archaic	MacDonald2014
48YE1578	South	2010-13	2	0	177	N	Paleo, Middle Archaic, Late Archaic, Late Prehistoric	MacDonald2014
48YE736	South	2010-13	2	0	72	N	Middle Archaic, Late Archaic, Late Prehistoric	MacDonald2014
TOTAL	47		220	37				

2.3 Synthesis of Excavation Results

There are 285 recorded sites around the lake that demonstrate precontact use dating back to almost 10,000 years B.P. (MacDonald and Hale 2013:1). Most notably, occupations around the entire perimeter of the lake indicate a heavily used area with possible multiple season occupation, such as early spring time for bear hunting, extended stay summer encampments and late summer/fall bison hunting (MacDonald et al., 2012). Yellowstone Lake served as a key component to precontact seasonal rounds for groups that frequented the area (Johnson 2001:83).

A primary focus of past studies of precontact occupancy in YNP is to establish a chronology of occupation and to understand production, procurement, and settlement/movement patterns. The past 30 years of excavation establishes a culture history of YNP and Yellowstone

Lake, so that now the focus can shift towards a more fine-grained interpretation of the peoples and occupations around the lake. Since 2007, the MYAP conducted archaeological survey and excavation at sites throughout the park including the Gardiner Basin, Yellowstone Lake, the Snake and Lewis River Valleys. The MYAP project took on CRM-specific projects for the park, such as mapping power lines and reevaluating established sites for National Register of Historic Places (NRHP) eligibility and integrity (NHPA, Section 110). YNP administration focuses intently on historic and cultural features of the park, which includes an active cultural resource management program. Through CRM reconnaissance and archaeological survey of Yellowstone, MYAP assists with the identification and preservation of the human story of Yellowstone.

One of the major research questions from the MYAP explores why Native Americans were attracted to Yellowstone Lake and to define the role the lake played among these groups. In sum, the MYAP project established Yellowstone Lake as a primary multi-resource procurement area with multiple uses for groups traveling to the area from all four ordinal directions (MacDonald et al., 2012:284). General access around the perimeter of the lake appears to be via pedestrian foraging. The land-based focus for resource procurement strategies employed by these groups demonstrates that the Greater Yellowstone Ecosystem (GYE) and Yellowstone Lake were "at the cross-roads of multiple tribal and/or band territories" (MacDonald et al., 2012:284). The data sets examined by prior researchers (Sanders, MacDonald, Hale, and Johnson) strongly support the interpretation that Yellowstone Lake's biodiversity was specifically targeted and sought out by groups entering the YNP region (MacDonald et al., 2012:284).

In addition to the MYAP technical reports, six M.A. theses and two Ph.D. dissertations completed since 2009 focus on archaeological data recovered within the Yellowstone region (specifically by the MYAP). However, none of these student theses address gender relations. The word “women” is used once as related to women’s activities situated near harvestable plants (McIntyre 2012:68), and three times within a short historical-fiction introduction to daily life in the Yellowstone Valley, 400 B.P. (Livers 2009:1-3). This is not pointed out to discredit the work of peer research in this area, but rather to highlight the lacuna that exists for research specifically focused on women (and gender-based social dynamics) in precontact Yellowstone.

Artifacts

The majority of artifacts recovered at sites the MYAP excavated are lithic (stone) tools. These artifacts include: flaking debris, bifacial flakes, bifacial points, unifacial flakes, tested cobbles, pieces of charcoal, fire-modified (cracked) rock (FMR or FCR), and some macrobotanical remains. The more widely accepted term, fire-cracked rock (FCR) is used herein. One reason for a lack of organic materials, such as plant, bone, wood or animal parts (e.g., sinew), in the artifact assemblage is the extremely acidic soil present in YNP caused by the geothermal activity. Soil pH at YNP varies from 2.7 pH (USDA Natural Resource Conservation Service classifies soil >3.5 pH as ultra-acidic) to 7.5 pH (classified as slightly alkaline), with a median pH of 4.8 (classified as very strong acidic soil) (Redman et al. 1999). The acidic soil breaks down organic matter more quickly than soil in nearby areas of Montana and Wyoming, where geothermal activity is less concentrated. Any artifacts made of organic materials deteriorate quickly in the presence of these acidic soils. Thus, organic artifacts are not as prevalent or well-preserved in the archaeological record at Yellowstone Lake.

As such, this research project takes a concentrated look at lithic stone artifacts, in particular unifacial or bifacial tools. Stone tool distribution patterns may indicate the influence of gender relations/structures on the lithic assemblage. The table below details the recovered tools from the site reports for the three major regions of the lake (Livers, M.C. and Douglas H.

MacDonald 2012; Livers, M.C. and Kristen Hare 2011; MacDonald, D.H. and Michael C. Livers 2011; Livers, M.C. and Douglas H. MacDonald 2011; MacDonald, D.H. 2014). The survey data listed below excludes recorded finds from other agencies/consulting groups that studied the areas previously Original, more detailed, tool categories were summarized into the following tool categories: projectile points (PP) are included with general bifacial tools; unifacial tools (UF) and endscrapers (ES) are categorized as general unifacial tools; hand-tested cores/cobbles and other tools that do not fit into the preceding categories are listed as "other". These data include all surveyed sites the MYAP recorded from the North, East and South shores of Yellowstone Lake, including standard test pit (STP) and surface survey. Sites with test unit (TU) excavation are the focus for the rest of project. This table does not include lithic debitage and non-utilized flakes.

Table 2: Artifact and FCR counts and survey details for the analyzed sites.

Actual Artifact Counts MYAP 2009-2014				
Survey Parameters	**Fishing Bridge**	**North Shore**	**South Shore**	**East Shore**
Total Area Surveyed (acres)	225.66	316	~18037.68	1046.29
Total Sites	8	11	152*	52
Tool Inventory	**Fishing Bridge**	**North Shore**	**South Shore**	**East Shore**
Bifaces (inc. PP, and partials)	39	196	359	125
Cores (freehand core; tested cobble)	5	25	119	11
Groundstone (hammerstone; abrader; mano; chopper)	0	0	6	2
Unifaces	16	99	85	89

(utilized/retouched flakes; scrapers; blades)				
FCR	85	100	81	6
Other Tools (drill)	0	0	2	0
Total Tools	**145**	**420**	**652**	**233**
*14 sites not surveyed due to extenuating circumstances (MacDonald 2014:59)				

Table 3: Proportions of stone tools and FCR recovered from sites within 3 survey regions.

Proportions				
Tool Types	**Fishing Bridge**	**North Shore**	**South Shore**	**East Shore**
Bifaces (inc. PP, and partials)	.27	.47	.55	.53
Cores (freehand core; tested cobble)	.03	.06	.18	.05
Groundstone (hammerstone; abrader; mano; chopper)	0	0	.01	.01
Unifaces (inc. utilized flakes+ scrapers)	.11	.23	.13	.38
FCR	.59	.24	.12	.03
Other Tools (drill)	0	0	.01	0
Total	**1**	**1**	**1**	**1**

Table 4: Mean number of total tools, including FCR, from sites within 3 survey regions.

Means				
	Fishing Bridge	**North Shore**	**South Shore**	**East Shore**
Mean # of Tools				
Per site	.64/acre	1.33/acre	0.036/acre	.22/acre
Per Acre	18.13/site	38.18/site	4.29/site	4.48/site

Archaeobotanical Remains

Pollen analysis provides insight into the paleoenvironment and human ecological resource proclivity for multiple sites around the entire perimeter of Yellowstone Lake (Gish 2013:227-256). This serves as a source of information for women's resource procurement activities at Yellowstone Lake. Spatial distributions of food related activities can potentially reveal the roles of men and women within these activity areas (Hastorf 1991:133). The paleobotanical remains from MYAP were recovered in conjunction with Jannifer Gish, a palynologist, archaeobotanist, ethnobotanist, and archaeologist (Gish 2011:107-115, 2013:227-257). She conducted all plant analyses on the projects, including analysis of flotation samples of soils used for pollen analysis, as well as analysis of macrobotanical remains from excavated sites in all three regions. This is especially helpful when coupled with radiocarbon dates to create a picture of climate change within the park over time and suggest ways precontact peoples adapted to the environment.

The presence of women could potentially vary among groups that used the lake. Variation may be season-specific as well, as it is hypothesized that some individuals from different cultures visited the lake in early-spring for bear hunting (MacDonald et al. 2012; Ciani 2014, M.A. thesis), then remained at the lake through late summer during the seasonal round. Detailed macrobotanical analysis of sites around the lake corroborate seasonal occupation, primarily through evidence for summer gathering activities such as processing of camas, juniper berries, and other seeds (Gish 2013: 227-256).

The vast body of knowledge for indigenous peoples' use of plants includes everything from medicinal (e.g., arthritis) to religious/spiritual (e.g., ritual smudging for spiritual cleansing) (Hart 1976; Moerman 1998, 2010; Nabokov and Loendorf 2002). The ethnographically documented uses of these archaeobotanical remains may not reflect a true direct use of these plants within these particular archaeological contexts. It does, however, suggest the range which precontact peoples likely utilized the abundantly diverse flora in the Yellowstone region. The frame of reference which is built upon the archaeobotanical data and corresponding ethnographic uses also demonstrates the creative, inventive and resourceful nature of the peoples living off the lands of YNP. This carries into modern times through the traditional ecological knowledge curated over multiple generations, still in use today by indigenous peoples of North America in general.

Cultural Features

MYAP identified cultural features including: ephemeral fire features, cooking hearths, fire pits/hearths, roasting pits, refuse pits or dump areas, living floors, and stone circles. The first early-Archaic burn feature was excavated at Fishing Bridge Point, which is on the North shore of Yellowstone Lake. MacDonald and his team from the MYAP recovered and dated wood charcoal from the feature, which returned an AMS ^{14}C date of 5910 ± 50 RCYBP (Beta-265310) (MacDonald et al., 2011:110). The majority of cultural features examined within the 47 sites in the scope of this project represent short-term food processing activities, although some prolonged use of cultural features is suggested where nearby refuse pits are associated as evidence of a hearth/pit cleaning out episode. Ethnobotanical remains also suggest possible plant, nut and seed processing within or near cultural features (i.e., a roasting pit), although evidence of this is sparse. Constructing a pit solely for plant roasting is not efficient in terms of Optimal Foraging Theory, unless a reasonable quantity of roots, nuts, seeds, or other plants are going to be processed therein to provide sufficient caloric payoff for the energy expenditure (Hayden and Cousins 2004:140-154).

For the sites considered for thesis, MYAP identified 17 out of 37 cultural features as "ephemeral" with the majority defined as surface or basin shaped hearth/fire features. Other cultural features present are: one potential boiling pit, two living surfaces, four undefined rock clusters and one stone circle (to secure a tipi structure). Only three features have possible associated refuse/dump piles nearby, and only two are defined as "cooking" features. Table 13 is a detailed accounting of these cultural features. An in-depth analysis of the chronology and composition of all the cultural features examined for this study is provided in Chapter 7.

The North shore region contains the highest concentration of cultural features (n=20). Proportionally, fewer cultural features were present at sites from the East and South shores, despite a greater number of total excavated sites (North shore n=9; East shore n=13; South shore n=25). The higher concentration of cultural features present in the North shore region may be related to the geographical proximity of Obsidian Cliff, a focal point for groups utilizing the Yellowstone region (MacDonald 2011:10; Smith 1999:271-273; 279).

Obsidian Cliff is an extensive and prized precontact stone quarry site, where continuous visitation by various tribes led not only to the ubiquitous presence of obsidian tools and stone at archaeological sites around Yellowstone Lake, but also throughout the United States demonstrating its value as a trade item as well (Adams 2011:99). The towering cliff within park boundaries still attracts tourists today, with its black volcanic glass face and the vast amount of scree that sits at the base from natural and human effects.

Cultural Affiliations with Yellowstone National Park/Greater Yellowstone Ecological Region

While researching cultural affiliations in this region is not the focus of this project, it is important to note that several cultural affiliations exist within Yellowstone National Park. Euro-American history worked to erase or discredit Native American occupation and use of the park area. But thanks to diligent work by Nabakov and Loendorf, their comprehensive volume reestablishes and validates Native American claims to the region long before Europeans ever set foot in the Americas (Nabokov and Loendorf 2002). This work also provides valuable information about Native American lifeways in the park prior to contact (MacDonald et al., 2011:1). This type of ethnographic and ethnohistorical information contributes to building an interpretive bridge, bringing meaning to archaeological data and contexts (Binford 1962; Binford 1980; Roux 2007; MacDonald 1998).

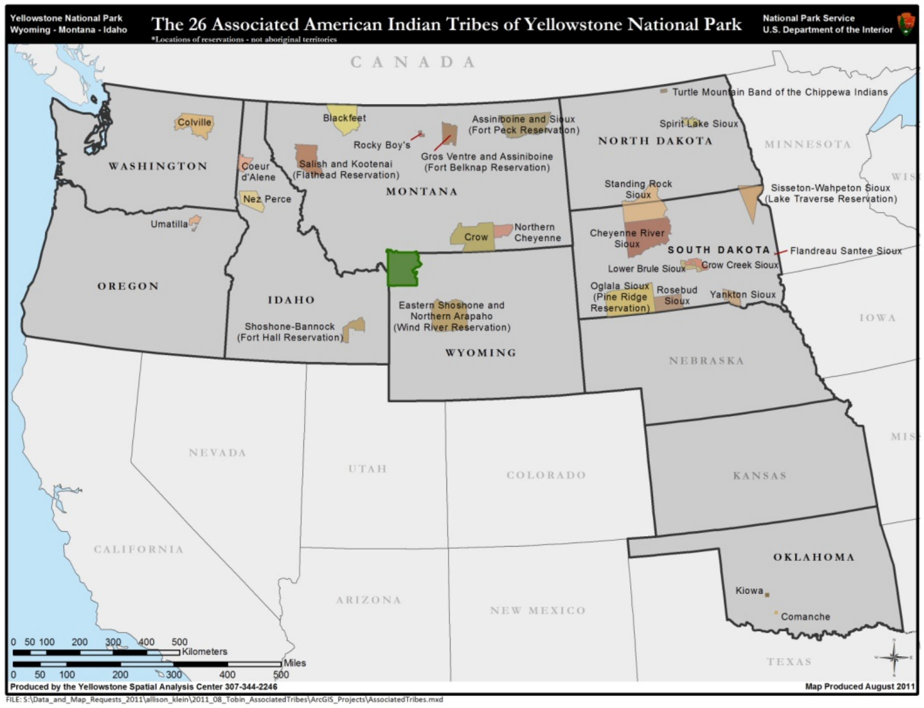


Figure 5: Map of the 26 Associated American Indian Tribes of Yellowstone National Park (Map provided courtesy T. Roop, Chief of Cultural Resources for YNP, *pers. communication* 2015).

Today, there are 26 tribes affiliated with Yellowstone National Park. These tribes are officially consulted with on projects within the park, ranging from archaeological, to construction, to bison management (Roop, *pers. communication 2015*). The ethnographic and ethnohistoric literature suggests that a diversity of ethnic groups utilized the Yellowstone and Yellowstone Lake region including: Tsitsistas (Cheyenne), Apsaalooké (Crow Nation), Natsitapii (Blackfeet), Salish (Flatheads), Agaidika (Lemhi/Northern Shoshone), Kukundiak (Plains/Eastern Shoshone) and the related Tukudika (Western Shoshone/Sheep Eaters), Nimíipuu (Nez Perce), Cáuigù (Kiowa) and Bana'kwut (Bannock) (Nabokov and Loendorf 2002; MacDonald et al, 2012:260-261; Whittlesey 2002:40-41). Cultural affiliations tend to be ambiguous within precontact archaeological sites and remains. However, it is assumed that at least some of these present-day tribes' ancestors were directly affiliated with the park. Figure 5 shows all 26 affiliated tribes and their present day territories.

2.4 Summary

This background research will serve to help build a frame of reference for interpretations made about the data analyzed. The rest of this thesis is devoted to three major elements of the archaeological record from around Yellowstone Lake, as mentioned in the introduction. First, a discussion on theoretical perspectives and methods that pertain to studying gender within archaeology is presented. This is a means to "set the stage" for the blended use of these perspectives and methods in order to analyze the three data sets: (1) lithic stone tools; (2) archaeobotanical remains; (3) cultural features, presented in Chapters Five, Six and Seven. Once the data are presented, a discussion in Chapter Eight ties all three archaeological lines of evidence together to form a holistic image of the potential lifeways of women in precontact Yellowstone, around Yellowstone Lake.

Chapter 3: Theoretical Perspectives & Literature Review

3.1 Introduction

This section provides an overview of literature and theoretical perspectives on gender-based archaeological research. Gender as a concept can be problematic in and of itself. As a fairly new research avenue (c. late 1970s), archaeologists interested in gender are still developing clearly defined methods and theoretical applications (Joyce and Claassen 1997:1-5; Conkey et al. 2005:53-62). However, this does not preclude the exploration of gender within archaeological contexts until it becomes fully defined and developed (Conkey and Gero 1991:6).

3.2 Gender as a concept

Gender as it is studied in archaeology, is the sociological term developed to identify the mechanism for organization of certain people in a group, according to the generally accepted roles each person should play in that society based on certain characteristics (Ingraham 1994:203-204; Gero and Scattolin 2002:155-158). These characteristics are both physical and ethereal, and both the individual and the society play a role in defining an individual's gender. In a heteronormative society like the United States, gender and sex are often thought of as one in the same. The classification of an individual's gender based on their sexual phenotype results in a rigid dichotomy (West and Zimmerman 2009:113-114). An individual is either male or female in this type of framework, with defined roles based on this gender attribution. However, the Westernized, mutually exclusive duality of gender is not a cross-cultural standard (Ingraham 1994:203-204).

Gender creates, generates and regulates variation at almost any level of social integration, while also acting as a mechanism of social organization (Ingraham 1994; Brettell and Sargent 2012). Ultimately, a focus on gender in archaeology should focus on the processes gender creates and controls within culture, not on classification with fixed categories (West and Zimmerman 2009:114). These complexities create immense challenges for archaeologists who wish to study gender, in particular for groups with little in the way of writing, art, ethnohistory, ethnographic study and other ways archaeologists might positively identify gender roles. This should not dissuade archaeologists from incorporating gender into their research agendas. Division of labor, organization of production, procurement, and food/resource distribution can be drawn out based on gender. As arguably one of the most inherent aspects of any society, modern or ancient, understanding gender roles and the implications of those gender roles can be the key to understanding a society. Elucidating gender via the examination of material remains challenges archaeologists to look at data from multiple perspectives and employ the creative use of methodologies.

3.3 Implications for gender in archaeology

Gender-based research in other sub-disciplines of anthropology (e.g. linguistics, cultural, physical) abounds, but a dearth exists in archaeological literature, especially within prehistoric research (Kornfeld 1991:1-3; Crasnow 2006:858; Conkey 2003:868, 876-877). The challenge lies in inferring gender distinctions based on archaeological data. Understandably, a reluctance to explore gender due to the lack of definitive answers in the archaeological record exists, despite its importance underscored by most contemporary archaeologists (Brumfiel and Robin 2008:4-5; Kornfeld 1991:1). Nonetheless, challenging the male-female dichotomy leads to beneficial reevaluations of past research, new lines of questioning, and awareness of research biases and projections of present culture into the past (Pyburn 2008:115-116).

Inferring gender dynamics and structures based on archaeological data is not as evident in the archaeological record as it might be in ethnographic or historical research. “Knowing exactly who made what, where, when and why is subject to great variation across space and time" (Bruhns and Stothert 1999:36). Explorations of gender in archaeology inevitably suffer from a lack of definitive answers (Brumfiel and Robin 2008:4-5; Kornfeld 1991:1).

It is important to emphasize that parallel discussions about gender occur across social sciences, speaking more to the fact that gender is imbued within everything we do and study. Discussions of gender, how gender defines us as individuals, our social roles designated by gender, exploring other gender roles, as well as non-normative behaviors can be controversial, confusing, and sometimes uncomfortable. However, the topic of gender dynamics is a contemporary conversation archaeologists can contribute to using the lifeways of people seen through the archaeological record. This helps dispel stereotypes, such as those perpetuated by "Man the Hunter" (Lee and DeVore 1973; Washburn et al.1968), and to illuminate the "shrinking woman" in prehistory (Waguespack 2005:667).

3.4 Feminist Archaeology vs. Gender Archaeology

Gender research in archaeology derives much of its theoretical basis from gender studies in sociology, and discussions that take place in sociological theory literature mirror those within archaeological literature (Ingraham 1994:210). The most simplistic definition of *gender archaeology* is, "the aim to explore variations in prehistoric gender relations as well as the analysis of their generation and maintenance" (Sørensen 2013:5). This definition is distinct from *feminist archaeology* which focuses on looking for women and their activities, especially where women's roles or tasks are ignored or taken for granted, to "refresh thinking about gender" (Nelson and Rosen-Ayalon, ed. 2001:ix-x). Feminist archaeology not only seeks to elucidate gender out of the archaeological record by focusing on women, but doing so with the intention of advocating for women both in the past and present, using shared feminist commitments (Wiley 2007:211-214).

Feminist archaeological theory first emerged in the archaeological literature in the 1980s. Largely owing its foothold beginnings in archaeological theory to processualism, this platform allowed feminists to ask the very simple question "where are the women?" (Hegmon 2003:218; Conkey 2014). Feminism applied to archaeological theory became an outcry against the historically androcentric bias in archaeological interpretations and the marginality of women both as a focus of study and as professionals in archaeology. In more recent times many archaeologists studying gender move away from the political underpinnings of feminist archaeology, and practice less politically charged gender archaeology, while still addressing the question of gender and historically marginalized populations.

Feminist and gender archaeology are not interchangeable. Feminist archaeologists like Alison Wiley assert that gender archaeology not undertaken by feminists is less effective. Non-feminist archaeologists are less compelled to position themselves within their work, or reflect on how their personal position affects their work. Investigating gender independent of feminism ignores the aims of early studies and represents gender and sex in a "conceptually deficient manner" (Wiley 2007:209-216).

Gender archaeological theory is a more tempered theoretical perspective, through which researchers can look at all genders, not just women, and how gender interacted with other social structures. We might see these systems in the archaeological record such as labor organization, technology specialization, and subsistence ways of life (Hegmon 2003:218). However, an actual "gender theory" in archaeology is not as straightforward as more classical theoretical frameworks, such as processualism. The existence of gender as an independent archaeological theoretical perspective versus a focus for study supplemented with other theoretical perspectives is debatable (Conkey 2007).

Feminism coupled with gender research does face criticism. Some critics feel that the feminist tenets create a post-structuralist obscurity, masking the real issues of political power and oppression (Scott 1994; Scott 1988:39; Palmer 1990). Another criticism underscores the social and political values of feminism, which influence feminist research (Nelson and Nelson 1997:61). Science loses its authoritative voice if accepting research that is not conducted under the guise of "value-neutral objectivity" (Crasnow 2006:840-842).

Gender research without a feminist research agenda also faces objections from feminist researchers. The loss of political impacts on contemporarily marginalized people perpetuates the colonial nature of science, and does not capitalize on the unique position to influence contemporary peoples and issues. Most notably, Wiley asserts that the dissociation of feminism from gender studies hinders gender research in archaeology and continues to hinder its development (Wylie 2007:209). Despite these criticisms of feminist archaeology, Conkey points out, "In the past fifteen years some distinctly different approaches to feminist and gender archaeology have evolved in different research traditions" (Conkey 2003:869). While feminism helped push past androcentric boundaries in science, and specifically in archaeology, feminism struggled to connect with all academic audiences (Nelson and Nelson 1997:61).

For researchers, it may not necessarily be an aversion to feminism, rather the difficulty in applying some of the feminist research commitments to archaeological research, along with a lacuna in feminist methodology (Crasnow 2006). For example, the idea of addressing researcher biases is a very post-processual concept, and is one of the major hurdles archaeologists adhering to traditional scientific conventions face in utilizing these types of theoretical frameworks. The post-processual archaeological theory movement began in the 1980s, contemporaneously with Marxist social thought and second wave feminism (Shanks 2007:140-142). This ultimately moved towards emphasizing subjectivity in archaeological interpretations (Patterson 1990:191-192). The use of critical reflexivity, born out of feminist theory and championed by post-processualists such as Ian Hodder, transformed many areas of archaeological study, such as collaborative and indigenous research (Hodder 1991; Silliman 2008).

Arguably, gender-focused research falls into what might be classified as a processual-plus theoretical perspective (Hays-Gilpin 2008: 343-358; Hegmon 2003:218). As Michele Hegmon explains:

> Gender archaeology is paradigmatic of processual-plus archaeology, in that it draws on a diversity of theoretical approaches to address a common issue. Emphasis on agency and practice is an important development, though conceptions of agency are too often linked to Western ideas of individuals and motivation [Hegmon 2003:213]

Inclusion of gender in archaeological research agendas is simply "good archaeology" and its use in research is becoming mainstream (Goldstein 2008:39-40; Conkey 2003:873, 875-877). This approach to gender studies in archaeology may be a tactic used to prevent the alienation of practitioners and audiences of archaeology, which in practice is more productive in regards to disseminating topics of gender through archaeological publications.

3.5 Theoretical Framework for Gender Studies at Yellowstone Lake

This project does not ascribe to a singular theoretical framework; rather it blends aspects of post-processual, processual plus, gender and feminist based archaeological theories, while using a relatively processual methodology. A rich and diverse literature base is drawn from, constituting this blend of theoretical approaches in order to address the topic of gender and formulate meaningful, holistic interpretations, while eschewing the dogma of any single theoretical framework.

The four major theoretical commitments ascribed to for this project include: (1) self-critical reflexivity and elimination of biases, as championed by feminist theory and post-processualism; (2) a concern for the best-applicable avenues of research using a processual-plus framework; (3) focusing on questions of social agency and how this impacts “the truth” of past social dynamics, based on post-processual underpinnings; and (4) evaluating the influence of gender as it pertains to division of labor, resource procurement, mobility patterns, and other forms of social organization, as outlined through gender archaeology and feminist theory.

Reliable ethnobotanical data, extensive lithic data sets and detailed site feature analysis in MYAP site reports provides an excellent starting point for discerning the contributions of women to precontact hunter-gatherer groups at Yellowstone Lake, without approaching the data with the intent to recreate gendered divisions of labor. This is key as "the expectation of gender hierarchy can result in misguided conclusions and unexplored alternative interpretations" (DeLucia 2008:31), and alternative questions and interpretations are generated when one does not reach for “mapping gender onto artifacts” (Preston-Werner 2008:53).

One focus for this project centers on the idea that gender specific tools are found at gender specific activity areas. Two broad categories of tools used for this analysis are: bifacial tools (stone worked on both sides, e.g., arrow points used for hunting) and unifacial tools (stone worked on one side, e.g., side scrapers, used to process wild game hides), sometimes with an intentionally shaped “spur” (Eren et al. 2013:1-2). Bifacial tools are thought to be utilized by primarily males based on the traditionally male classified activities of hunting and dispatching of large wild game (Waguespack 2005:668; Gero 1991:163-193; Costin 1996:122).

While making a comparison between bifacial tools versus unifacial tools may seem obtuse, the underlying rationale is that these distinct tool types serve very different functions, within fairly well-defined sets of tasks (Sassaman 1993:249-262). Stone tool manufacturers were methodical and intentional in the creation and use of stone tools (Nelson 1991; Eren et al. 2013). This social agency between the stone tool and the manufacturer is where gender distinctions may be drawn.

Two other lines of evidence are explored within this research project to elucidate gender. First, archaeobotanical remains are a key element in defining the domestic tasks of women. Using ethnographic and ethnohistoric accounts helps tie traditional ecological use of plants to possible food, religious and medicinal uses. Second, the use of space upon the landscape of Yellowstone Lake may demonstrate how gendered processes shaped site boundaries, deposits and the archaeological remains.

Women and Tools

The tasks involved in subsistence in hunter-gatherer lifeways are well defined both by archaeological literature and ethnographic studies of contemporary hunter-gatherers. Hunting, for example, can be narrowly or broadly defined. As a narrowly defined act, it is simply the actual act of dispatching an animal. When viewed as an entire process it involves stalking, dispatching and processing prey to a point where it is consumable by humans. Piercing the hide and heart to dispatch, slicing through bone and hide, scraping hide from the flesh and meat, pounding or chopping the meat are all tasks related to this process. The process requires hunter-gatherers, as both individuals and as a collective, to curate a “Swiss army” type tool kit, complete with multifunctional tools for those tasks (Nelson 1991:70; Kelly 1988).

Unlike modern western culture where there seems to be a constant dialectic between men and women, someone's "gender" may not preclude she/he from a particular activity in hunter-gatherer groups. This is suggested in many articles which deal with the sexual division of labor (Arakawa 2013; Jarvenpa and Brumbach 2006; Brumbach and Jarvenpa 1997; Waguespack 2005; Saussman 1993; Brumfiel and Robin, eds., 2008). Other factors such as lifecycle or reproductive stages, social status or affiliation may weigh more heavily in the determination of assigned subsistence based tasks in some societies. This is important to keep in mind when working within an archaeological context. For example, Brumbach and Jarvenpa conducted cross-cultural ethnoarchaeological study of gender dynamics and subsistence systems for several North American/circumpolar societies (Jarvenpa and Brumbach 2006; Brumbach and Jarvenpa 1997). They specifically focus on how women are integrated into the dominant hunting cultures of these societies. They found that male-female teams, often a husband and wife, ventured various distances from their larger main village in order to hunt, except when the wife became pregnant. There are even cases of female-female hunting teams, such as an elder woman and her granddaughter, but this arrangement is not as frequent (Brumbach and Jarvenpa 1997:419). This research demonstrates that gender itself may not define who hunts (and by extension uses tools for the tasks) and who does not hunt, but rather the social status (single, married, old, young) and lifecycle stage (i.e., menarche, puberty, pregnancy, menopause).

Exploring gender in archaeology requires unpacking the nuances within the archaeological record and finding patterns of possible division. When coupled with ethnographic, ethnohistoric and cross-cultural correlates, archaeologists can make certain interpretations about gender dynamics (Brumfiel 2006:862-863). The subsequent analysis of unifacial versus bifacial tools should not be read as female versus male tools, but rather seen as an exploration of these two tool types and what they may tell us about manufacturing and task distinctions.

Revisiting archaeological studies to approach the data with new questions about gender is a method many archaeologists interested in gender utilize. For instance, Joan Gero reexamined the stone tool assemblages she herself excavated from Huaricoto, Peru specifically to demonstrate ways to engender the past through the archaeological record (Gero 1991:163-193). The focus of this research assesses the potential for stone tools to signify status and to delineate group identity. Gero revisits the lithic data from this site to focus on the changes in lithic technology using an explicitly gendered analysis. Her goal centers on determining how this changes the interpretation of the data. She outlines three important points about lithics and how they relate to gender:

> 1) Lithic raw materials. Gender can be used as a category to limit control over different types of workable stone.
> 2) Degree of preparation of tool forms. Gender has already been shown to be associated with "energy investments" in tool production…Minimally, women have certainly contributed extensively to flake tool production.
> 3) Context of tool preparation and use. Gender has spatial implications, with certain contexts and ranges of tool applications at least loosely suggesting female work areas. [Gero 1991:180]

Gero operates under the assumption that women at Huaricoto had unlimited, unrestricted access to local lithic raw materials only, in order to curtail arguments over differential male/female mobility. She found that expedient tools such as flake tools were almost always made out of the local lithic raw material, while more complex tools were made with somewhat local lithic raw material (quarried from at least five kilometers away). Gero's assumptions are that women primarily utilized local materials and women are associated with the minimal energy investment of making expedient stone tools. This coupled with the shift in lithic tools discard found within ceremonial areas versus residential areas demonstrates that women not only made and utilized stone tools at Huaricoto, but the majority of stone tools and debitage found around hearth or residential areas are related specifically to women's stone tool production (Gero 1991:176-182).

This "Huaricoto lithics model" is utilized in Chapter 5 to evaluate the lithic stone tool use by women at Yellowstone Lake. There are various quarry sites for chert and obsidian throughout YNP, therefore what defines "local" lithic material is based on the relationship between the site where the stone tool is found and its distance from a raw material source. However, one issue in directly applying Gero's Huaricoto lithics model is the overwhelming pervasiveness of obsidian found around Yellowstone Lake. For example, North shore sites' lithic composition is 90% obsidian from Obsidian Cliff (MacDonald and Hale 2013:219-222). Gero's model relies on multiple material types to rank the social value. However, the application of distance from quarry or procurement site can still be applied to sites around Yellowstone Lake. The categorization for degrees of production in her model for expedient sharp-edged cutting tools (female) vs. complex bifacial points (male) (Gero 1991:176) is more directly translated to the lithic assemblage at Yellowstone Lake, and is used in conjunction with a comparison to material types.

Women and Flora

Ethnobotanical remains are a key element in defining the domestic tasks of women, and are explored in ethnographic and ethnohistoric accounts to tie traditional ecological uses of plants to sustenance, symbolic, religious and medicinal uses. Archaeobotanical data from MYAP sites offers a line of evidence for elucidating the presence and activities of women. Examination of these recovered archaeobotanical remains “provides direct evidence for the use of a variety of native and cultivated plants” (Drass 1993:51). But it should be noted that processing and preservation factors affect the presence of archaeobotanical remains. Based on a case study taken from Richard Drass, an archaeologist and paleoethnobotanist, the majority of ethnobotanical remains are drawn from features. Features present the best concentrations of debris, including burned and plant remains. These types of remains offer important information for radiocarbon dating and direct use of plants within those features.

Ethnographically women are most commonly associated with food and plants in the course of their tasks, thus the presence of ethnobotanical remains offers a unique window into this particular aspect of life for women. What were they collecting? How were they processing or cooking? What types of purposes did plants serve? These are all questions that can be answered when combining the archaeobotanical remains and ethnographic and ethnohistoric information about traditional plant use. Plants were not only used as a fuel source (e.g. pine) but also as food (e.g. sunflower seeds), medicine (e.g. prickly pear cactus stems) or for spiritual and ritual practices (e.g. sage). Most plants are multi-purpose. When connected with the cultural features that likely served at least in part as women’s activity areas for cooking and processing food stuffs, we can begin to elucidate the presence of women.

As Daniel Moreman (1996) points out, food and medicine from the cultivation and use of plants is an intimate “dance” that requires specialized knowledge acquired in multiple ways. In his evaluation of plants used by Native Americans, he highlights the distinction between their uses as food versus medicine. Among most societies a niche exists for women’s medicine, as physiologically women encounter a unique set of needs and experiences in their lifetime (i.e., menarche, menstruation, pregnancy and menopause). Many contemporary societies, including indigenous groups, adhere to taboos that include isolating women during menstruation (Crooks and Baur 2013:64-65). It is logical to conclude that the medicinal uses of plants for the physical, emotional and symbolic needs of precontact women during menses potentially carried similar connotations in precontact times.

The prolific use of plant resources is not simply a matter of gathering plants for consumption, then stumbling upon their medicinal qualities or relying solely on the placebo effect (Moreman 1979). A knowledge base established and then built upon must be passed down to subsequent generations as it is perpetuated and refined. No doubt trial and error established some of this traditional ecological knowledge, but even more so was reliance on a sophisticated knowledge system that likely developed over thousands of years, through cultural transmission.

In order to consider women as the primary "gatherers" in these precontact societies, then we must also consider that women curated and maintained the majority of information about plant resources (i.e., uses, growing and harvesting seasons, cultivation, nutritional value, processing, habitats, etc.). If this is the case, then women must transmit this knowledge to other women, and the social group as a whole. However, if we consider men the primary curators of all subsistence knowledge then we might ask what would that look like in the archaeological context? The Optimal-Foraging Theory and ethnographic data help us infer the most effective division of labor for plant procurement and use (MacDonald 1998:225-226; Waguespack 2005).

Women and Space

When looking at specific lifeways through activities, the most heavily utilized data sets in gender archaeology involve food and space. Women's space is usually associated with residential areas; this includes food preparation areas (e.g., cooking hearths), distribution, storage, and food refuse areas. Food and space are two aspects of culture that are almost always cross-culturally engendered (Hastorf 1991:134). Food systems, for example, are an extremely important element for social relations when it comes to economics, and food may define the "development and maintenance of gender relations in the past" (Hastorf 1991:132). Exploring activities that women were engaged in during precontact occupations at the lake (e.g. food procurement, food processing), may give insight into gender roles and a better understanding of group activities (Morehart and Helmke 2008:60-62). Using microscale analysis of households through archaeological remains provides answers to questions about social processes, even for hunter-gatherer groups, to "dismantle fundamental assumptions of gendered divisions of labor implicit in notions of the public and private domains (Tejeda 2008:88)

Cultural features are a key component to the archaeological record around Yellowstone Lake. Much of MYAP's work involved analysis of charcoal, soils and artifacts in association with cultural features, along with defining the context of these features. A cultural feature is a broad term used in archaeology and can encompass everything from permanent site furniture to ephemeral non-distinct fire hearths. The 37 cultural features recovered from 17 of the 47 sites provide a platform to conduct a microscale analysis of features and their associated lithics and plant remains. Chronological information from radiocarbon dating within cultural features builds a timeline for use, and may provide information about the types of occupation at particular points in prehistory.

Cultural features contribute to our understanding of the capacity in which these features were used, and allow for inferences about who used them and for how long. Arguably, "non-kill" sites make up the majority of sites within the archaeological record. The temporary, ephemeral nature of kill-sites are not as spatially concentrated, therefore the actual dispatch site does not typically contain as much activity "residue" as areas where processing a kill into a variety of foodstuffs occurs. Furthermore, actual kill-sites typically occur at a considerable distance from domestic activity areas or encampments, therefore they are sparsely recovered through archaeological means (Brumbach and Jarvenpa 1997:22). This type of knowledge can be applied to the Yellowstone Lake area. While the lithic assemblage may over-emphasize hunting subsistence tasks, the multitude of "non-kill" or "non-hunting" sites provides evidence for female-specific task differentiation.

Hunting activities for hunter-gatherer societies is traditionally defined narrowly as male-specific labor, "dogmatically portrayed" and perpetuated in literature based on the seminal *Man the Hunter* by Lee and DeVore in 1973 (Brumbach and Jarvenpa 1997:17). Women certainly had roles in hunting, and this is demonstrated by ethnohistoric, ethnographic and traditional oral narratives (Brumbach and Jarvenpa 1997:17-32; Waguespack 2005). Yet analysis of other subsistence tasks within non-kill site activity areas still holds a female specific connotation. It should be recognized that these non-kill sites actually inform us about both male and female activities and their relationship to each other, and hunter-gatherer societies do not always adhere to social organization through gender roles.

As it pertains to gender roles through social organization, A.V. Thoms provides a launch point for archaeologically analyzing hunter-gatherer subsistence tasks through spatial analysis with his 2008 article, "The fire stones carry: Ethnographic records and archaeological expectations for hot-rock cookery in western North America" (Thoms 2008). Using ethnographic accounts and experimental archaeology he demonstrates how microspatial analysis of cultural fire features leads to interpretations about cooking habits at archaeological sites. This is important because cooking foodstuffs is not a random, impulsive activity. Cooking requires the knowledge and resources necessary in order to successfully maximize foods' nutritional value, flavor and preservation. Information about the intentional assembly of cultural features elucidates the possible function of the feature, which implies what types of foods were cooked, for how long, and the seasonality. FCR deposits are also useful for indicating types of cooking features and types of cooking techniques (Thoms 2008).

Thoms identifies four types of cooking facilities in two major categories: closed cooking facilities and open-air cooking facilities. He identifies these as a) earth oven with rock heating element fired in situ; b) pit steaming with rock heating element fired nearby; c) cook-stone grill fired in situ (in shallow basin); d) stone boiling (in bark/pouch lined pit) with cook stones fired nearby (left schematic, Figure 6). The right schematic depicts the construction of a typical earthen oven where (a) is a fire built in a pit beneath a layer of rocks; (b) is after the fire has burned completely, the red-hot rocks are covered with a packing material, the food packets, additional packing material and covered over with soil (earth); finally (c) what the pit will look like post-use, after being mined of all food contents.

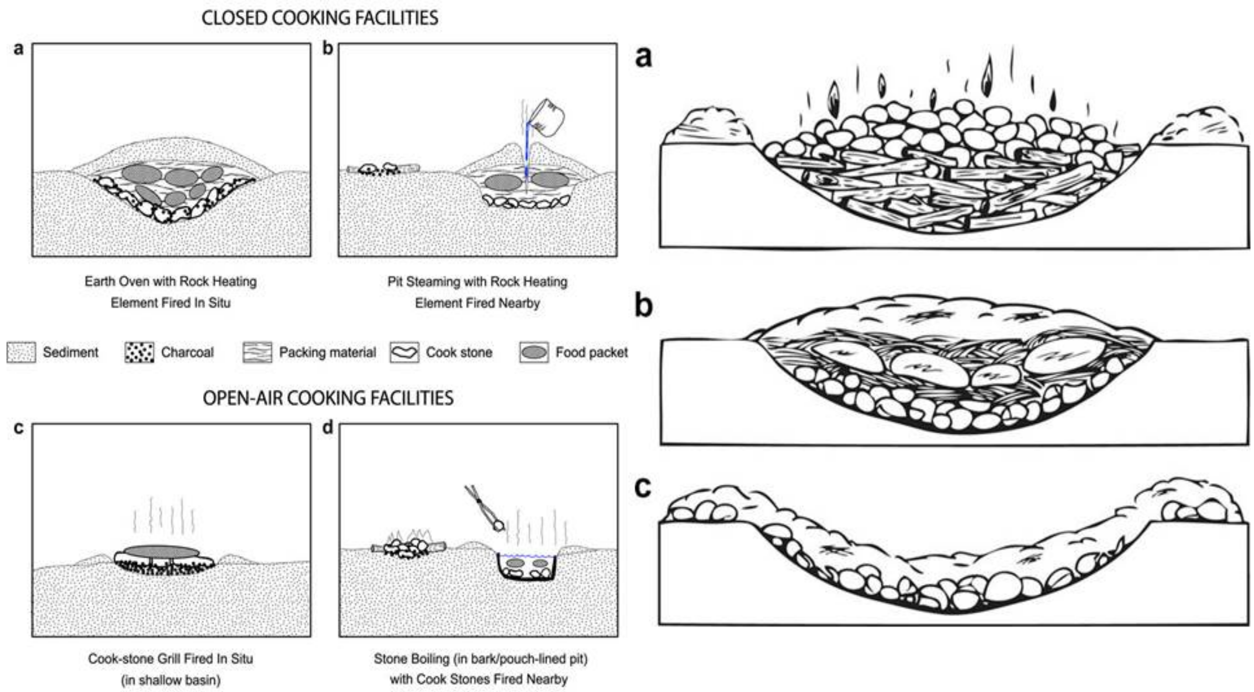


Figure 6: Schematic of hot-rock cooking facilities (Thoms1989:268).

Thoms also provides descriptions of the expected or likely characteristics and archaeological context seen, based on the type of hot-rock cooking feature.

Table 5: Summary of expected archaeological correlates for the nature and distribution of fire-cracked rocks used in hot-rock cooking facilities. Ŧ

Hot-rock cooking facility	**Expected archaeological characteristics of resulting fire-cracked rock (FCR) feature(s)**	**Expected archaeological characteristics of non-feature FCR**
Earth ovens, rocks heated therein *Smith (2000, pp. 7.8–7.15)*	Basin-shaped pit, 1–3 m in dia. and 0.1–0.3 m deep, sometimes with rock lining and always with a lens of FCR (i.e., heating element) underlain by and intermixed with thermally altered (oxidized, carbon-stained) sediments; FCR (small to large *), typically carbon stained and mostly fragments, varies considerably in size, whole rocks often found along edges of heating elements; burned bone (possibly from fuel residue), flakes and tools expected therein as discard from routine clean-up activities	Scattered FCR in the immediate vicinity of remains of earth ovens, representing discard and scavenging activities, and perhaps rocks used with oven-top fire; also other scattered camp debris, furniture rocks, and unused cook stones
Open-pit drying ovens, rocks heated elsewhere *Smith (2000, pp. 7.15–7.16)*	Basin-shaped pit (ca. 1 m dia. X 0.3 deep) with FCR lens, mostly medium-size large rocks, underlain by thermally unmodified sediment; nearby surface hearths (ca., 1 m dia.) where rocks were heated, represented by ash, oxidized sediments, and a few pieces of FCR, burned bone (possibly from fuel residue), flakes and tools expected therein as	Scattered FCR in the immediate vicinity of remains of open pits, representing discard and scavenging activities; also other scattered camp debris, furniture rock, and unused cook stones

	discard from routine clean-up activities	
Surface ‘‘oven,” rock(s) heated therein *Smith (2000, p. 7.20)*	Large to medium, presumably flattish, rock(s) on or just below the occupation surface, underlain and encompassed by thermally altered sediment (oxidized, perhaps some carbon stained); burned bone (possibly from fuel residue), flakes and tools expected therein as discard from routine clean-up activities	Scattered FCR in the immediate vicinity of remains of surface ‘‘ovens” (i.e., open-air griddles) representing discard and scavenging activities; also other scattered camp debris, furniture rock and unused cook stones
Steaming pits; rocks heated nearby *Smith (2000, p. 7.19)*	Basin-shaped pit (ca. 1 m dia. X 0.3 m deep) partially filled or lined with medium and large FCR (typically not carbon stained), or occasionally a large flat rock, underlain by thermally unaltered sediment; nearby surface hearths (ca. 1 m dia.) where rocks were heated, represented by ash, charcoal, oxidized sediments, and a few pieces of FCR	Scattered FCR in the immediate vicinity of remains of steaming pits, representing discard and scavenging activities; also other scattered camp debris, furniture, and unused cook stones
Stone boiling in a pit; rocks heated nearby *Smith (2000, pp.7.16–7.19)*	Bucket-like (i.e., near-vertical side walls) pits, 0.3–0.45 m in dia. and 0.15–0.45 m deep, partially filled with small, possibly medium-sized, FCR, not typically carbon stained, underlain by thermally unmodified sediment; nearby surface hearths where rocks were heated, represented by ash, charcoal, oxidized sediments, and a few pieces of FCR, burned bone (possibly from fuel residue), burned flakes and tools discarded in the fire pit	Comparatively dense, scattered FCR in the immediate vicinity of remains of stone-boiling pits or concentrations representing discard and scavenging activities; also other scattered camp debris, furniture, and unused cook stones
Stone boiling in a container; rocks heated nearby *Smith (2000, pp. 7.16–7.19)*	Surface hearths where rocks were heated, represented by ash, charcoal, oxidized sediments, and FCR (not typically carbon stained); concentrations of discarded small- and possibly medium-sized FCR, burned bone (possibly from fuel residue), burned flakes and tools, possibly discarded in fire pit	Comparatively dense, scattered FCR in the immediate stone boiling area, representing discard and scavenging activities; also other scattered camp debris, furniture rock, and unused cook stones

* Original rock sizes: large rocks, >25 cm in diameter; medium rocks, 10–25 cm in diameter; small rocks, <than 10 cm in diameter.
Ŧ Table reproduced from original table in Thoms 2008:457, Table 4. Citations in original table.

Cultural features, viewed as “activity areas”, provide spatially concentrated residues of production, settlement and site use patterns (Brumbach and Jarvenpa 1997:22), as well as microscale views of spatial distinctions or patterning that may reflect a broader use of the landscape as a whole (Dobres 1995). Cultural features are a broadly defined category in archaeology. Hearths or fire pits are typically defined as a concentration of FCR and/or charcoal, along with dark staining (Thoms 2008:457). For example, roasting pits are typically defined as a concentric rock cluster often with an associated secondary dump or refuse area nearby (Thoms 2008:457; Hayden and Cousins 2004:140-154). These types of “expected archaeological characteristics” provide a frame-of-reference for microspatial analysis of activity areas, such as those of cultural fire features found around Yellowstone Lake.

Chapter 4: Methods and Materials

4.1 Introduction

This section provides details of the methods and materials used to evaluate specific material data sets outlined in the introduction. The materials that are utilized in this study were composite data from previous site reports completed by the MYAP, listed below.

4.2 Materials

Five site reports are used in this thesis that were produced by the MYAP project and submitted to YNP in fulfillment of work conducted under cooperative agreement between the University of Montana, YNP, and the Rocky Mountains Cooperative Ecosystem Study Unit (UM Grants 365689, 365729, & 367773; RM-CESU/NPS Reference Numbers: J1580110158, P12AC10427 & P13AC00345). The five primary site reports that provided composite data sets are:

(1) *2009-2010 Montana Yellowstone Archaeological Project Survey and Evaluation of Sites along Yellowstone Lake's Northwest Sh*ore, Douglas H. MacDonald, Ph.D., RPA & Michael C. Livers, M.A. With Contributions by Steven Sheriff, Ph.D., Jannifer Gish, M.A., Kathryn Parker, M.A., Ryan Sherburne, Jordan McIntyre, and Loni Waters.

(2) *2010 Montana Yellowstone Archaeological Project Archaeological Assessment of Fishing Bridge Developed Area Utility Upgrade Projects: Waste Water Treatment Plant Lift Station Line Replacement and Fishing Bridge Museum Water Line Upgrade*, by Michael C. Livers, M.A. & Douglas H. MacDonald, Ph.D., RPA. With Contributions by Steven Sheriff, Ph.D., Jordan McIntyre, and Ryan Sherburne.

(3) *2010-2011 MYAP East Shore Survey, Volume 1: Yellowstone Lake Class III Archaeological Survey and National Register Testing, Yellowstone National Park, Wyoming*, by Michael C. Livers, M.A. and Douglas H. MacDonald, Ph.D., RPA. With Contributions by Jannifer Gish, M.A., Jordan McIntyre, Kristin Hare, and Ryan Sherburne.

(4) *2010-2011 University Of Montana East Shore Yellowstone Lake Survey, Yellowstone National Park, Wyoming, Volume 2: Artifact Descriptions and Research Results*, by Michael C. Livers, M.A. and Kristin Hare. With Contributions by Douglas H. MacDonald, Ph.D., RPA, Marc Hendrix, Ph.D., Michael Hoffman, Ph.D., Jannifer Gish,

M.A., and Linda Scott-Cummings, Ph.D.

(5) *2010-2013 Montana Yellowstone Archaeological Project Evaluation of Sites along the South Shore, Yellowstone Lake, Wyoming, Volume 1: Site Results and Recommendations*, by Douglas H. MacDonald, Ph.D., RPA. With Contributions by Michael C. Livers, M.A., Jannifer Gish, M.A., Ryan Sherburne, Matthew Nelson, and Jordan McIntyre.

Once identified, aggregate data are used for (1) stone tool; (2) archaeobotanical; and (3) cultural feature data from the site reports produced for the three major regions of the lake, defined as the North, East and South lake shore survey areas (see Figure 4). Recovered lithic artifacts from excavation are temporarily housed in the laboratory of Douglas H. MacDonald, Ph.D., RPA, at the University of Montana in Missoula, Montana and permanently curated at the Yellowstone Historic Center, Gardiner, Montana, as per the cooperative agreements. No additional lithic, feature, or botanical analysis was conducted for this project; instead, data were gleaned from published reports. Original photos of artifacts, sites and features pertinent to this study are extracted from the site reports and utilized as supplemental visual context.

4.3 Methods

Review of the site report data began by tabulating sites where test unit excavation occurred (n=47). The sites chosen for analysis in this thesis had at least one test unit excavated within the site boundaries. Sites evaluated with only pedestrian or shovel test-pit survey are excluded due to the variability in excavation techniques, less detailed documentation and lack of botanical flotation and radiocarbon sampling data.

A variable amount of test unit excavation at each site occurred, depending on site information potential, surface and STP results, the indication of cultural features present, site conditions, fieldwork staff time and resources, as well as other variables. Site reports provided counts for bifacial and unifacial tools, results of macrobotanical and float sample analyses and excavation results of cultural features.

Tool counts and types were determined by trained project staff using a consistent methodology and standardized definitions, and recorded verbatim from MYAP site reports. Cultural features were always excavated by MYAP within a test unit, whether discovered inadvertently, such as eroding out of a lake shore, or using some other method such as ground-penetrating radar (GPR). Out of the 47 archaeological sites analyzed, a total of 37 cultural features were recorded within the three MYAP survey regions of the lake. Most features were defined as small ephemeral fire hearths or small boiling or roasting pits. A complete chronology of feature and site use over time appears in Figures 16-17. Feature dates range from Early Archaic (RCYBP date of 5910±50) to Late Prehistoric (RCYBP date of 220±40), but also include a possible, but not independently dated Paleoindian feature, presumably from the late Paleoindian Period.

Lithic tools (unifacial and bifacial) are analyzed primarily using basic statistical methods: chi-square and linear regression. These methods are discussed in greater detail in Chapter 5.2. Archaeobotanical remains are studied by utilizing ethnohistoric data to create a frame-of-reference, from which to infer possible uses of plant remains found in cultural features. This methodology and the ethnohistoric sources are discussed in Chapter 6. Cultural features are analyzed using a rubric of expected archaeological characteristics and defining women's space as 1) features requiring more labor to create, i.e. roasting or boiling pits, and 2) features that contain plant remains beyond what would typically be used as fuel for fire. This is discussed in detail in Chapter 7. Synthesizing the five site reports by aggregating data for stone tools, archaeobotanical remains and cultural features allows for a three-pronged analysis used to identify potential gender-based lifeways. The three lines of evidence provide information about subsistence-based practices (i.e., hunting, food processing and use, plant collection and processing or use), as the primary focus of hunter-gatherer groups utilizing the Yellowstone Lake region.

Exploring the cultural materials of precontact peoples around Yellowstone Lake is a logical and effective way to establish social dynamics, including gender. Hunter-gatherer groups are mobile; therefore they tend to carry fewer personal possessions, translating into less cultural materials recovered in the archaeological record. Focusing on two major stone tool types, bifaces and unifaces, utilized in the majority of daily tasks, provides a means to study the transported material culture curated by these groups. The use of archaeobotanical remains is an effective avenue for exploring plant procurement, which is often attributable to almost exclusively female labor. Lastly, hunter-gatherer groups seldom establish permanent sites with large-scale, long-term site demarcations. However, evaluating the cultural fire features through microscale spatial analysis allows for exploration of encampments and immediate activities therein.

Chapter 5: Lithic Analysis and Results

5.1 Introduction

The initial hypothesis for approaching the lithic data centered on the notion that if unifacial tools are indeed female specific tools based on the tasks they accomplish, then unifaces would be found at sites with cultural features in higher frequencies than bifaces, because these are presumably female-specific activity areas. Investigations made into the possible relationship between tool types and gender pertain to the presence of cultural features at sites and regional differences for stone tool types and the materials with which tools are made from. Examination of the lithic (stone) tool assemblages from the 47 selected sites around Yellowstone Lake revealed that the overwhelming majority of tools classified by MYAP staff were either bifacial or unifacial tools. The level of tool manufacture varied from expedient to labor intensive. As discussed by other Yellowstone area researchers, there appears to be a dominance of obsidian as a stone tool material type used to manufacture these tools.

The majority of bifacial tools are categorized as projectile points and various stage chipped stone tools flaked on both sides. The majority of unifacial tools are categorized as endscrapers and utilized flakes. The majority of recovered lithics are debitage flakes related to stone tool manufacture, predominately made of obsidian. Close to 90% of lithics recovered around Yellowstone Lake are from Obsidian Cliff, approximately 40 miles from Fishing Bridge Point, near the North Central tip of Yellowstone Lake. Using energy-dispersive x-ray fluorescence (EDXRF) analysis, volcanic lithic artifacts at the lake can be sourced to Obsidian Cliff using the unique chemical signature of this stone. There is also a widespread amount of chert, with a major procurement site at Crescent Hill, also about 40 miles from the North Central tip of Yellowstone Lake. With the exception of chert, other stone material types such as dacite, jasper and quartzite occur in much smaller quantities and are not uniformly found across sites. A variety of other artifacts, such as red ochre, a drill, a mano, and hammerstones, were also present at various sites excavated by the MYAP. However, these are in fairly low quantities compared with lithic debitage, unifacial and bifacial tools (see Tables 2-4).

A comparison of tool types in relationship to the frequency of cultural features at sites is performed using simple ratios, bivariate linear regressions and chi-square test of significance. After aggregating the data published in all five site reports for the three regions (North, East and South shores), a ratio of unifacial tools compared with bifacial tools is determined for each region. This ratio is an initial step towards exploring a possible relationship between these two distinct tool types. A descriptive table for these data appears in Appendix A.

The second hypothesis explored is the relationship between tool type and the material used in its manufacture. MacDonald et al., 2012 explored the lithic assemblage from 28 sites around Yellowstone Lake and part of their analysis was to calculate the use of material types for tools within particular regions around the lake shoreline. In their article, obsidian clearly dominates the overall lithic assemblage, which the authors owe to the fact that several major obsidian sources are in the lake area, including Obsidian Cliff. While some chronological variation exists, the "general material-use trends hold true for most of prehistory around the lake" (MacDonald et al., 2012:264).

The authors point out differences in the material-type composition of the lithic assemblage based on distances from this main obsidian source. In areas such as the East and South shores, which are farther from Obsidian Cliff than the North shore, more cherts and other stone material types are present. The authors cite this evidence to suggest that multiple, distinct cultural groups used the area around Yellowstone Lake. Trade for material types on the East and

South shores likely occurred as well, accounting for the frequency of obsidian at those specific sites (MacDonald et al., 2012:265).

This MacDonald et al. analysis of lithics and the use of stone material types is reconsidered here in this thesis through a series of linear regressions, as a means to explore possible gendered social structures and group distinctions as it pertains to stone tool manufacture. To do so, 22 of the original 28 sites are examined from the MacDonald et al., 2012 study. The six sites not excavated by the MYAP, and therefore not documented in the MYAP site reports are excluded, as well as MYAP site 48YE2084 due to insufficient information. A table of the pertinent sites for this analysis is below.

Table 6: List of sites from MacDonald et al. 2012.

MacDonald, et al 2012 region (region distinctions used in this thesis: East Shore (ES); South Shore (SS); North Shore (NS))	Site Number	Bibliographic Citation
NW Shore (NS)	48YE380	Livers and MacDonald 2011; MacDonald and Livers 2011
NW Shore (NS)	48YE381	Livers and MacDonald 2011; MacDonald and Livers 2011
NW Shore (NS)	48YE1556	Livers and MacDonald 2011; MacDonald and Livers 2011
NW Shore (NS)	48YE1558	Livers and MacDonald 2011; MacDonald and Livers 2011
NW Shore (NS)	48YE1553	Livers and MacDonald 2011; MacDonald and Livers 2011
NW Shore (NS)	48YE549	Livers and MacDonald 2011; MacDonald and Livers 2011
NW Shore (NS)	48YE2111	Livers and MacDonald 2011; MacDonald and Livers 2011
NE Shore (ES)	48YE2075	Livers and MacDonald 2011; MacDonald and Livers 2011
NE Shore (ES)	48YE678	Livers and MacDonald 2012
NE Shore (ES)	48YE2080	Livers and MacDonald 2012
NE Shore (ES)	48YE2082	Livers and MacDonald 2012
NE Shore (ES)	48YE2083	Livers and MacDonald 2012
NE Shore (ES)	48YE2085	Livers and MacDonald 2012
SE Shore (ES)	48YE1499	Livers and MacDonald 2012
SE Shore (ES)	48YE2107	Livers and MacDonald 2012
SC/SW Shore (SS)	48YE1660	MacDonald, 2012a
SC/SW Shore (SS)	48YE1664	MacDonald, 2012a
SC/SW Shore (SS)	48YE1670	MacDonald, 2012a
SC/SW Shore (SS)	48YE2190	MacDonald, 2012a
SC/SW Shore (SS)	48YE1384	MacDonald, 2012a

SC/SW Shore (SS)	48YE1383	MacDonald, 2012a
SC/SW Shore (SS)	48YE1601	MacDonald, 2012a

Table 7: List of sites from MacDonald et al. 2012, excluded from the analysis herein.

The following 6 sites were not used for this lithic stone tool material type use reanalysis.		
NE Shore (ES)	48YE2084 (data not available for material types of tools)	Livers and MacDonald 2012
NE Shore (ES)	48YE696	Cannon et al 1997
NE Shore (ES)	48YE697	Cannon et al 1997
NE Shore (ES)	48YE701	Cannon et al 1997
SE Shore (ES)	48YE525	Lifeways, Vivian 2009
SC/SW Shore (SS)	48YE409/410	Lifeways, Johnson et al 2004

The Yellowstone Lake area is expansive, with three distinct regions, all with signs of precontact occupation in various contexts and near prominent and concentrated stone tool material resource procurement areas. Obsidian Cliff is one of four primary sources of obsidian in the park based on energy-dispersive x-ray fluorescence (EDXRF) analysis sourcing analysis, conducted by MYAP and others (MacDonald et al., 2012:264; Smith 1999; Adams 2006:539; Sanders 2002:214-216). Crescent Hill is also within this region and is a primary chert resource for artifacts found around Yellowstone Lake (MacDonald et al., 2012:265). See Adam's M.A. thesis (2011) for a comprehensive evaluation of this stone procurement site. Both stone procurement areas are approximately 40 miles (35 km) from Fishing Bridge Point on the North shore of Yellowstone Lake.

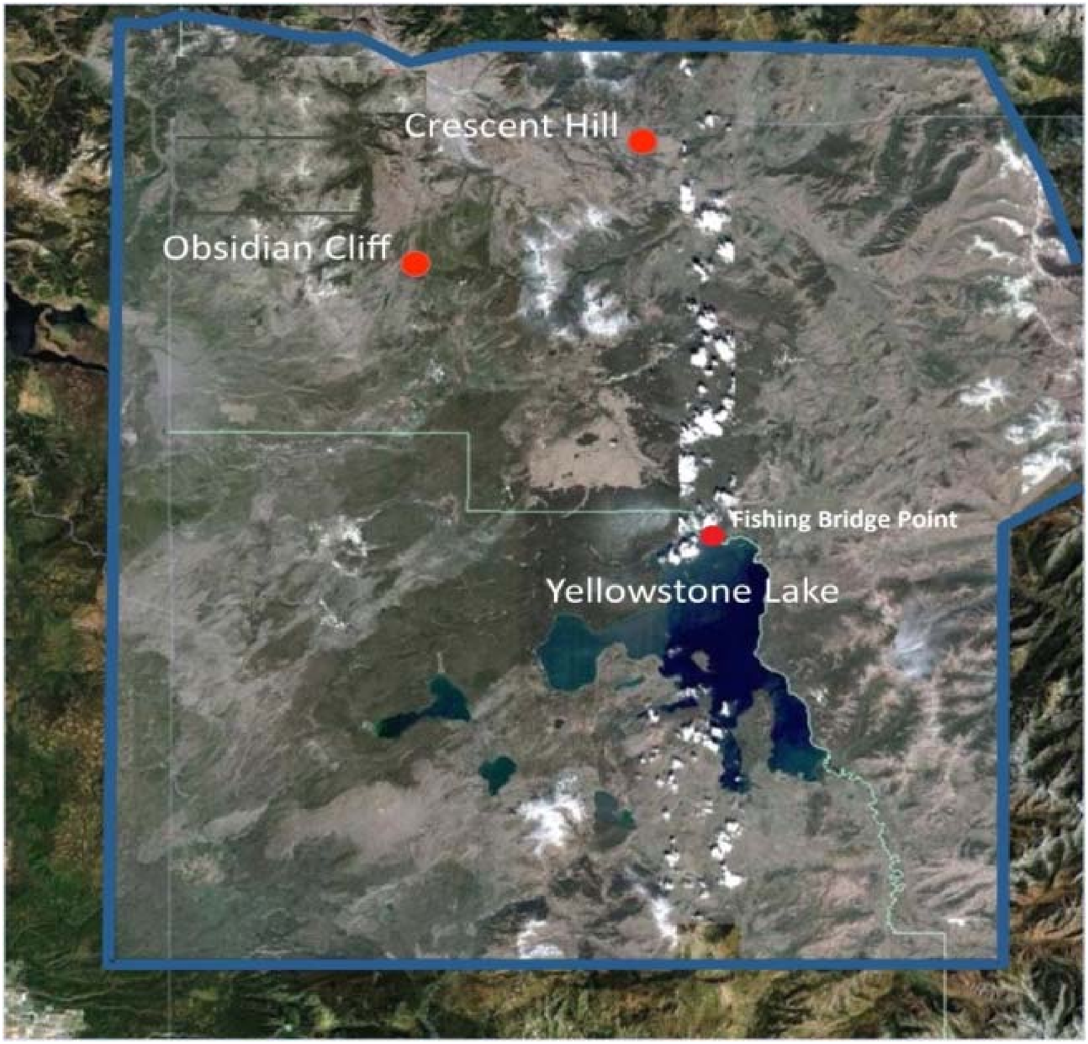


Figure 7: Yellowstone Lake Region, Obsidian Cliff and Crescent Hill (Modified from Adams 2011:3).

The second relevant case study, used to complement the analysis of stone tool type and material type for stone tool manufacture, provides a frame-of-reference for the valuation of stone tool material types around the lake. The study is built on the work of the pioneering and renowned gender archaeologist Joan Gero, and is described in detail in Chapter 3. Essentially, her analysis considers stone material resources in terms of low to high social value, based on regional location and distance from the material procurement site. It is hypothesized that this concept can also be applied to the lithic assemblages found around Yellowstone Lake, as it relates to geographic proximity from major stone procurement sites.

5.2 Methods

The purpose of this analysis is to test two hypotheses: 1) unifacial tools occur in higher frequency than bifacial tools at sites with cultural features among the 47 sites analyzed, because these are more female-specific activity areas, and 2) the possible social value placed on obsidian and chert in the manufacture of unifacial versus bifacial tools, based on an analysis conducted by MacDonald et al. 2012 which compares the rate of use of these stone material types for various regions around the lake. The pertinent test statistics used for analysis of these two hypotheses are: correlation coefficient (r), coefficient of determination (R^2) and chi-square (χ^2).

The strength of the relationship between tools, cultural features and tool material types is analyzed through the calculation of Pearson's r (r), also known as the correlation coefficient. Pearson's r is a measure of association for variables measured at the interval-ratio level. The strength of the relationship between stone tool material (obsidian; chert) and type (biface; uniface) for this data set are defined based on the thresholds presented in Table 8 (Healy 2009:372). Thus, "an r value of 0.50 indicates a moderately strong, positive linear relationship" (Healy 2009:371) between the stone material type and stone tool type.

Table 8: Pearson's r correlation strength thresholds (Healy 2009:372).

Pearson's r value (correlation coefficient)	Definition of strength of relationship
0.00-0.30	weak
0.30-0.60	moderate
>0.60	strong

Beyond this, the coefficient of determination is simply the square of Pearson's r (R^2), which essentially predicts the mean of Y for every observation point. The strength in using the coefficient of determination is that it provides the explained and unexplained variation between the two variables, X (tool type) and Y (material type). In other words, in the case of a perfect positive or perfect negative relationship ($R^2= 1$ or -1), then X (tool type) explains (or accounts for) all of the variation we see for Y (material type) (Healy 2009:375). The coefficient of determination (R^2) is *not* a test of significance, rather a bounded measurement that can be interpreted independently of the scale of the two variables.

Another powerful test statistic utilized is a chi-square test (χ^2). This type of hypothesis testing provides a sampling distribution (a chi-square distribution, established based on the degrees of freedom (df) and confidence interval (p-value)). Using chi-square to test the null hypothesis helps determine whether there is a statistically significant difference between expected and observed frequencies within the data set. A chi-square obtained value that meets or exceeds the chi-square critical value means that the observed frequencies are due to something other than sampling variation (random chance). A test statistic that fails to meet or exceed the critical value, means that we cannot rule out that the observed frequencies are due to any more than sampling variation or random chance (Healy 2009:262-263).

The chi-square analysis provides the flexibility needed to run a basic statistical comparison, while still providing valuable information about the relationship between variables. One caveat to the use of chi-square is that this test statistic is best utilized when the number of cases (observed frequencies) is at least $n \geq 100$. A combination of bivariate linear regressions and chi-square analysis are performed to evaluate if a correlation between tool type and the presence of cultural features exists. An averages plot and linear regressions correlate the tool type with the number of features at all 47 sites. Further examination of the statistical significance of this relationship also uses a chi-square test for significance.

The chi-square test for significance at the 95% confidence interval is conducted for the presence of features with bifaces or unifaces (present or not present). The chi-square tests are calculated using SPSS Statistical Software. The outputs for these calculations are summarized in Figure 10, and SPSS outputs are listed in Appendix B. This test is conducted for the entire set of sites with test unit excavations (n=47). Testing the relationship between the presence of particular tool types and cultural features at sites aims to confirm the hypothesis that female-specific tools (unifaces) are found in greater frequency than male-specific bifacial tools at sites with female-specific activity areas, defined as sites with cultural features present.

The second hypothesis is tested using regression analyses to understand the relationship obsidian and chert stone tool material types have to the manufacture of the two types of tools (bifaces; unifaces), for (1) the lake regions collectively; (2) the lake region distinctions (North, South, East shores) based on the selected sites from the MacDonald et al. 2012 analysis (Table 6). The composition of stone tool assemblages from the 22 selected sites is overwhelmingly dominated by obsidian and chert, which make up the majority of material types for all bifacial and unifacial stone tools recovered (87%, see Figure 11). Parameters for the lithic assemblage analysis in this thesis are constrained in order to evaluate the relationship between stone tool type (unifacial; bifacial) and material type (obsidian; chert), as it relates to the geographic proximity to primary stone procurement areas: Obsidian Cliff and Crescent Hill. Narrowing the focus to obsidian and chert allows for an evaluation as to why these two types of material were the most commonly used, based on acts of human agency (i.e., human preference). This might make evident any "gendered labor practices through which raw materials were transformed into cultural objects for use and exchange" (Dobres 1995:25).

It should be noted that the sites used in the MacDonald et al. 2012 study are a mix of sites with various levels of archaeological survey, not limited to sites with test unit excavation. The regions used in the MacDonald et al. 2012 study are redefined for the subsequent analysis; this only affected the regional classification of two sites: 48YE1499 and 48YE2107, which MacDonald et al. 2012 define as the "Southeast shore". Consequently these are the only two sites within this region, according to that classification. These sites are reassigned to the East shore, which is geographically logical. Bivariate linear regressions were performed with the 22 selected sites from MacDonald et al. 2012 using the original regional distinctions (Northwest, Northeast, Southeast and Southwest shores), however there were no differences of consequence in the outputs. Therefore, this analysis proceeded with calculating bivariate linear regressions using the established regional distinctions used throughout the rest of this thesis (North, East and South shore).

5.3 Results

Tool types and the presence of cultural features

In order to establish a baseline measurement of the relationship between tool types and cultural features, uniface to biface tool ratios at 47 sites were calculated, then compared to frequency of cultural features at these sites. This is done to test the hypothesis that female-specific tools are found within female-specific activity areas. Results show that at every site there were always a greater number of bifaces than unifaces. Figure 8 is a summary chart of tool types and the presence of features within the three regions (left). Uniface to biface tools ratios per square meter excavated in each region is presented on the right.

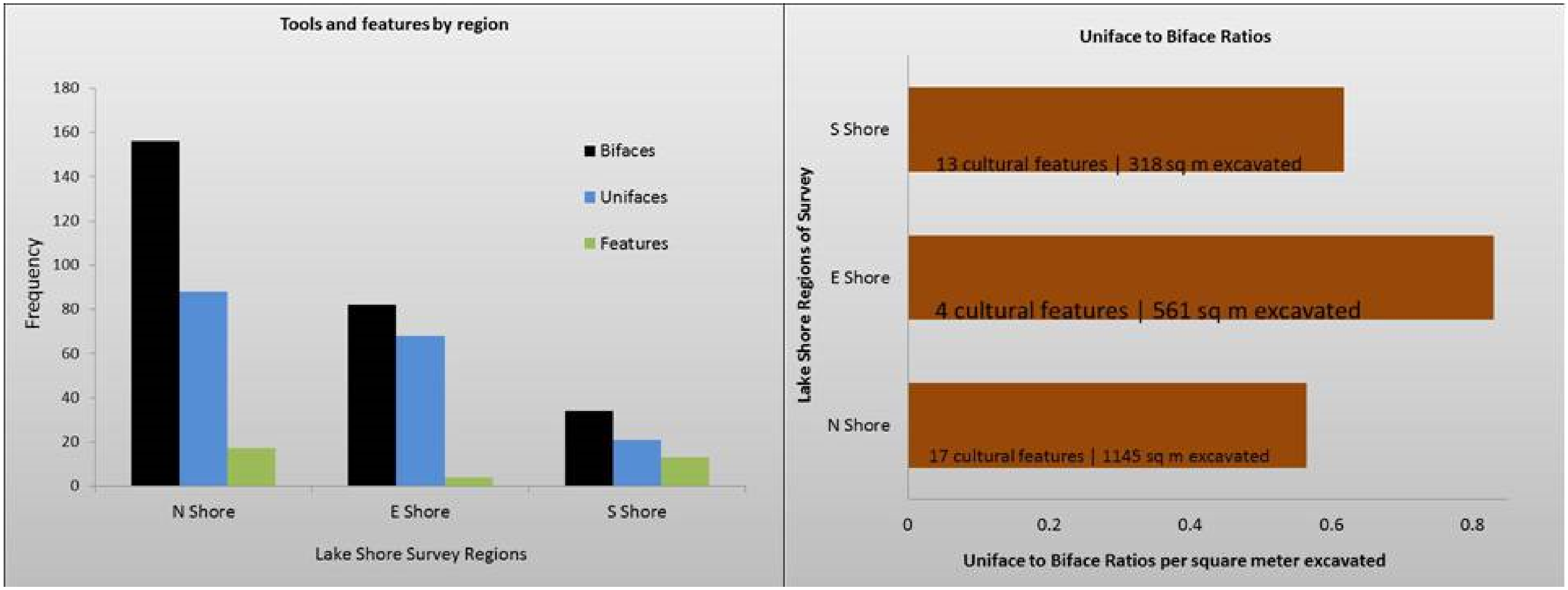


Figure 8: Summary chart of tool types and presence of features within regions (left). Uniface to biface tools ratio per sq. m excavated, with number of cultural features present noted (right).

The highest uniface to biface ratio was at the East shore (unifacial:bifacial = 0.80) which had the fewest number of cultural features (n=4). The South and North shores had similar unifacial to bifacial ratios of 0.60 and 0.55, and cultural features 14 and 17, respectively.

The bivariate linear regression plots (inset, Figure 9) show a positive correlation between the number of features per site to both bifacial (n=300) and unifacial (n=185) tools. The number of unifaces (inset left plot) and bifaces (inset right plot) were calculated for the frequency of features at sites (0, 1, 2, …. 7), and used to construct a linear relationship between the number of features and the tool types (unifacial or bifacial). As the number of features at a site increases, the tool counts for both bifacial and unifacial tools increases as well. Given that a greater amount of excavation occurs at sites with cultural features, increasing the quantity of recovered artifacts, and these sites contain a greater amount of visible precontact activity, this is an expected result.

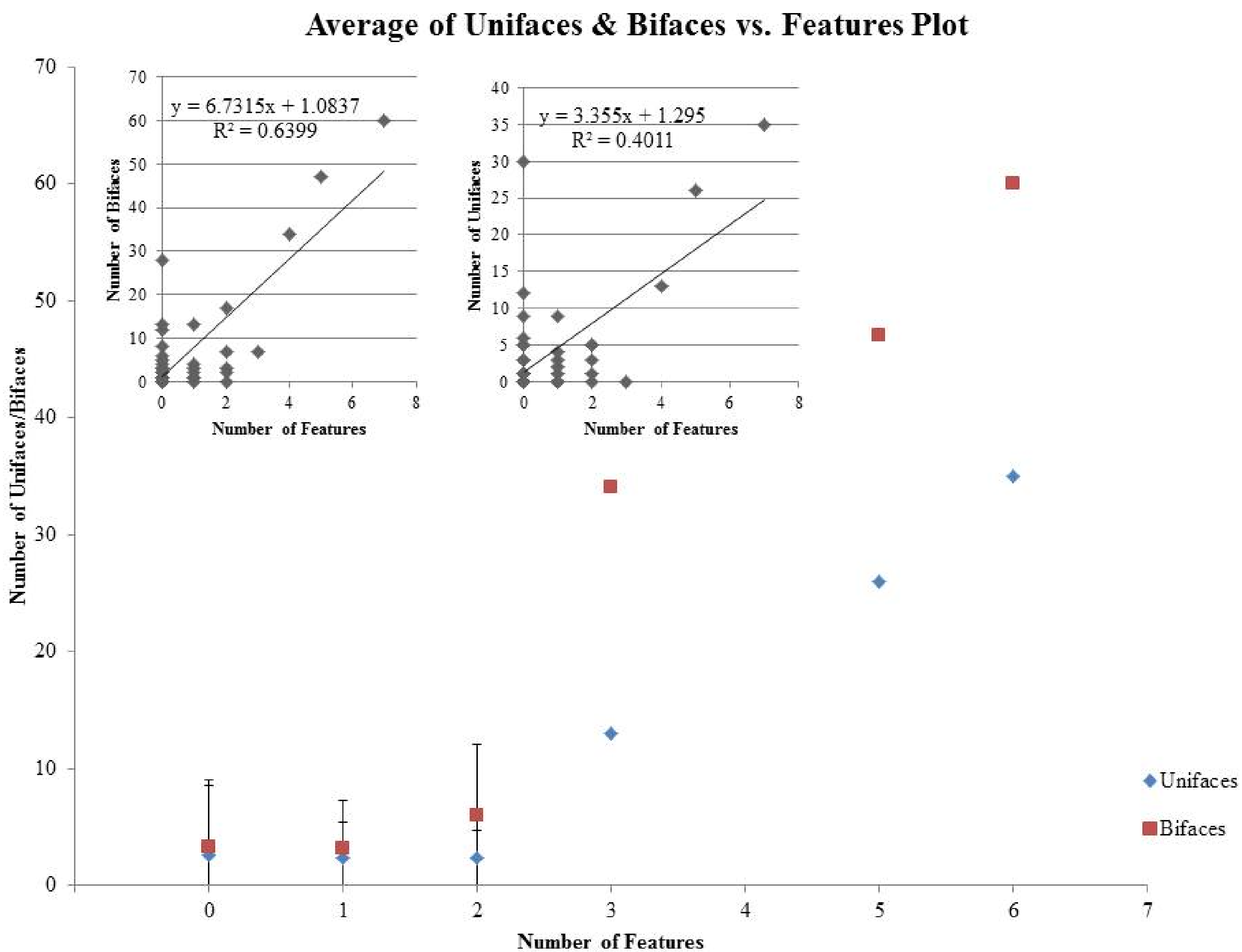


Figure 9: Averages Plot with linear regression inset for comparison of bifacial and unifacial tool counts to the number of cultural features present.

The bivariate table in Figure 10 reflects the chi-square analysis for the presence of unifaces at sites with features versus bifaces at sites with features. Actual counts are not used because bifaces are in greater numbers at all sites. In neither case is the relationship considered statistically significant at the 95% confidence interval. However, the relationship between unifaces and sites with features comes close to the critical value. The chi-square values for both unifacial and bifacial tools falls below the critical value (χ^2_{crit}=3.841) in order for the relationship between tool type and sites with features to be considered statistically significant at the 95% confidence level ($p < 0.05$). SPSS outputs for this calculation appear in Appendix B. A caveat is that chi-square is more robust when using at least 100 cases. These results suggest that there may be a statistically significant relationship between the presence of unifaces at sites with features, but a larger sample size of sites needs to be evaluated.

Presence of Unifaces	Presence of Features: Yes	No	Total
Yes	48% (12)	52% (13)	100% (25)
No	23% (5)	77% (17)	100% (22)
Total	36% (17)	64% (30)	100% (47)

Chi Square obtained= 3.24
Chi Square critical= 3.841
P< .05

Presence of Bifaces	Presence of Features: Yes	No	Total
Yes	60% (15)	84% (21)	100% (36)
No	9% (2)	41% (9)	100% (11)
Total	36% (17)	64% (30)	100% (47)

Chi Square obtained = 2.02
Chi Square critical= 3.841
P< .05

Figure 10: Bivariate table for relationship between features and tool types; *df=1*.

Tool and material type comparisons

The second hypothesis tested attempts to explain the differential rates of use for certain stone tool material types in unifacial and bifacial tool manufacture. Figure 11 shows the composition of stone tool assemblages from the 22 sites that were selected from the analysis by MacDonald et al. 2012. The compostion of stone tools analyzed for the Yellowstone Lake region in general is overwhelmingly dominated by obsidian and chert, which make up the majority of material types for all bifacial and unifacial stone tools recovered (87%, see Figure 11, A). It should be noted that several other tool material types are present, which make up 13% of the lithic assemblage from the 22 sites analyzed. The presence of tools made out of any given material other than obsidian or chert is relatively rare. In total, there were 487 bifacial and unifacial tools recovered from the 22 MacDonald et al. 2012 sites analyzed, based on corroborating site report documentation (Livers, M.C. and Douglas H. MacDonald 2012; Livers, M.C. and Kristen Hare 2011; MacDonald, D.H. and Michael C. Livers 2011; Livers, M.C. and Douglas H. MacDonald 2011; MacDonald, D.H. 2014). Out of these lithic tools 64% are bifaces (n=311), and 36% are unifaces (n=176).

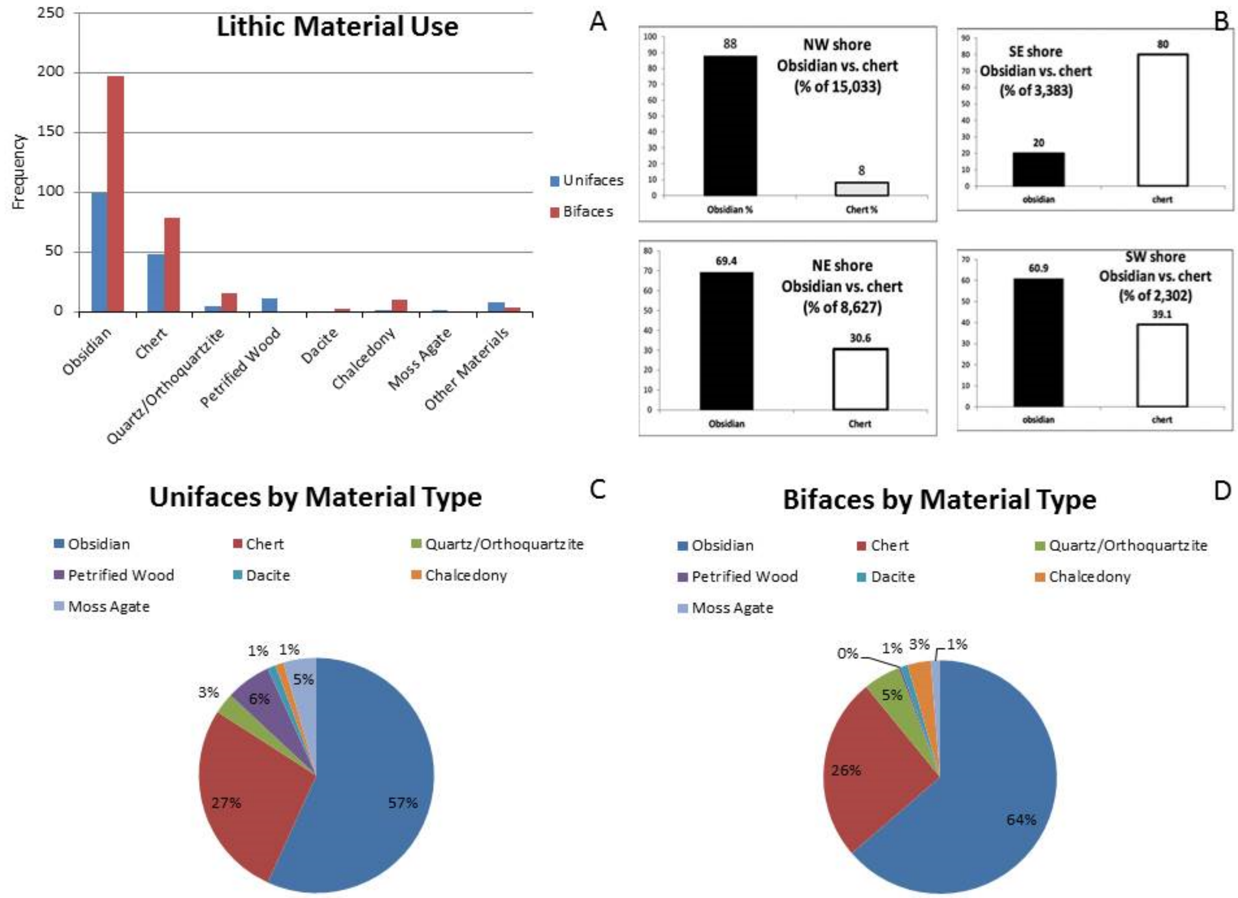
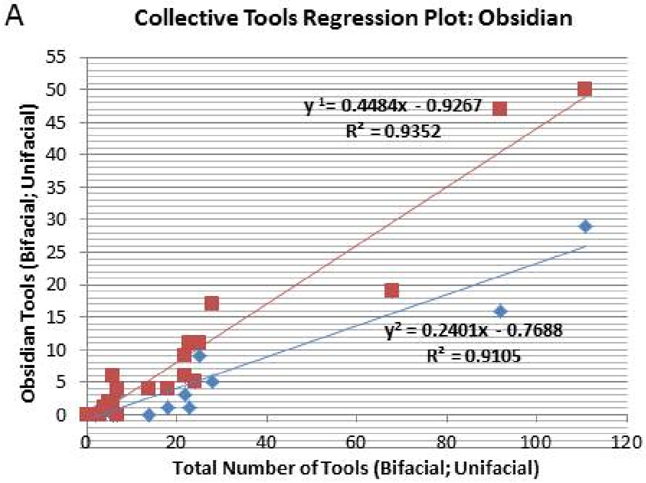
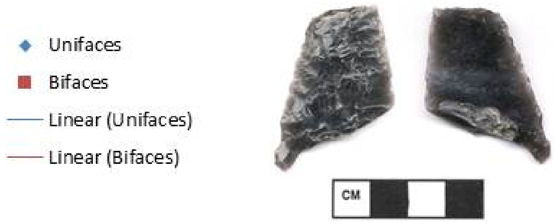


Figure 11: A) Lithic material used for all material types found for bifacial and unifacial tools (n=487) Red bars are bifaces frequency and blue unifaces. (B) Excerpt stone tool composition charts (MacDonald et.al 2012:266-267, Fig. 5). (C) Pie chart showing proportion of unifaces for each material type. (D) Pie chart showing proportion of bifaces for each material type.

MacDonald et al. 2012 established the relationship for stone tool material type use based on the proximity to the main quarry for obsidian from Obsidian Cliff. This complementary analysis conducted using MacDonald et al. 2012 site data, also takes chert from Crescent Hill into consideration as the second major stone tool material source. This linear regression tests the hypothesis of interest here by looking at what the rate of use for stone tool material types are in comparison to unifacial and bifacial tools around the lake. Collectively for all three lake regions there is a parallel rate of use for both obsidian and chert in bifacial and unifacial tools (Figure 12). The linear regression plots and correlation matrices for these results are presented in greater detail in Appendix D.

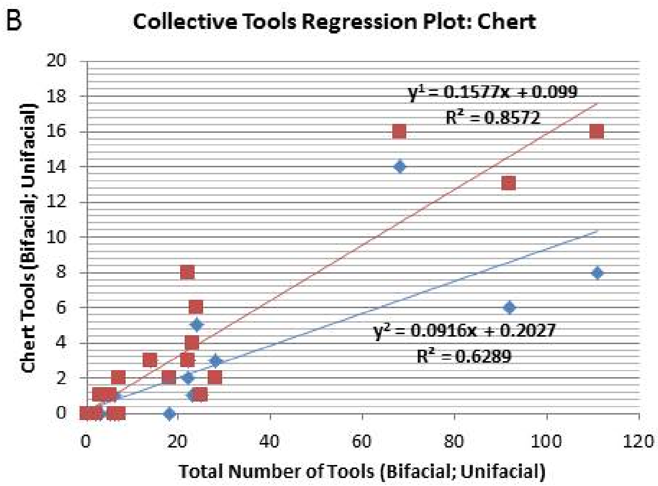
A

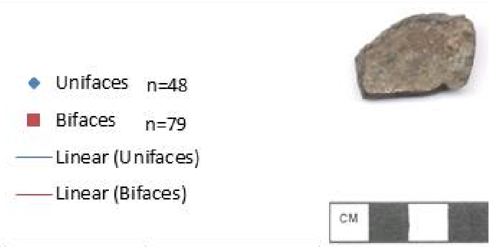




*rounded to the nearest tenth	Correlation Coefficient (Pearson's r)*	Coefficient of Determination (r2)*	Strength of Association (Pearson's r)
y¹ (bifaces) n=198	0.97	0.94	Strong
y² (unifaces) n=100	0.95	0.91	Strong

B





*rounded to the nearest tenth	Correlation Coefficient (Pearson's r)*	Coefficient of Determination (r2)*	Strength of Association (Pearson's r)
y¹ (bifaces) n=79	0.93	0.86	Strong
y² (unifaces) n=48	0.79	0.63	Strong

Figure 12: Entire lake region obsidian tool linear regression plot.

Figure 12 (A) shows a linear regression plot demonstrating the relationship between tool type and obsidian material type for all 3 lake regions examined (n=487). The photo inset is: 48YE551, FS 1 Late Archaic Projectile Point (obsidian biface) (Livers, M.C. and Douglas H. MacDonald 2011:170, Photograph 42). Figure 12 (B) shows a linear regression plot demonstrating the relationship between tool type and chert material type for all 3 lake regions examined (n=127). The photo inset is: 48YE549, Chert Endscraper (FS 54), Feature 2 (chert uniface) (Livers, M.C. and Douglas H. MacDonald 2011:152, Photograph 32).

Based on the location of these two main sources for stone tool material around the lake, a map created using the coefficient of determinations shows the rate of use for bifacial and unifacial tools at the three regions of the lake individually (Figure 13). When the three regions are analyzed individually the results corroborate what MacDonald et al. found, in that the rate of use for obsidian in stone tools drops off as geographical distance from Obsidian Cliff increases. What these results presented here show in addition to this, is that there also appears to be a drop off in the rate of use for obsidian for unifacial tools as you move away from Obsidian Cliff, especially at the South Shore.

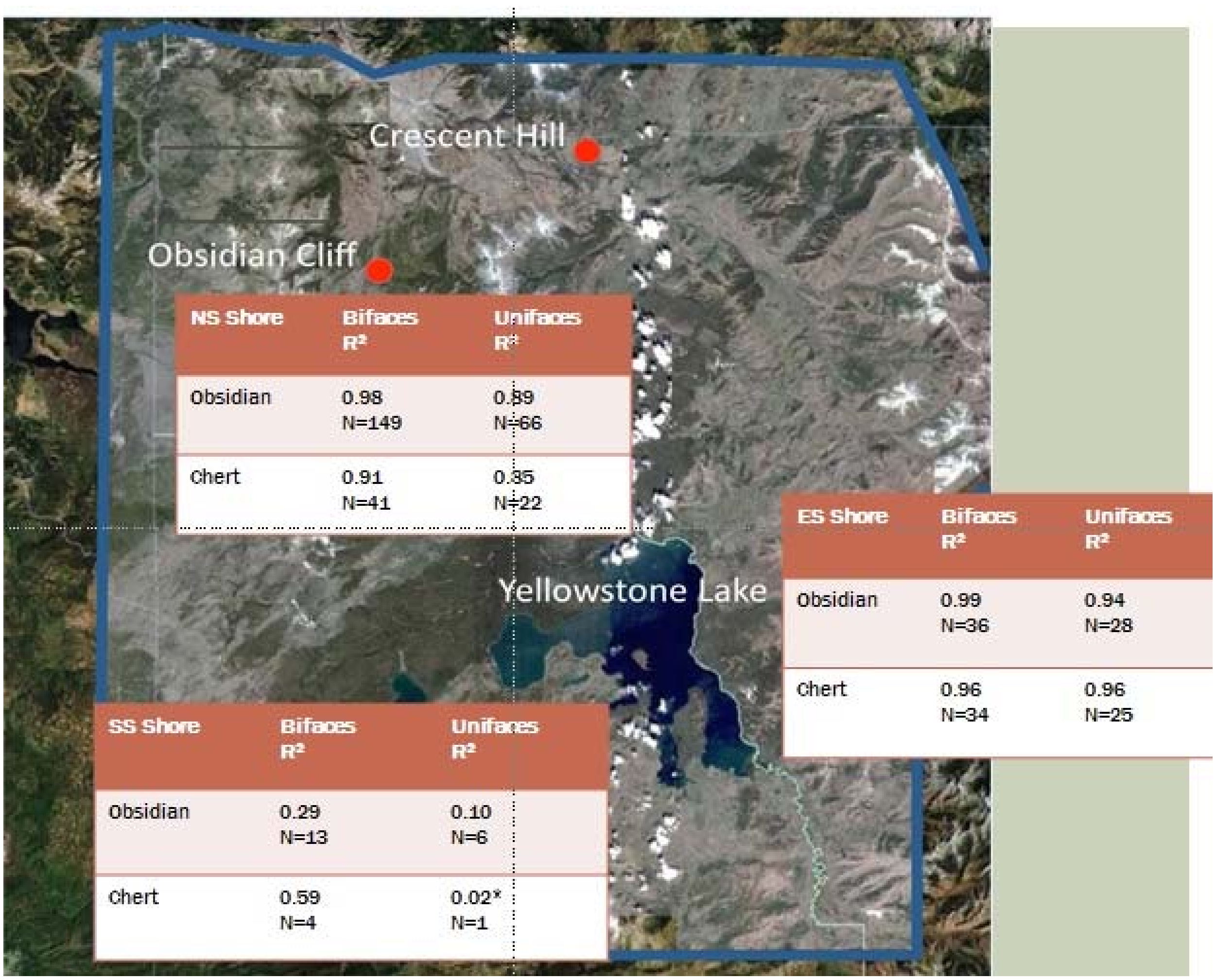


Figure 13: Map of Yellowstone Lake showing coefficient of determinations for rates of use of tools types in relationship to major stone tool material procurement sites.

Now, just as in the chi-square analysis, sample size does become an issue here. However these results suggest what Joan Gero found in her 1991 study, where a higher instance of female specific tools are made of local stone material types, while material types acquired from further distances, defined by Gero as “exotic”, appear to be reserved for male-specific use. The inference here is the possible social value placed on obsidian translated into a restriction on the type of tools produced as this stone material type became more exotic. What the results presented here suggest is a possible restriction placed on the presumably female production of unifacial tools using obsidian as groups moved away from Obsidian Cliff.

To summarize, it is apparent and not unexpected that bifacial tools are dominate within the archaeological record from around Yellowstone Lake. This is expected when there is an increase in the dependence on meat in subsistence tasks, as this may increase the focus of women on hunting activities. Thus women in hunting-centric cultures spend less time investing in tool technology related to activities outside of hunting. This likely expalins why bifacial tools dominate the lithic assemblage around Yellowstone Lake, and suggests that bifacial tool use was not exclusively male (MacDonald 1998:225-226; Waguespack 2005:668).

Chi-square hypothesis testing provides a means to establish if the relationship between tool types and presence of cultural features is statistically significant for the lithic data from the 47 sites around Yellowstone Lake. The chi-square values for both unifacial and bifacial tools fall below the critical value (χ^2_{crit}=3.841) in order for the relationship between tool types and sites with features to be considered statistically significant at the 95% confidence level ($p < 0.05$). It should be noted that the chi-square obtained value for the presence of unifacial tools with features at sites does come closer to the critical value ($\chi^2_{obt.}$=3.24) than the chi-square obtained for bifacial tools ($\chi^2_{obt.}$=2.02). Analysis using a greater number of sites may provide stronger chi-square obtained results for further interpretation of the relationship between unifacial tools and cultural features at sites.

Further analysis of the 22 Yellowstone Lake sites taken from the MacDonald et al. (2012) study establishes relatively high coefficients of determination (R^2) which exist for obsidian bifacial and unifacial tools and chert bifacial and unifacial tools around the lake collectively, 0.94, 0.91, 0.86, 0.63 respectively (Figure 12). These linear regressions also demonstrate the dominant use of obsidian for stone tool making, in particular for bifacial tools, in the North and East shore regions (Figure 12, A-B).

The linear regressions appear to reveal patterns of use for lithic stone tool material based on the geographical proximity to Obsidian Cliff and Crescent Hill. Restricting the use of obsidian for bifacial tools as this stone resource becomes less available may indicate restrictions on the creation of gender specific tools. This statement should be moderated by stating that analysis of unifacial versus bifacial tools should not be read as female versus male tools. This analysis is an exploration of these two tool types and what they may tell us about manufacturing and task distinctions, which are often defined as male or female-specific. The difference in rate of use for material type and tool type may also indicate different performance characteristics inherent to the material type, creating preferential use based on tasks each tool needed to accomplish. However, the parallell rates of use for obsidian and chert in both tool types the closer sites are to the major stone material procurement sites supports an interpretation made by another Yellowstone archaeological researcher, in that obsidian held economic and social value as a raw material for all tool manufacture (Park 2013).

Ultimately this analysis does two things: (1) corroborates results from the MacDonald et al. 2012 analysis in terms of lithic stone material use around the lake regions; and (2) gives insight into intra-group lithic stone material use, with suggestive social and economic value. These results and implications for gender dynamics at Yellowstone Lake are discussed in depth in Chapter 8, section 8.2.

Chapter 6: Analysis and Results of Archaeobotanical Remains

6.1 Introduction

Exploring the composition of features, including archaeobotanical remains, creates a frame-of-reference for what plants were utilized within the area at the time these features were in use. This ultimately draws a link to the agency illustrated in the utilization of these plants and presumably the role of women in their collection, processing, and use. The table below outlines the features where plant remains were recovered and analyzed here.

Table 9: Archaeological Context for Ethnobotanical Remains from Yellowstone Lake Features

Common Name	Archaeological Context (Region, Site ID; Feature ID; Feature Type; Feature Age)	Citation
Alder	N. Shore 48YE380; Feature 380-10-3: basin shaped hearth (circular); Late Archaic (1570+-40 B.P.)	MacDonald, D.H. and Michael C. Livers 2011
Arrowleaf Balsam Root	E. Shore 48YE678; Feature 1: fire feature w/ assoc. dump nearby; Late Archaic (1,460±40 B.P.)	Livers, M.C. and Douglas H. MacDonald 2012
Aspen; Quaking Aspen	N. Shore 48YE380; Feature 380-09-1: basin shaped hearth; Late Archaic (1900+-40 B.P.) S. Shore 48YE1383; Feature 1: small surface hearth; Late Archaic period (2290+/-30 B.P.)	MacDonald, D.H. and Michael C. Livers 2011 MacDonald, D.H. 2014
Cf. mouse-ear-chickweed	S. Shore 48YE1384; Feature 1: small firepit/hearth; Late Prehistoric (1330+-30 B.P.)	MacDonald, D.H. 2014
Coniferous (other-not pine)	E. Shore 48YE678; Feature 2/3: fire feature with associated dump nearby; Late Archaic (1,400±40 B.P)	Livers, M.C. and Douglas H. MacDonald 2012
Cottonwood; Narrowleaf Cottonwood; Black Cottonwood; Eastern Cottonwood	E. Shore 48YE1499; Feature 1: an oval shaped, ephemeral fire feature roughly 20cm below surface; Late Prehistoric (1,220±130 B.P)	Livers, M.C. and Douglas H. MacDonald 2012
Draba-type mustard; Mountain Tansymustard	N. Shore 48YE380; Feature 380-09-1: basin shaped hearth; Late Archaic (1900+-40 B.P.)	MacDonald, D.H. and Michael C. Livers 2011
Dwarf-mistletoe	S. Shore 48YE1660; Feature 1: firepit/hearth; Late Archaic (1850+-30 B.P.)	MacDonald, D.H. 2014
Fir; Subalpine fir	N. Shore 48YE380; Feature 380-10-3: basin shaped hearth (circular); Late Archaic (1570+-40 B.P.) N. Shore 48YE380; Feature 380-09-1: basin shaped hearth; Late Archaic (1900+-40 B.P.) S. Shore 48YE1660; Feature 1: firepit/hearth; Late Archaic (1850+-30 B.P.) S. Shore 48YE1332; Feature 1: ephemeral surface hearth; Middle Archaic (2880±30 B.P.)	MacDonald, D.H. and Michael C. Livers 2011 MacDonald, D.H. 2014

	S. Shore 48YE1642; Feature 2: surface hearth, lacks depth; Late Prehistoric (2890+-30 B.P.) S. Shore 48YE1384; Feature 1: small fire feature-small firepit/hearth; Late Prehistoric (1330+-30 B.P.)	
Geranium	N. Shore 48YE380; Feature 380-10-3: basin shaped hearth (circular); Late Archaic (1570+-40 B.P.)	MacDonald, D.H. and Michael C. Livers 2011
Goosefoot	E. Shore 48YE678; Feature 1: fire feature w/ assoc. dump nearby; Late Archaic (1,460±40 B.P.)	Livers, M.C. and Douglas H. MacDonald 2012
Grass	N. Shore 48YE380; Feature 380-10-3: basin shaped hearth (circular); Late Archaic (1570+-40 B.P.) N. Shore 48YE380; Feature 380-09-1: basin shaped hearth; Late Archaic (1900+-40 B.P.)	MacDonald, D.H. and Michael C. Livers 2011
Grass caryopsis	S. Shore 48YE1660; Feature 3: hearth; Late Archaic (1690+-30 B.P.)	MacDonald, D.H. 2014
Ground cherry; Clammy Groundcherry	N. Shore 48YE380; Feature 380-09-1: basin shaped hearth; Late Archaic (1900+-40 B.P.)	MacDonald, D.H. and Michael C. Livers 2011
Groundsmoke	N. Shore 48YE549; Feature 3: unknown function; small cluster of 7 hand-sized river cobbles; possible stone cairn?; Late Prehistoric (220+-40 B.P.)	Livers, M.C. and Douglas H. MacDonald 2011
Jacob's Ladder	N. Shore 48YE380; Feature 380-09-1: basin shaped hearth; Late Archaic (1900+-40 B.P.) N. Shore 48YE380; Feature 380-10-3: basin shaped hearth (circular); Late Archaic (1570+-40 B.P.) N. Shore 48YE549; Feature 3: unknown function; small cluster of 7 hand-sized river cobbles; possible stone cairn?; Late Prehistoric (220+-40 B.P.)	MacDonald, D.H. and Michael C. Livers 2011 Livers, M.C. and Douglas H. MacDonald 2011
Juniper; Rocky Mountain Juniper	N. Shore 48YE380; Feature 380-09-1: basin shaped hearth; Late Archaic (1900+-40 B.P.)	MacDonald, D.H. and Michael C. Livers 2011
Lodgepole Pine	E. Shore 48YE678; Feature 2/3: fire feature with associated dump nearby; Late Archaic (1,400±40 B.P) E. Shore 48YE1499; Feature 1: an oval shaped, ephemeral fire feature roughly 20cm below surface; Late Prehistoric (1,220±130 B.P) N. Shore 48YE380; Feature 380-10-3: basin shaped hearth (circular); Late Archaic (1570+-40 B.P.) N. Shore 48YE380; Feature 380-09-1: basin shaped hearth; Late Archaic (1900+-40 B.P.) N. Shore 48YE1558; Feature 5: fire feature (soil stain)-ultimate function uncertain/short term fire for camping episode; Late Archaic (1470+-60 B.P.) N. Shore 48YE1558; Feature 7: fire feature, small shallow basin w/ FCR concentration; Late Archaic (2130+-40 B.P.) N. Shore 48YE1558; Feature 8: fire feature; shallow basin w/ gently tapered sides; Late Archaic (2310+-40 B.P.) N. Shore 48YE381; Feature 10: surface hearth (no depth); Late Prehistoric (770+-40 B.P.) N. Shore 48YE549; Feature 1: short-term, small surface hearth; Late Prehistoric/Proto-historic (240+-40 B.P.) S. Shore 48YE2190; Feature 1: ephemeral firepit/hearth used during a short-term occupation of the site; Late Prehistoric (1380±30 B.P.) S. Shore 48YE1642; Feature 1: surface feature, lacks depth, small ephemeral hearth; probable living surface with fire-cracked rock and small rock features; Late Archaic (1610+-30 B.P.) S. Shore 48YE1660; Feature 3: hearth; Late Archaic (1690+-30 B.P.) S. Shore 48YE1660; Feature 1: firepit/hearth; Late Archaic (1850+-30 B.P.) S. Shore 48YE1332; Feature 1: ephemeral surface hearth; Middle Archaic (2880±30 B.P.) S. Shore 48YE1642; Feature 2: surface hearth, lacks depth; Late Prehistoric (2890+-30 B.P.) S. Shore 48YE1384; Feature 1: small fire feature-small firepit/hearth; Late Prehistoric (1330+-30 B.P.) S. Shore 48YE1388; Feature 1: basin shaped, tapered at the ends; hearth and/or cooking feature; Late Archaic/Late Prehistoric (transition period: 1530±30 B.P.) S. Shore 48YE1588; Feature 1: cobble arc feature "stone circle"-secure for winter tepee-structure; Late Prehistoric (AD 1220 to 1280 or 730 to 670 B.P.) S. Shore 48YE1383; Feature 1: small surface hearth; Late Archaic period (2290+/-30 B.P.)	Livers, M.C. and Douglas H. MacDonald 2012 MacDonald, D.H. and Michael C. Livers 2011 Livers, M.C. and Douglas H. MacDonald 2011 MacDonald, D.H. 2014

Mint; Wild Mint	N. Shore 48YE380; Feature 380-09-1: basin shaped hearth; Late Archaic (1900+-40 B.P.)	MacDonald, D.H. and Michael C. Livers 2011
Cheno-Am	N. Shore 48YE380; Feature 380-10-3: basin shaped hearth (circular); Late Archaic (1570+-40 B.P.) N. Shore 48YE549; Feature 3: unknown function; small cluster of 7 hand-sized river cobbles; possible stone cairn?; Late Prehistoric (220+-40 B.P.)	MacDonald, D.H. and Michael C. Livers 2011 Livers, M.C. and Douglas H. MacDonald 2011
Gymnospermae	S. Shore 48YE1383 Feature 1: small surface hearth Late Archaic period (2290+/-30 B.P.)	MacDonald, D.H. 2014
Nightshade Fruit; Nightshade	E. Shore 48YE678; Feature 2/3: fire feature with associated dump nearby; Late Archaic (1,460±40 B.P.)	Livers, M.C. and Douglas H. MacDonald 2012
Oak; Bur Oak	N. Shore 48YE380; Feature 380-09-1: basin shaped hearth; Late Archaic (1900+-40 B.P.)	MacDonald, D.H. and Michael C. Livers 2011
Parsley (family); wild celery; Fernleaf Biscuitroot; Narrowleaf Lomatium; Nineleaf Biscuitroot; Great Basin Desert parsley	N. Shore 48YE380; Feature 380-09-1: basin shaped hearth; Late Archaic (1900+-40 B.P.)	MacDonald, D.H. and Michael C. Livers 2011
Pine; Ponderosa Pine	E. Shore 48YE678; Feature 2/3: fire feature with associated dump nearby; Late Archaic (1,460±40 B.P.) E. Shore 48YE1499; Feature 1: oval shaped, ephemeral fire feature roughly 20cm below surface; Late Prehistoric (1,220±130 B.P) N. Shore 48YE380; Feature 380-09-1: basin shaped hearth; Late Archaic (1900+-40 B.P.) N. Shore 48YE1553; Feature 3.1: possible stone boiling pit (?); Late Prehistoric (1280+-40 B.P.) N. Shore 48YE1558; Feature 5: fire feature (soil stain); Late Archaic (1470+-60 B.P.) N. Shore 48YE1558; Feature 7: fire feature, small shallow basin w/ FCR concentration; Late Archaic (2130+-40 B.P.) N. Shore 48YE1558; Feature 8: fire feature; shallow basin w/ gently tapered sides; Late Archaic (2310+-40 B.P.) N. Shore 48YE381; Feature 10: surface hearth (no depth); Late Prehistoric (770+-40 B.P.) N. Shore 48YE549; Feature 1: short-term small surface hearth; Late Prehistoric/Proto-historic (240+-40 B.P.) S. Shore 48YE2190; Feature 1: ephemeral firepit/hearth used during a short-term occupation of the site; Late Prehistoric (1380±30 B.P.) S. Shore 48YE1642; Feature 1: surface feature, lacks depth, small ephemeral hearth; probable living surface with fire-cracked rock and small rock features; Late Archaic (1610+-30 B.P.) S. Shore 48YE1660; Feature 3: hearth; Late Archaic (1690+-30 B.P.) S. Shore 48YE1660; Feature 1: firepit/hearth; Late Archaic (1850+-30 B.P.) S. Shore 48YE1332; Feature 1: ephemeral surface hearth; Middle Archaic (2880±30 B.P.) S. Shore 48YE1642; Feature 2: surface hearth, lacks depth; Late Prehistoric (2890+-30 B.P.) S. Shore 48YE1384; Feature 1: small firepit/hearth; Late Prehistoric (1330+-30 B.P.) S. Shore 48YE1388; Feature 1: basin shaped, tapered at the ends; hearth and/or cooking feature; Late Archaic/Late Prehistoric (transition period: 1530±30 B.P.) S. Shore 48YE1588; Feature 1: cobble arc feature "stone circle"-secure for winter tepee-structure; Late Prehistoric (AD 1220 to 1280 or 730 to 670 B.P.) S. Shore 48YE1383; Feature 1: small surface hearth; Late Archaic period (2290+/-30 B.P.)	Livers, M.C. and Douglas H. MacDonald 2012 MacDonald, D.H. and Michael C. Livers 2011 Livers, M.C. and Douglas H. MacDonald 2011 MacDonald, D.H. 2014
Pine Nut	E. Shore 48YE678; Feature 1: fire feature w/ assoc. dump nearby; Late Archaic (1,460±40 B.P.)	Livers, M.C. and Douglas H. MacDonald 2012
Plains Prickly Pear; Prickly Pear Cactus Fruit	E. Shore 48YE678; Feature 2/3: fire feature with associated dump nearby; Late Archaic (1,460±40 B.P.) E. Shore 48YE678; Feature 1: fire feature with associated dump nearby; Late Archaic (1,460±40 B.P.)	Livers, M.C. and Douglas H. MacDonald 2012
Riparian Plant/Tree	E. Shore 48YE1499; Feature 1: an oval shaped, ephemeral fire feature roughly 20cm below surface; Late Prehistoric (1,220±130 B.P)	Livers, M.C. and Douglas H. MacDonald 2012

Sagebrush; Prairie Sage	N. Shore 48YE380; Feature 380-10-3: basin shaped hearth (circular); Late Archaic (1570+-40 B.P.) N. Shore 48YE380; Feature 380-09-1: basin shaped hearth; Late Archaic (1900+-40 B.P.) N. Shore 48YE1558; Feature 7: fire feature, small shallow basin w/ FCR concentration; Late Archaic (2130+-40 B.P.) N. Shore 48YE1558; Feature 8: fire feature; shallow basin w/ gently tapered sides; Late Archaic (2310+-40 B.P.) N. Shore 48YE549; Feature 3: unknown function; small cluster of 7 hand-sized river cobbles; possible stone cairn?; Late Prehistoric (220+-40 B.P.) S. Shore 48YE1642; Feature 2: surface hearth, lacks depth; Late Prehistoric (2890+-30 B.P.)	MacDonald, D.H. and Michael C. Livers 2011 Livers, M.C. and Douglas H. MacDonald 2011 MacDonald, D.H. 2014
Spruce	N. Shore 48YE380; Feature 380-10-3: basin shaped hearth (circular); Late Archaic (1570+-40 B.P.) N. Shore 48YE380; Feature 380-09-1: basin shaped hearth; Late Archaic (1900+-40 B.P.) S. Shore 48YE1332; Feature 1: ephemeral surface hearth; Middle Archaic (2880±30 B.P.) S. Shore 48YE1384; Feature 1: small fire feature-small firepit/hearth; Late Prehistoric (1330+-30 B.P.) S. Shore 48YE1388; Feature 1: basin shaped, tapered at the ends; hearth and/or cooking feature; Late Archaic/Late Prehistoric (transition period: 1530±30 B.P.) S. Shore 48YE1588; Feature 1: cobble arc feature "stone circle"-secure for winter tepee-structure; Late Prehistoric (AD 1220 to 1280 or 730 to 670 B.P.) S. Shore 48YE1383; Feature 1: small surface hearth; Late Archaic period (2290+/-30 B.P.)	MacDonald, D.H. and Michael C. Livers 2011 MacDonald, D.H. 2014
Sunflower; Common Sunflower	S. Shore 48YE1660; Feature 1: firepit/hearth; Late Archaic (1850+-30 B.P.)	MacDonald, D.H. 2014
Dicotyledoneae (unidentified-seed/bud)	S. Shore 48YE1660; Feature 3: hearth; Late Archaic (1690+-30 B.P.) S. Shore 48YE1660; Feature 1: firepit/hearth; Late Archaic (1850+-30 B.P.) S. Shore 48YE1384; Feature 1: small fire feature-small firepit/hearth; Late Prehistoric (1330+-30 B.P.) S. Shore 48YE1588; Feature 1: cobble arc feature "stone circle"-secure for winter tepee-structure; Late Prehistoric (AD 1220 to 1280 or 730 to 670 B.P.)	MacDonald, D.H. 2014
Western Dock; Curly Dock	S. Shore 48YE1384; Feature 1: small firepit/hearth; Late Prehistoric (1330+-30 B.P.)	MacDonald, D.H. 2014
Wild Buckwheat; Black Bindweed	N. Shore 48YE380; Feature 380-10-3: basin shaped hearth (circular); Late Archaic (1570+-40 B.P.) N. Shore 48YE549; Feature 3: unknown function; small cluster of 7 hand-sized river cobbles; possible stone cairn?; Late Prehistoric (220+-40 B.P.) S. Shore 48YE1384; Feature 1: small fire feature-small firepit/hearth; Late Prehistoric (1330+-30 B.P.)	MacDonald, D.H. and Michael C. Livers 2011 Livers, M.C. and Douglas H. MacDonald 2011
Wild Strawberry	N. Shore 48YE549; Feature 2: short-term basin shaped hearth feature; n.d.	MacDonald, D.H. 2014
Willow	E. Shore 48YE1499; Feature 1: an oval shaped, ephemeral fire feature roughly 20cm below surface; Late Prehistoric (1,220±130 B.P) S. Shore 48YE1383; Feature 1: small surface hearth; Late Archaic period (2290+/-30 B.P.)	Livers, M.C. and Douglas H. MacDonald 2012 MacDonald, D.H. 2014
Draba incerta; Yellowstone Whitlow grass	S. Shore 48YE1384; Feature 1: small firepit/hearth; Late Prehistoric (1330+-30 B.P.)	MacDonald, D.H. 2014

Photograph 1: Preparing for a Pollen Wash of the Feature 3 Rock Cluster, at site 48YE549 (Livers, M.C. and Douglas H. MacDonald 2011:39, Photograph 39).

6.2 Analysis and Results:

Archaeobotanical Remains and Cultural Features

The pollen and macrobotanical data from these 47 sites are presented here with a focus on the ethnohistorically recorded uses of all plants identified via macrobotanical analysis and floatation samples. Table 9 is a detailed table of recovered archaeobotanical remains from the 37 cultural features excavated by the MYAP. The majority of taxa identified through pollen analysis were for fuel related resources (pine in particular). The various other taxa that might be considered "non-fuel" occurred in much lower frequencies, on average only one to four identified species for non-fuel plant types were found in any given feature.

Out of the 47 sites analyzed for this thesis, archaeobotanical remains were recovered from three, five and nine cultural features at the East, North and South shore sites respectively. A total of 17 sites examined contained archaeobotanical remains, with the identification of 36 unique plant species.

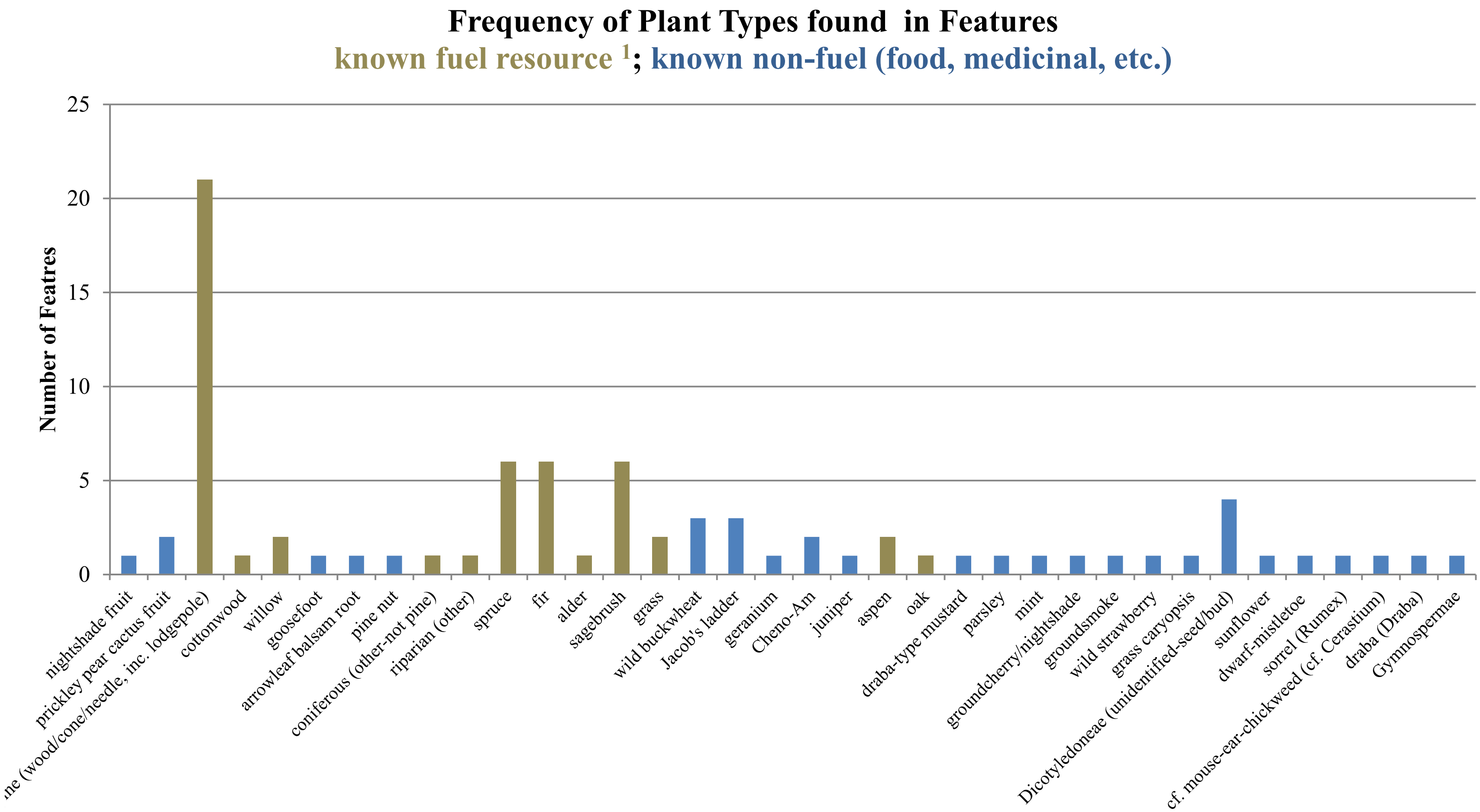


Figure 14: Frequency of plant types found within cultural features. Fuels are in brown; Non-fules are in blue. [1]Fuel sources are typically identified as: pine, cottonwood, willow, other non-pine coniferous tree species, other riparian plant species, spruce, fir, alder, sagebrush, grass, aspen, oak (e.g., MacDonald, D.H. and Michael C. Livers 2011:124, 133, 309; Livers, M.C. and Douglas H. MacDonald 2011:26, 30, 116; Livers, M.C. and Douglas H. MacDonald 2012:94, 136, MacDonald, D.H. 2014: 72, 116, 177).

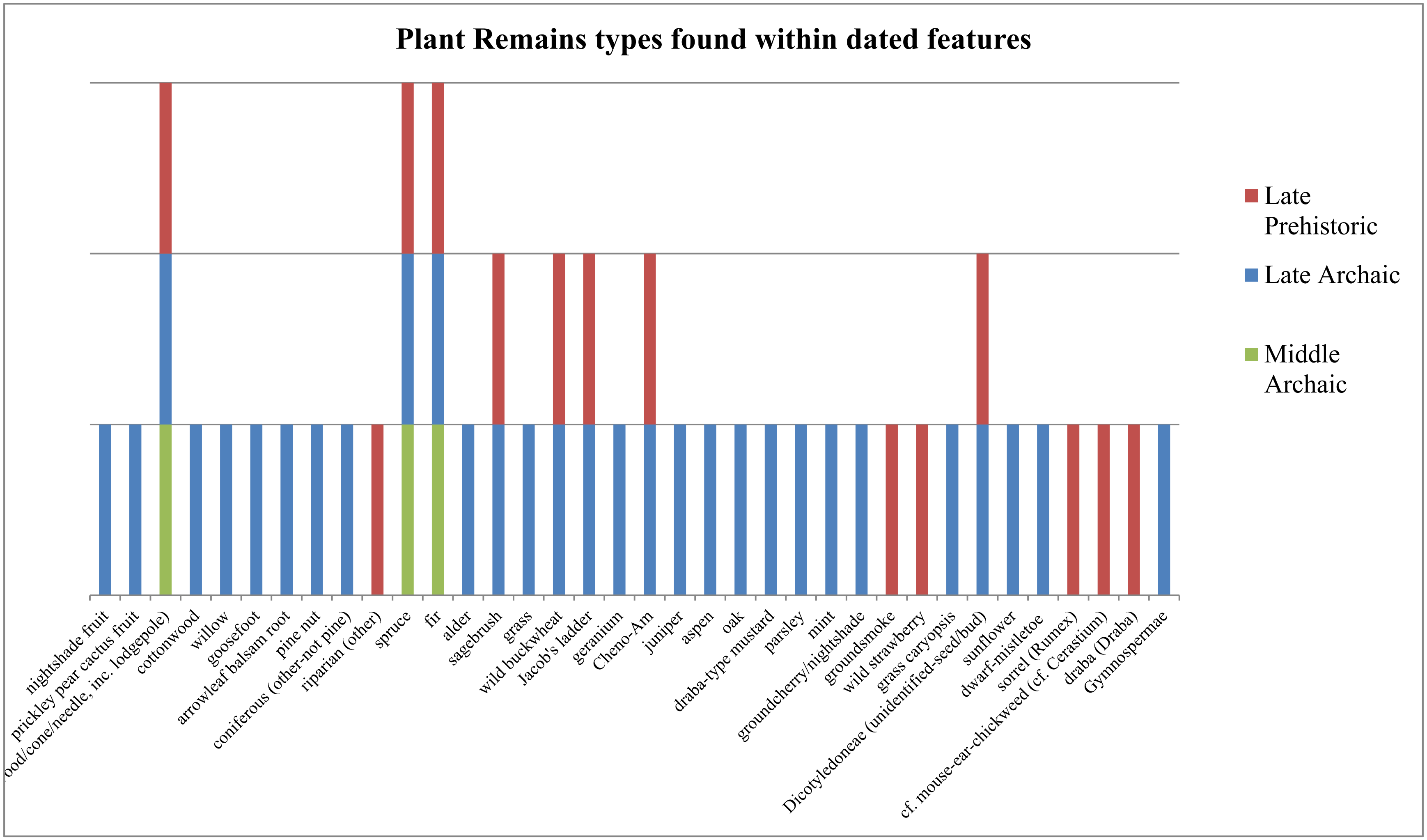


Figure 15: Bar graph of types of plant remains found within dated cultural features, presented by period.

Ethnographic and Ethnohistoric Data for Archaeobotanical Remains

The major categories for use as defined by Daniel Moerman, medical anthropologist and ethnobotanist, are: food/cooking, medicinal/drug and "other" (Moerman 1998; 2010). The figure below provides a glimpse of the general use of plant remains recovered from pollen analysis of floatation samples at sites around Yellowstone Lake.

Figure 16: Categorical ethnohistoric use of plant remains recovered from pollen analysis of floatation samples at sites around Yellowstone Lake.

Table 10 details uses for each plant that are ethnographically or ethnohistorically documented from four ethnohistoric sources:

1) *Montana Native Plants and Early Peoples,* Jeff Hart 1976
2) *Native American Ethnobotany,* Daniel E. Moerman 1998
3) *Native American Food Plants: An Ethnobotanical Dictionary,* Daniel E. Moerman 2010

4) *American Indians and Yellowstone National Park: A Documentary Overview,* P. Nabokov and L.L. Loendorf 2002

This compilation of ethnographic data on plants serves as a frame of reference for *possible* explanations as to why these particular types of taxa were found at these sites. It is not a comprehensive list nor is it meant to say that this *is* how these plants were used. References to "women's medicine" are of particular interest, but are few and far between (highlighted in red text).

Table 10: Ethnohistoric data for archaeobotanical remains from Yellowstone Lake Cultural Features assayed by MYAP.

Ethnobotanical Remains from Yellowstone Lake Features and their Possible Cultural Uses[T]
Tribes with territorial/cultural affiliation with Yellowstone (limited to the ethnobotanical use references that could be found in primary sources) Blackfeet=B; Cheyenne=CH; Chippewa=CP; Crow=CW ; Gros Ventre=GV; Kootenai /Flathead=K/F; "Montana Indian"[1]=MT; Nez Perce=NP; Salish=S; Sioux=SX; Shoshone=SH [1]category used in D. Moreman text as "catch-all" for Montana Tribes; [*]indicates site report did not list scientific name; Red text indicates female/women's specific references
Nightshade fruit ; Nightshade *Solanaceae Solanum **
Food: n/a **Medicinal/Drug:** (B) antidiarrheal and pediatric aid; decoction of berries given to children for diarrhea (Moerman 1998:535) **Other**: n/a
Prickly Pear; Plains Prickly Pear *Opuntia Polyacantha Haw.**
Food/Cooking: eaten raw or dried and stored for winter; (CH) women prepared the fruits by sweeping the piles of them with sagebrush branches to remove the spines; used pulp (less the seeds) mixed with stew or soups as a thickener; stems eaten in times of scarcity (Hart 1976:39). (CH) pulp dried and used to thicken soups and stews, fruits dried and used as winter food; fruit eaten raw or dried for winter use; used in soups and stews with meat and game; (MT) used dried fruits for winter eating (Moerman 1998:366-368); (MT) boiled and fried; stems occasionally used for food (Moreman 2010:167) **Medicinal/Drug:** (K/F) used stems for backache by burning off spines, smashing stems up and putting on affected area; boiled stems to make a tea for diarrhea (Hart 1976:39). (K/F) used as analgesic by smashing stems to use for backache; antidiarrheal as an infusion of stems taken for diarrhea (Moerman 1998:366-368). (SX) used "the peeled mucilaginous stems as a dressing for wounds" (Hart 1976:39). **Other:** (SX; CW) used to fix colors on hides by rubbing freshly peeled stem over the paint (Hart 1976:39). (CW) used a mordant by peeling stems and used to fix color on hides (Moerman 1998:366-368).
Pine; Ponderosa Pine *Pinus ponderosa Dougl.*
Food: peeled back the bark to eat as a sweet food; (K/F) and other regional tribes" found bark nourishing treat; to preserve for longer bark could be rolled into little balls and packed with green leaves in bags/parfleches/bark baskets for storage; only women harvested the bark in a very specific manner (Hart 1976: 50-51); (CH) chewed pitch as gum; (B) used inner bark for food; (CH) chewed pitch as a gum (candy) and used the seeds for food, the young male cones chewed for the juice; (MT) ate the inner bark in the spring (Moreman 2010:185). **Medicinal/Drug:** used pine boughs in sweat lodges to "beat" one suffering from muscular pain (Hart 1976: 50-51). (CH) gum used as a salve or ointment for sores and scabby skin (Moerman 1986:345). (K/F) "and others" used as medicine; cure for boils and carbuncles; used for rheumatism, backache in the form of a salve of pine pitch mixed with animal fat; used for dandruff by jabbing pointed ends of needles into the scalp to kill the germs; (K/F) also used to facilitate delivery of the placenta by placing heated needles on the abdomen of women giving birth (Hart 1976: 50-51). **Other:** used pitch to manufacture bone and wooden whistles and flutes; (CH) plastered hair in place with pitch for vanity purposes; (NP; CW) used as glue; (NP)made torches with the pitch, burned in semi-subterranean houses to give light and guide at night (Hart 1976: 50-51).
Lodgepole Pine *Pinus contoria*
Food: (K/F) ate inner bark or cambium by scraping it off the slabs of the bark; also ate nourishing seeds and chewed the pitchy secretions on the bark as gum;

Flathead used to relieve burns and boils; Kutenais ate sweet inner bark for TB (Hart 1976:52). Blackfoot and Flathead: chewed pitch as gum/candy (Moerman 2010:183). **Medicinal/Drug:** (K/F) occasionally used sap for medicinal purposes; Flathead used to relieve burns and boils (Moerman 2010:183); (K/F) ate sweet inner bark for TB (Hart 1976:52). **Other:** most commonly used for tipi poles -strong, yet light and easy to handle (Hart 1976:52).
Cottonwood *Populus sect. Aigeiros*
Food: (K/F; B) "relished" the sweet inner bark and sap; (CH) "and other tribes" fed young twigs and bark to horses in times of scarcity or took the bark on war parties to feed stock; (B) used inner bark and sap used for food; (CH) used inner bark scraped and eaten in the spring; (K/F)used inner bark and sap for food; (MT) used inner bark considered valuable as mucilaginous food (Moerman 2010:191). **Medicinal/Drug:** (K/F) applied leaves as a poultice for bruises and sores and boils, to draw pus out; (NP) plastered leaves on sore arms to relieve aching muscles; (K/F) drank tea made from bark for TB and whooping cough; (K/F) drank tea from young branches and buds mixed with roots of cinquefoil and wild rose for syphilis; eating cottonwood bark good for colds (Hart 1976 68-69). **Other:** used to construct lodge for Sundance; (CH)special ceremony to locate the cottonwood trunk to be used as center pole for Sundance; (B) warriors rubbed themselves with cottonwood sap to conceal human scent when stealing enemy horses; excellent firewood because it does not crackle and makes a clean smoke for use in the tipi; extracted dyes and paints to color belongings; (CH) used the buds in springtime to paint records of deeds on robes- buds mixed with blood to produce black color which doesn't wear off; Missouri River region cottonwood has yellow dye; fruits produced variety of colors (Hart 1976 68-69).
Willow *Salix sps.*
Food: n/a **Medicinal/Drug:** (CH) used willow bark shavings from peachleaf willow to make a tea for diarrhea and other stomach issues; (K/F) chewed bark of unknown silver leafed willow for stomach issues such as diarrhea and summer flu; (K/F; CH) used willow as remedy for cuts; (K/F) chewed bark and placed it on cuts and abrasions to relieve pain and promote rapid healing; (CH)fashioned a portion of peeled bark into a ring which was placed on cuts to stop the flow of blood; (K/F) made an eyewash from leaves or young stem tips; (NP; CW) used willow as an emetic in conjunction with sweatbath; (CW) chewed willow stem tips to induce vomiting; (NP) used willow twigs to "clean out their insides", by thrusting smooth sticks down the throat resulting in vomiting with green bile, they believed the bile cause and tired feeling and forcing it out would make a man feel more energetic, light and strong to face hardships and warfare (women never practiced this remedy); (CW) chewed willow bark to clean teeth, prevent cavities and relieve headaches (Hart 1976: 67-68). (MT) poles used for framework of "sweat tepee" for treating colds and rheumatism (Moerman 1986:431); (SH) roots taken for stomachaches; decoction of leaves and twigs rubbed into the scalp to treat dandruff; mashed roots applied to the gums to relieve toothaches; used in various ways to treat venereal disease (Moerman 1986:432) **Other:** flexible willow wood was used to construct multitude of implements, craft ware, furniture and dwellings (e.g., pins, pegs, backrests, mattresses for the tipi, fishtraps, foxtraps, cradleboards, snowshoes, gambling wheels, walking sticks, stirrups for horsemen, scrapers for removing hair from hides, hoops for catching horses, baskets, drums, framework for sweathouses and small hunting tipis, ropes and meat racks); (CH) used peachleaf willow for religious ceremonies; (CH) Sundancers wore wreaths of willow because of its association with water, dancers thought it would help as they went several days without food or water or sleep (Hart 1976: 67-68).
Goosefoot *Chenopodium, Chenopodiaceae**
Food: (MT) staple seeds ground into flour and made into bread or used as a vegetable-young plants used as a potherb (Moerman 1998:154-155). **Medicinal/Drug:** n/a **Other:** n/a
Arrowleaf Balsam Root

Balsamorhiza sagittata (Pursh) Nutt.

Food: (K/F; NP) peeled young, immature flower stems and ate the tender inner portion raw, like celery; did not eat the stalk supporting the leaf (the petiole) as food; some ate the tough, woody roots by baking them in a fire pit, like camas for at least 3 days; (NP) ate the seeds which are similar to sunflower seeds; they roasted and ground them, combined with grease to form little balls (Hart 1976:20).
Medicinal/Drug: some used for medicinal purposes; (K/F) used the large, coarse leaves as a poultice for burns; boiled the roots and applied the infusion as a poultice for wounds, cuts and bruises; (K/F) drank the tea brewed from the roots for TB, whooping cough, increased urine and as a cathartic (Hart 1976:20); (SH) poultice of mashed root applied to insect bites or swellings; poultice applied to syphilitic sores; decoction of root used as an eyewash (Moerman 1986:88).
Other: n/a

Pine Nut
Pinus, Pinaceae; Pinus monophylla

Food: (MT) used unspecified inner bark for food; nuts an important article of food (Moerman 1998:403).
Medicinal/Drug: (SH) poultice of heated resin applied to treat static pains/muscular soreness; decoction of resin taken for nausea; compound decoction of several plant parts taken for colds; smoke of pitch compound inhaled for colds; decoction of needles used as antiseptic wash for measles and other rashes (Moerman 1986:344-345).
Other: n/a

Spruce; Engelmann Spruce
Picea engelmannii

Food: Young needles used for tea; (NP) needles used to flavor roasted bear meat (Nabokov and Loendorf 2002:281).
Medicinal/Drug: (B) used as a poultice and a resin for tea (Nabokov and Loendorf 2002:281).
Other: (B; CW; K/F) needles used for ceremonial incense; (CW) used to smudge with cedar; the roots used in basketry; needles could be dried for later use; resin collected as needed (Nabokov and Loendorf 2002:281).

Fir; Supalpine Fir
Abies lasiocarpa (Hook.) Nutt.

Food: (B) pulverized cones into a fine powder to mix with back fat and marrow, and eaten as a confection (candy); the fragments of the cones left by squirrels and chipmunks were gathered to make the confection distributed during social gatherings and meetings as an aid to digestion as well as a delicacy; resin was chewed for bad breath and pleasure (Moerman 2010:31).
Medicinal/Drug: used for various medicinal purposes (e.g., cuts, wounds, ulcers, sores, various skin infections, colds, coughs and constipation); for swollen skin the needles were pounded into powder, mixed with grease and marrow; (K/F) pulverized the needles to make a baby powder; used on reddened skin caused by excessive urination; used the gummy secretions on the bark as an antiseptic for wounds; (K/F) used the gummy secretions for cuts and bruises; pounded the needles mixed with lard, applied to the bleeding gums; use the needles as poultices for treatment of fevers and colds in the chest; made a tea from the needles and resinous blisters for colds; (CW) mixed crushed fir needles and brewed into a tea for colds, coughs and in stronger concentrations for constipation (Hart 1976:2-3).
Other: (K/F; B; CW; CH; CR) found the aromatic evergreen beneficial for personal adornment, medicine, incense, and for its power of spiritual blessing and purity; used as a hair tonic to enhance the appearance sleek hair with a tonic from subalpine fir; used in a concoction to make hair grow longer by mixing the needles with the roots and leaves of buckbrush (Hart 1976:2-3); (K/F) placed needles on top of stoves as incense or arranged the boughs in a room for the aroma; used the pulverized needles as a body scent and perfumed articles of clothing such as shawls; (NP) put balsam with clothes to keep away insects; burned fir boughs in the sweathouse to impart a pleasant smell and purify the air and drive away unpleasant odors; (NP) hung branches on walls to drive away bad spirits and ghosts because spirits were afraid of them, also burned fir to drive away woeful spirits and ghosts causing bad dreams; after a death fir was burned in the house to fumigate it; (CH) used fir incense to chase away spirits causing illness in people or to revive their spirits if near death; often used in

various ceremonies; (CH) Sundancers incensed their bodies with its smoke in order to purify themselves; by burning fir they sought to protect those who were afraid of thunder and give renewed confidence (Hart 1976:2-3).
Alder *Alnus incana (L.) Moench*
Food: n/a **Medicinal/Drug:** (B) drank the hot tea made from the bark for scrofula (TB of lymph glands, especially in the neck); (K/F) women drank the tea to regulate their menstrual period (Hart 1976:5). **Other:** used to make bright plants and dyes to color their bodies and clothes and other items; (B; K/F; NP) "and other tribes" boiled bark for its reddish brown or orange color; (K/F) immersed moccasins and feathers in boiled alter bark solution for more brilliant coloring; (K/F) bark used to dye hair "flaming red" (Hart 1976:5).
Sagebrush; Prairie Sage *Artemisia ludiviciana Nutt.*
Food: n/a **Medicinal/Drug:** (K/F) brewed strong bitter tasting tea for colds; used the solution externally to treat bruises or itching (might mix rose water with sage); boiled the plant to make a solution to dry up sores; (CW) used to treat sores by making a salve mixed with neck fat; also prepared a strong infusion applied as an astringent for eczema, or used for underarm and foot perspiration and odor; (CH) crushed the leaves to snuff for sinuses, nose bleeding and headache; (GV) made a medicinal tea for high fever; other species of sage used as well; (K/F) used tarragon to reduce swelling of feet and legs; applied to open sores; (CW) call it "wolf's perfume" made an infusion from stems and leaves applied as an eyewash for snow blindness; (CH; SX) called "women's sage or medicine" because women made tea to correct menstrual irregularity; (SX) used as a decoction for bathing; (K/F)drank for chest trouble, which caused vomiting (they saw as beneficial); drank for TB; even acquired a certain kind of sage from Spokane Indians in WA to make a concoction they drank as a tea for colds or used externally as a hair rinse for dandruff; drank a tea made from big sagebrush for colds and pneumonia and sometimes; (NP) boiled as tea to treat TB; (CH) burned as medicine for horses (Hart 1976:44-45); (SH) infusion of leaves used as a regulator of menstrual disorders; steeped leaves used a cold compresses especially for babies; used for colds and coughs (Moerman 1986:65). **Other:** (CH) used in more religious ceremonies than any other plant; sacred; spread on boarders of ceremonial lodges; fragrant herb considered to have power to drive away bad spirits, evil influences and ominous dreams of sick persons; used for purification; burned leaves to purify implements, utensils or persons in various ceremonies; used to purify someone who committed a taboo by whipping the person with a sage bundle; Sundancers prepared beds of sage to stand or rest during the ceremony, drawing power from it; Sundance priests incensed participants starting first with the" Sacred Woman", the Pledgers and finally the Dancers with purifying smoke; used the sprigs as paint brushes to ceremonially paint the dancers; Sundancers wore wreaths of sage on arms, waist and head; during fasting the men lay on bed of white sage, before going to battle warriors purified shields; in sweat lodge men used sprigs of sage to sprinkle water on the rocks and beat their bodies; purifying with sage made you immune to sickness; (CW) used sage in nearly every ceremony; Crow may have seen the pungent purifying plant as representing the future;"; (K/F) believe Coyote smoked tarragon as tobacco; burned it as smudge for mosquitoes; used for firewood when nothing else available (Hart 1976:44-45).
Geranium *Geranium, Geraniaceae*
Food: (B) used as spice by keeping leaves in food storage bags to mask the spoiling of contents (Moerman 1998:246-247; Moerman 2010:121). **Medicinal/Drug:** (MT) used as roots as drug for antidiarrheal and dermatological aid; roots used as an astringent; (S) used as oral aid by holding leaves between sore lips (Moerman 1998:246); (B) used for a cold remedy as an infusion of leaves and simple sweat bath; infusion of leaves used for sore eyes; other: infusion of leaves applied to the head and eaten for large head, from dropsy or severe malnutrition (two cases of this use reported during the historic period) (Moerman 1998:246-247; Moerman 2010:121). **Other:** n/a

Juniper; Rocky Mountain Juniper *Juniperus scopulorum Sarg.*
Food: n/a **Medicinal/Drug:** common cure for ailments; (NP; K/F; CH; SX) made tea from boughs, branches and fleshy cones which was drank for common colds, fevers and pneumonia; (CH) used juniper tea as vaporizer for colds and fevers, chewed fleshy cones for fever relief; (CW) chewed cones to settle upset stomach or aid the appetite; (S; K/F) covered themselves in juniper smoke to bring relief from colds; (CH)drank juniper tea for coughs and tickling of throat; relief from arthritis and rheumatism; (B) boiled juniper leaves in water added turpentine, cooled and rubbed on affected part; (CH) women used juniper as a medicinal tea if a child was not born right away; (CW) women drank a medicinal tea after birth for cleansing and healing; (CH) used as a sedative; (K/F)drank for sugar diabetes; stop hemorrhages; (CW) drank to stop diarrhea, lung or nose hemorrhage; (K/F) doctored horses with juniper; (B) common juniper used to treat lung and venereal diseases and related creeping juniper for kidney issues (Hart 1976:36-37); (CH) leaves burned to promote delivery of child; taken for cold and cough; boughs or fleshy cones taken for coughing (Moerman 1986:245). **Other:** "plains Indians ascribed a mystic sacredness" to the juniper; represents youthfulness (ever-green), therefore central role in holy rites, purification ceremonies; admired for aromatic fragrance of needles, which were burned as incense; durable wood, desirable for lance shafts, bows and other items; placed cedar leaves on fire to produce a sacred, purifying smoke in many religious ceremonies including: Peyote meetings, Sundances, sweatlodges, and other medicine rights; (CH) believed juniper smoke was good for those who fear lightning and thunder, a belief based on the observation that lightening doesn't strike cedar trees; (K/F) common cure for ailments; believed sacred smoke purified the air and warded off illness; made excellent bow from juniper wood; (CH) considered it the best material for bow (Hart 1976:36-37).
Aspen; Quaking Aspen *Populus tremuloides Michx*
Food: (K/F) drank tea made from bark for ruptures (Hart 1976:37); (B) cambium used as a snack food by children; a special food where bark was sucked by anyone observing a liquid taboo; inner bark eaten in the spring; (MT) inner bark considered a valuable mucilaginous food. (Moerman 2010:192). **Medicinal/Drug:** n/a **Other:** (CH; CW) used aspen logs to construct Sundance lodges; occasionally used as firewood (Hart 1976:37).
Oak; Bur Oak *Quercus macrocarpa*
Food: (CH) used acorns as food; (CP) roasted acorns in ashes or boiled, mashed and eaten with grease or duck broth, also used as a vegetable by boiling acorns, splitting them open (Moerman 2010:210). **Medicinal/Drug:** n/a **Other:** n/a
Draba-type Mustard; Mountain Tansymustard *Descurainia incana ssp. Incisa**
Food: (MT) parched seeds and ground for food (unspecified) (Moerman 1998:197; Moerman 2010:100). **Medicinal/Drug:** n/a **Other:** n/a
Parsley; Wild Celery; Narrowleaf Lomatium; Great Basin Desert Parsley; Fernleaf Biscuitroot; Nineleaf Biscuitroot *Apium, Apiaceae, Apium sp.; Lomatium simplex (Nutt.); Lomatium simplex var. simplex; Lomatium dissectum (Nutt.); Lomatium triternatum (Pursh)*
Food: (SH) used as a spice by steeping seeds which were added to dishes for flavoring (Moerman 1998:78); (NP) pit baked roots (Moerman 1998:313); (MT) young sprouts eaten (Moerman 1998:314-315); (MT;B) used as vegetable, root eaten baked, roasted or raw (Moerman 1998:317); (B) used as food-flowers used to make pemmican, roots eaten raw or roasted; (MT) used as staple food which was spring roots reduced to flour and spring roots eaten raw, roasted or

baked, also a vegetable which was fusiform root eaten baked, raw or roasted (Moerman 1998:317); (MT) used spring roots as a staple food by reducing down to flour; spring roots eaten (Moerman 2010:145). **Medicinal/Drug:** (NP) used as dermatological aid; root oil used for sores; infusion of cut roots taken to increase appetite; root oil used for sore eyes; roots mixed with tobacco and smoked for sinus trouble; infusion of cut roots taken for TB (Moerman 1998:313); tonic to help weak people gain weight; root used to make a tea for weakened people; (SH) poultice of root applied and decoction of root used as a wash for rheumatism; compound decoction of root taken for colds; decoction of root taken as cough remedy; poultice of root applied and decoction used as a salve on cuts and sores; used as disinfectant; root used as "the basis of a number of antiseptics"; compound of roots used as herbal steam for lung/nasal congestion and asthma; decoction of dried root taken for influenza, or root and sometimes leaves used as antiseptic wash for smallpox; poultice of root applied and decoction used as wash for sprains; simple or compound decoction of root taken for venereal diseases (Moerman 1998:314-315). (B) used as drug which was chewed roots blown onto affected part by "the diviner" and the healing qualities of the spray were believed to penetrate the body at that place; infusion of roots and leaves taken for chest troubles; chewed by long distance runners to avoid side aches (Moerman 1998:317). **Other:** (B) ceremonial medicine by pulverizing roots and burning as incense (Moerman 1998:314-315); (B) used for hide prep. by mixing plant with brains to use in soft tanning (Moerman 1998:314-315); (B) used as good luck charm by stuffing the fruits into a porcupine foot and tied on a young girl's hair; used for hide preparation during the tanning process of animal pelts to keep them from smelling (Moerman 1998:317).
Mint; Wild Mint; Canadian Mint *Mentha arvensis L.; Mentha canadensis*
Food: (B) dried plant and used to make tea; also used dried plant to spice pemmican and soups; used leaves to make tea; placed leaves in parfleches to flavor dried meat as a spice; (CH) used the leaves and stems for a tea (Moerman 2010:154). **Medicinal/Drug:** brewed into a tea believed to be effective for many illnesses; (K/F) "and other tribes" drank tea for colds, coughs, fevers and similar ailments; (K/F) treated rheumatism and arthritis with mint leaves; remedy for vomiting; (CH) ground leaves and stems finely and drank as a potion for relief; (K/F)drank tea as tonic; (K/F) packed the leaves around a carious tooth for relief; drank for kidney problems; (GV) brewed for headaches; widely used for fragrant and germicidal properties (Hart 1976:64-65); (SH) cold remedy; used as wash for fevers; decoction of plant parts for stomachaches, indigestion or babies' colic (Moerman 1986:288). **Other:** hung mint in dwellings for aroma; (CH) used for "Indian perfume"; chewed leaves and put on their bodies to improve the love life; (SX) placed their animal traps in mint to conceal human scent; (K/F) sprinkled the powdered leaves on meat and berries to repel bugs (Hart 1976:64-65).
Groundcherry; Clammy Groundcherry *Physalis heterophylla*
Food: (CH) ate ripe fruits in the fall (Moerman 2010:180). **Medicinal/Drug:** n/a **Other:** n/a
Wild strawberry; Virginia Strawberry *Fragaria* xananassa; *F. chiloensis* ; *F. sp.*; *F. vesca*; *F. virginiana*
Food: (MT) ate berries fresh; dried berries that were stored for winter use (Moerman 1998:234); (B) used roots for tea; also ate ripe fruits; (CH) ate as fruit (Moerman 2010:117). **Medicinal/Drug:** (B) an infusion of the plant used for diarrhea (Moerman 1998:234-235) **Other:** n/a
Sunflower; Common Sunflower; Maximilian Sunflower *Helianthus annus L.; Helianthus maximiliani*
Food: "One of the few plants plains tribes cultivated"; eaten raw, or more often dried the seeds by heating in pan/pot over fire; powdered seeds, making a gruel

by boiling or cakes by adding grease; "warring Indians often took cakes on their marches" (energy bar) (Hart 1976:30); not really known in contemporary times as a food source unless times of scarcity (Hart 1976:30); (MT) seeds dried, powdered and grease added to make cakes; seeds dried, powdered and boiled to make gruel (porridge) (Moerman 2010:124); (SX) tubers were dug and eaten (Moerman 2010:125). **Medicinal/Drug:** (SX) ascribed medicinal qualities (Hart 1976:30). **Other:** adornment; anointing hair and bodies with oil extract from seeds (Hart 1976:30).
Sorrel (Rumex)l Western Dock; Curly Dock *Rumex aquaticus var. fenestratus; Rumex crispus L.*
Food: (MT) seeds used for food; spring leaves used for "greens" (Moerman 1998:495); (CH) ate stems peeled and inner portions eaten raw; (MT) used spring leaves as "greens" for vegetable (Moerman 1998:496-497) **Medicinal/Drug:** (B) antirheumatic (external) by mashing root pulp used for swellings; dermatological aid of mashed root pulp used for sores; (CH) an infusion of dried rots taken for lung hemorrhages; wet poultice pounded, dried root applied to wounds or sores; infusion of dried, pulverized root taken for lung hemorrhage or infusion of pulverized roots used for lung hemorrhages; (SH) analgesic, a poultice of pulped root applied to rheumatic pains; a poultice of pulped root applied to burns; a decoction of root taken as a physical cathartic; poultice of pulped root applied to bruises and swellings; decoction of root taken for liver complaints; a tonic decoction of root taken as a general tonic; a decoction of root taken for venereal disease (Moerman 1998:496-497). **Other:** (CH) used to make a dye, by using the yellow leaves and stems boiled and used as a yellow dye (Moerman 1998:496-497).
Yellowstone Whitlow grass *Draba incerta**
Food: n/a **Medicinal/Drug:** (B) used as an abortifacient (to cause abortions); infusion of roots taken for nosebleeds (Moerman 1998:203). **Other:** n/a
1) ǂ Primary Sources: *Native American Food Plants: An Ethnobotanical Dictionary, Daniel E. Moerman 2010; Native American Ethnobotany, Daniel E. Moerman 1998; Montana Native Plants and Early Peoples, Jeff Hart 1976; American Indians and Yellowstone National Park: A Documentary Overview,* P. Nabokov and L.L. Loendorf 2002.

To summarize specific references to the "female" use (or non-use) of these plants, the majority of uses fall within the medicinal category. Only two distinct practices involve women preparing or collecting plants for food purposes and two instances that fall into the "other" category, which could be deemed spiritual uses. Instances where there is mention for the use of plants for the care of children are omitted from the table below and are not highlighted in red in the table above. This may indeed be a female specific use of the plants, but it is not defined as specifically "female" or "women" use in the ethnohistoric sources used, so male caretakers may have also used this knowledge. The table below summarizes the female specific references for ethnobotanical remains and a detailed analysis with interpretations appears in Chapter 8, section 8.3.

Table 11: Summary of female specific uses of plants.

Food/Cooking (2)	**Medicinal (9)**	**Other (2)**
Food Preparation Prickly Pear (Tsitsistas (Cheyenne)) **Harvesting** Ponderosa Pine (Kutenai/Salish)	**Pregnancy** Birth: Juniper (Tsitsistas (Cheyenne) After birth: Ponderosa Pine; Juniper (Kutenai/Salish; Apsaalooké (Crow)) Abortion: Yellowstone Whiltlow Grass (Natsitapii (Blackfeet)) **Menstruation** Regulation: Alder; Ponderosa Pine (Kuteani/Salish) Irregularities: Sagebrush/Prairie Sage (Tsitsistas (Cheyenne); Sioux; Agaidika (Lemhi/Northern Shoshone), Kukundiak (Plains/Eastern Shoshone) and the related Tukudika (Western Shoshone/Sheep Eaters))	**Spiritual/Ritual** Sagebrush/Prairie Sage (Tsitsistas (Cheyenne)) **Luck Charm/Protection** Parsley Family (Natsitapii (Blackfeet)

Chapter 7: Spatial Analysis of Cultural Features

7.1 Introduction

Out of over 700 identified prehistoric sites, almost all contain the same elements of small forager camps with mostly lithic scatter, and chipped stone tools (mostly obsidian from Obsidian Cliff) (Sanders 2002:214-228; MacDonald 2013:215). In total, table 12 shows the 37 culturally identifiable features excavated and recorded by the MYAP over the 2009-2014 field seasons. The features examined in this chapter are primarily ephemeral surface hearths (n=18), and basin-shaped hearths (n=9). Features from around the lake also provide a key source of information through charcoal radiocarbon dating. Fortunately, all but three cultural features (48YE380, feature 380-10-3; 48YE381, feature 10; 48YE1382, feature 1) yielded a radiocarbon date, which allows us to construct a chronology of use and occupation around the lake. Almost all features are generally defined as fire/hearth features, with the exception of one stone tipi ring circle (48YE1588, Feature 1). Feature type descriptions are summarized from site report descriptions, using site report language.

Table 12: Listing of cultural features excavated at 47 MYAP sites.

Region	**Site #**	**Feature name**	**Feature Type**	**Feature Date**	**Botanical Remains Y[1]/N**
East Shore	**48YE2075**	**Feature 1**	**subsurface fire feature, hearth**	**LA/LP (1,500+-40 B.P.)**	**Y**
East Shore	**48YE678**	**Feature 2/3**	**fire feature w/ assoc. dump nearby**	**LA (1,400±40 B.P)**	**Y**
East Shore	48YE678	Feature 1	fire feature w/ assoc. dump nearby	LA (1,460±40 B.P.)	Y
East Shore	**48YE1499**	**Feature 1**	**an oval shaped, ephemeral fire feature roughly 20cm below surface**	**LP (1,220±130 B.P)**	**Y**
North Shore	48YE380	Feature 380-09-2	n/a; scatter of FCR within an amorphous dark stain. Due to time constraints at the end of the field season, Feature 2 remained undefined in 2009; it may represent a cultural or natural feature.	none	N

North Shore	48YE380	Feature 380-10-3	basin shaped hearth (circular)	LA (1570+-40 B.P.)	Y
North Shore	48YE380	Feature 380-09-1	basin shaped hearth	LA (1900+-40 B.P.)	Y
North Shore	48YE1558	Feature 5	fire feature (soil stain)-ultimate function uncertain/short term fire for camping episode	LA (1470+-60 B.P.)	Y
North Shore	48YE1558	Feature 7	fire feature, small shallow basic w/ FCR concentration	LA (2130+-40 B.P.)	Y
North Shore	48YE1558	Feature 8	fire feature; shallow basin w/ gently tapered sides	LA (2310+-40 B.P.)	Y
North Shore	48YE1558	Feature 6	surface hearth, built w/ surface cobbles	MA/LA (2790+-40 B.P.)	Y
North Shore	48YE1558	Feature 9	circular dark black soil stain, few FCR, plus flaking debris	Archaic (3040+-30 B.P.)	Y
North Shore	48YE381	Feature 7.2	ephemeral rock pile on ground surface hearth, no depth	n.d., below F3(7.1)	N/A
North Shore	**48YE381**	**Feature 10**	**surface hearth (no depth)**	**LP (770+-40 B.P.)**	**Y***
North Shore	48YE381	Feature 4	oval, gentle sloped basin-shaped pit	LA (1720+-40)	N
North Shore	48YE381	Feature 7.1	ephemeral rock pile on ground surface hearth, no depth	MA (2840+-40 B.P.)	N
North Shore	48YE381	Feature 5	shallow depth fire hearth	MA (2920+-40 B.P.)	N
North Shore	48YE381	Feature 6	surface hearth, shallow	MA (3100+-40 B.P.)	N
North Shore	48YE381	Feature 12	small rock cluster; above F1 (10)	EA (5910+-50 B.P.)	N
North Shore	**48YE1553**	**Feature 3.1**	**hearth, possible boiling pit given depth and lack of charcoal staining; gapped ring of rocks around the central pile**	**LP (1280+-40 B.P.)**	**N/A**
North Shore (Fishing Bridge)	48YE549	Feature 3	unknown function; small cluster of 7 hand-sized river cobbles; possible stone cairn?	LP (220+-40 B.P.)	Y
North Shore (Fishing Bridge)	**48YE549**	**Feature 1**	**short-term small surface hearth**	**LP/Proto-historic (240+-40 B.P.)**	**Y**
North Shore (Fishing Bridge)	48YE549	Feature 4	hearth	LP (360+-40 B.P.)	Y
North Shore (Fishing Bridge)	**48YE549**	**Feature 2**	**short-term basin shaped hearth feature**	**LP (940+-B.P.)**	**Y**

South Shore	48YE2190	Feature 1	ephemeral firepit/hearth used during a short-term occupation of the site	LP (1380±30 B.P.)	Y
South Shore	48YE1642	Feature 1	surface feature, lacks depth, small ephemeral hearth; probable living surface with fire-cracked rock and small rock features	LA (1610+-30 B.P.)	Y
South Shore	48YE1660	Feature 3	hearth	LA (1690+-30 B.P.)	Y
South Shore	48YE1660	Feature 1	firepit/hearth	LA (1850+-30 B.P.)	Y
South Shore	**48YE1332**	**Feature 1**	**ephemeral surface hearth**	**MA (2880±30 B.P.)**	**Y**
South Shore	48YE1642	Feature 2	surface hearth, lacks depth	MA/LA (2890+-30 B.P.)	Y
South Shore	48YE1382	Feature 2	living floor remains (feature 1 sits atop)	LA (no rcy date)	N
South Shore	48YE1382	Feature 1	basin-shaped hearth or cooking feature	LA (1970±30 B.P.)	Y
South Shore	48YE1384	Feature 1	small fire feature- small firepit/hearth	LP (1330+-30 B.P.)	Y
South Shore	48YE1388	Feature 2	ephemeral surface hearth	LA/LP (1490+-30 B.P.)	N
South Shore	48YE1388	Feature 1	basin shaped, tapered at the ends; hearth and/or cooking feature	LA/LP (transition period: 1530±30 B.P.)	Y
South Shore	48YE1588	Feature 1	cobble arc feature "stone circle"-secure for winter tepee-structure	LP (AD 1220 to 1280 or 730 to 670 B.P.)	Y
South Shore	**48YE1383**	**Feature 1**	**small surface hearth**	**LA (2290+/-30 B.P.)**	**Y**

[1] Red 'Y' in botanical remains column indicates there was more than probable fuel source remains detected.
2 Bolded text indicates feature construction analyzed for type of cooking structure based on. Thoms, 2008.
*At site 48YE381, Feature 10 only macrobotanical remains of lodgepole pine were recovered, no float samples were taken.

Archaeobotanical remains were found in 29 of these features, while 12 out of 29 had archaeobotanical remains beyond that of probable fuel sources (pine, cottonwood, willow, coniferous/other (non-pine), riparian (other, undefined), spruce, fir, alder, sagebrush, grass, aspen, oak; see Figure 15 for a summary of archaeobotanical remains and frequency within features).

Beyond synthesizing the radiocarbon dated chronology, a microscale spatial analysis of nine selected features from the site reports is conducted utilizing a hot-rock cookery classification that further elucidates the possible purpose of these fire features.

The majority of identified cooking features in the MYAP site reports fall into the category A.V. Thoms' defines as a "cook-stone grill fired in situ in a shallow basin" (Figure 6). The site reports did not utilize Thoms' cooking facilities classification system, however reporting and photo/schematic evidence from the site reports provides sufficient data in order to re-classify these cultural fire features within Thoms' cooking classification described in Chapter 3.

Nine features were chosen for composition analysis from the 37 cultural features based on their information content. This represents approximately 25% of the total features listed in Table 11. These nine features are detailed below with their feature number, site number, region and the classification/description provided within the MYAP site reports. These features are then re-classified using Thoms' classification system (see Chapter 3, section 3.5), based on the description and photographic/schematic evidence from the site reports. Hallmark features that justify this cooking classification are discussed, using the original interpretation within the pertinent site report. To supplement this, a listing of the ethnobotanical remains found within eight out of nine of the features is also provided. Lastly, Table 14 provides a breakdown for the unifacial and bifacial tool recovery ratios at sites with and without features, and at sites with and without archaeobotanical remains.

7.2 Analysis and Results

Chronology of Cultural Features

A summary of chronological variation for sites with features is below. The total number of features is reduced from 37 to 35 for chronological charts, as three cultural features did not yield radiocarbon dates (48YE1382, Feature 2, 48YE381, Feature 7.2, 48YE380, Feature 380-09-2). However, Feature 7.2 at 48YE1382 is defined as a living floor and dated temporally to the Late Archaic based on Feature 1 at the same site. Feature 1 sits atop Feature 7.2, with a radiocarbon date of 1,970±30 B.P.

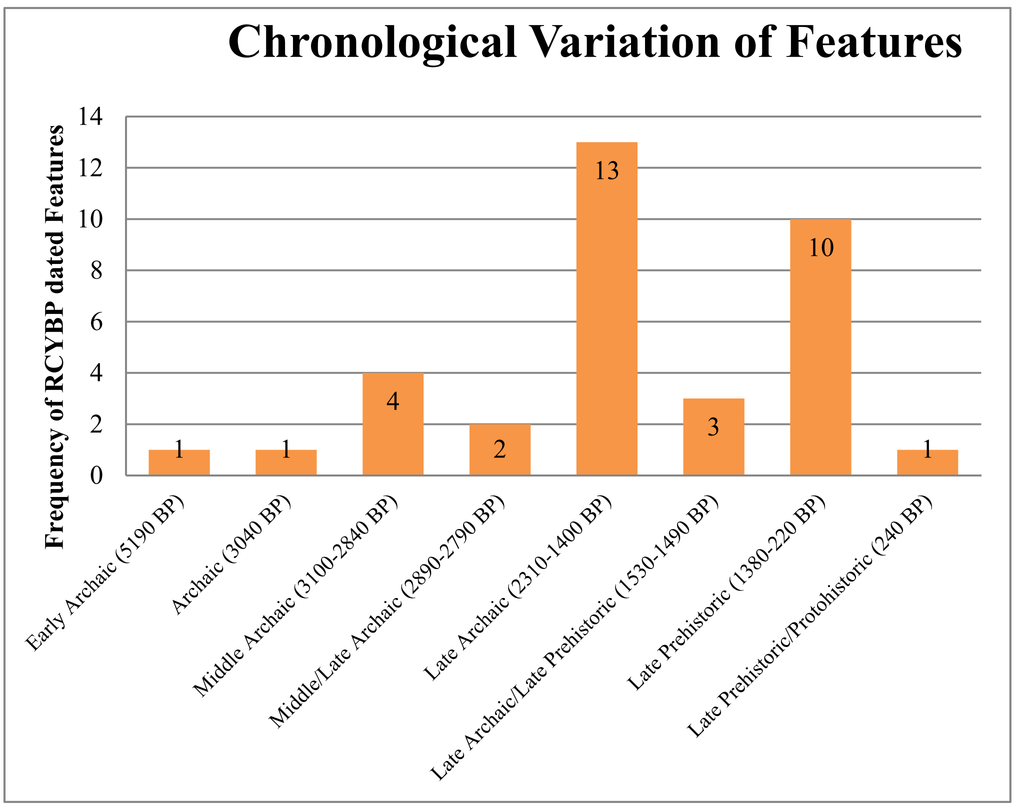


Figure 17: Chronological variation of dated features by site.

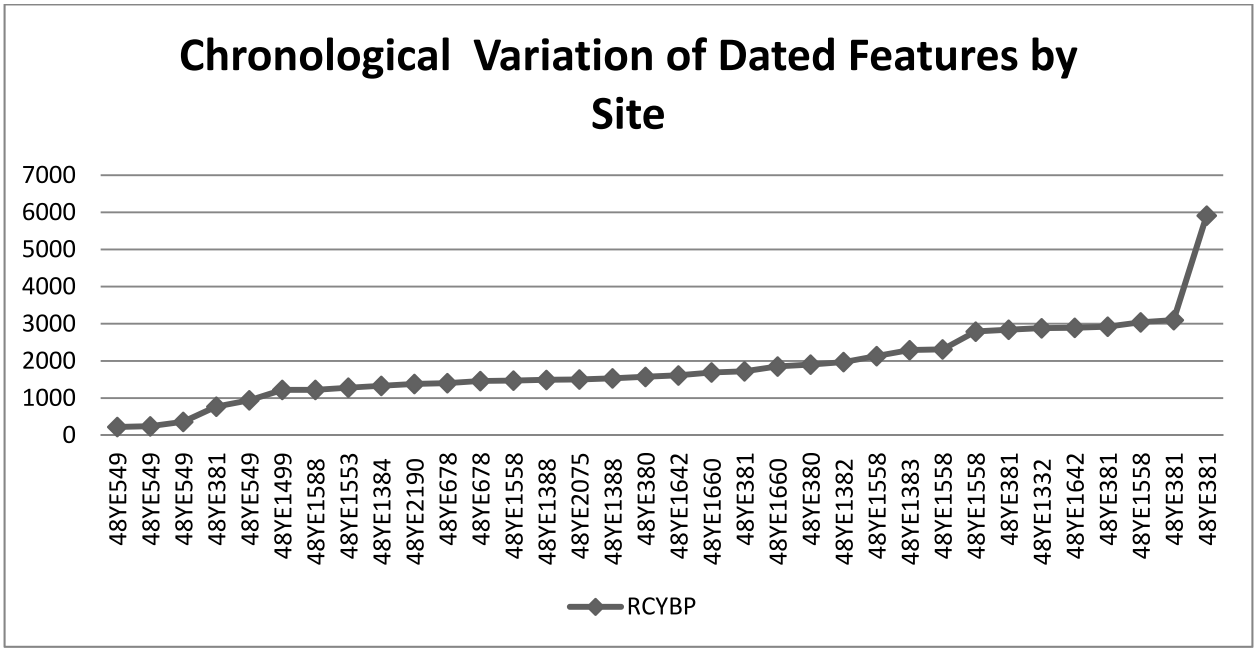


Figure 18: Chronological variation of features based on frequency within time period.

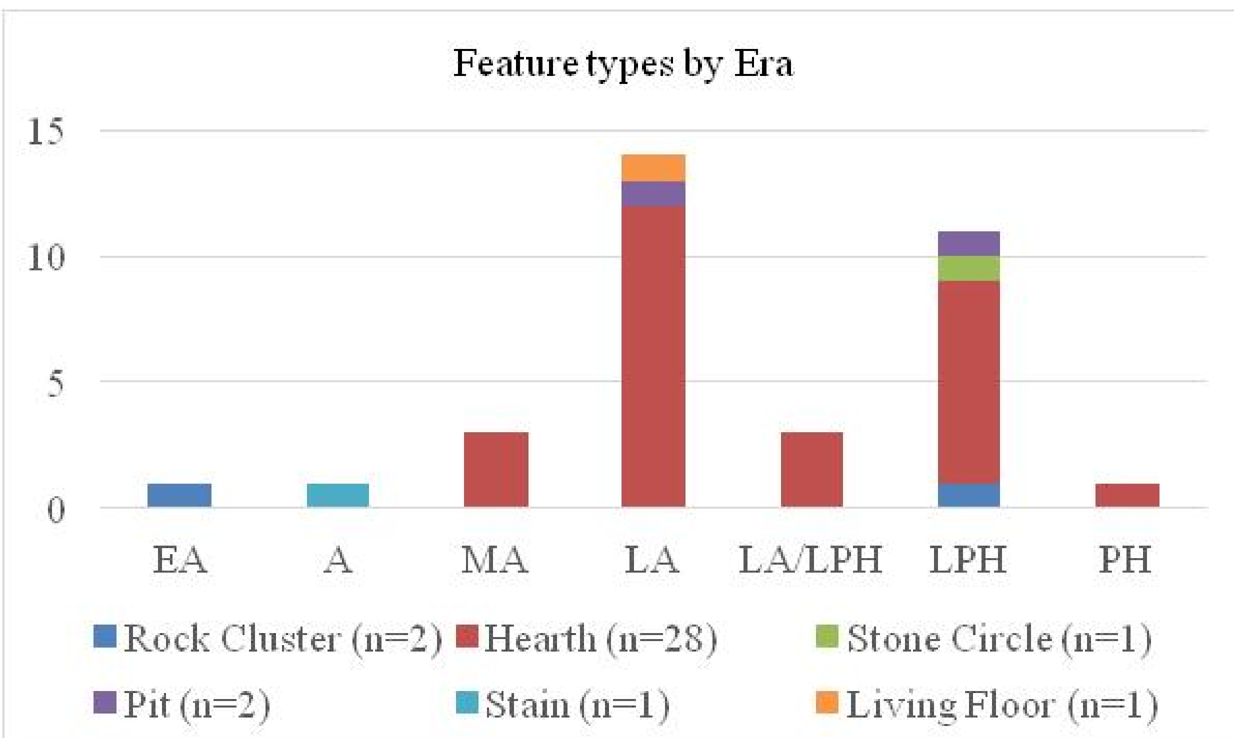


Figure 19: Feature types, based on archaeological era. Key: EA=Early Archaic; A=Archaic; MA=Middle Archaic; LA=Late Archaic; LPH=Late Prehistoric; PH=prehistoric/protohistoric.

Microscale analysis of fire features

This section utilizes the archaeological expectations for hot-rock cookery, based on Thoms' 2008 publication. Nine features were chosen from the 37 total features excavated by the MYAP and these nine features are presented in detail, including photos and/or schematic sketches obtained from the sites reports.

Feature 1, 48YE1499 (East Shore): Livers and MacDonald (2012) defined this feature as a an oval shaped, ephemeral fire feature roughly 20 cm below the surface with several densely packed pockets of charcoal and several dozen broken FCR pebbles (Livers, M.C. and Douglas H. MacDonald 2012:316). This feature is dated to the Late Prehistoric (1,220±130 B.P). Based on comparison to the Thoms Cooking Classification, it appears this feature is a *closed cooking, earth oven with rock heating elements fired in situ* (Figure 6; Table 5). The feature bisection profile (lower right of Figure 21) shows the charcoal fill of the feature with additional charcoal and fire modified rock atop. The shallow basin shape with "thermally altered sediments" (i.e., the charcoal fill) is a hallmark of earth ovens fired in situ. Thoms discusses this type of feature as having "scattered FCR in the immediate vicinity" of the remains of the earth oven, "representing discard and scavenging activities" (Thoms 2008:457, Table 5). Gish conducted macrobotanical analysis on soil from this feature. She concludes the soil sample indicates a vegetative mix of pine and an undefined riparian plant species present, which suggests use of this type of fuel

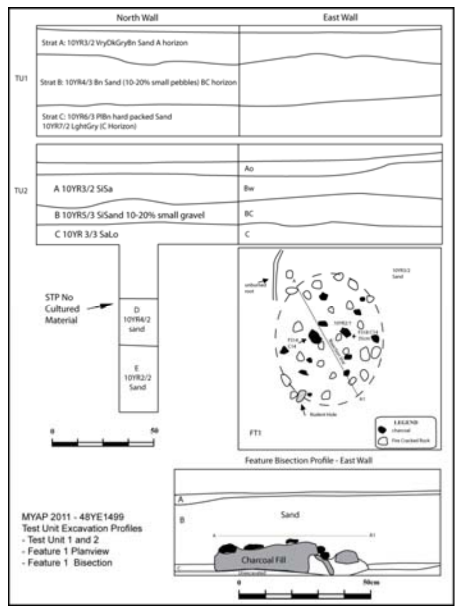


Figure 20: 48YE1499 TU Profiles and FT 1 Bisection profile/plan view (Livers, M.C. and Kristen Hare 2012:318, Figure 39).

source (Livers, M.C. and Douglas H. MacDonald 2012:317).

Feature 1, 48YE2075 (East Shore): Livers and MacDonald (2012) defined this feature as "a basin shaped hearth starting approximately 30 centimeters below the surface. In profile, the hearth measured approximately 1 meter wide and 20 centimeters deep at its maximum dimensions, containing large pockets of charcoal as well as several dozen fire cracked rocks." (Livers, M.C. and Douglas H. MacDonald 2012:90). Charcoal samples submitted for testing date this feature to the Late Archaic/Late Prehistoric (1,500+-40 B.P.). Based on comparison to the Thoms Cooking Classification, it appears this feature is an *open cooking, earth/surface oven with rock heating element fired in situ*. Again, we see thermally altered sediments (charcoal and charcoal stain) beneath and intermixed with clusters of rock. The scattered rock near the feature fits with Thoms' "expected archaeological characteristics…of furniture rock, and unused cook stones" for open-pit drying ovens (Thoms 2008:457, Table 5). This feature did not contain any archaeobotanical remains

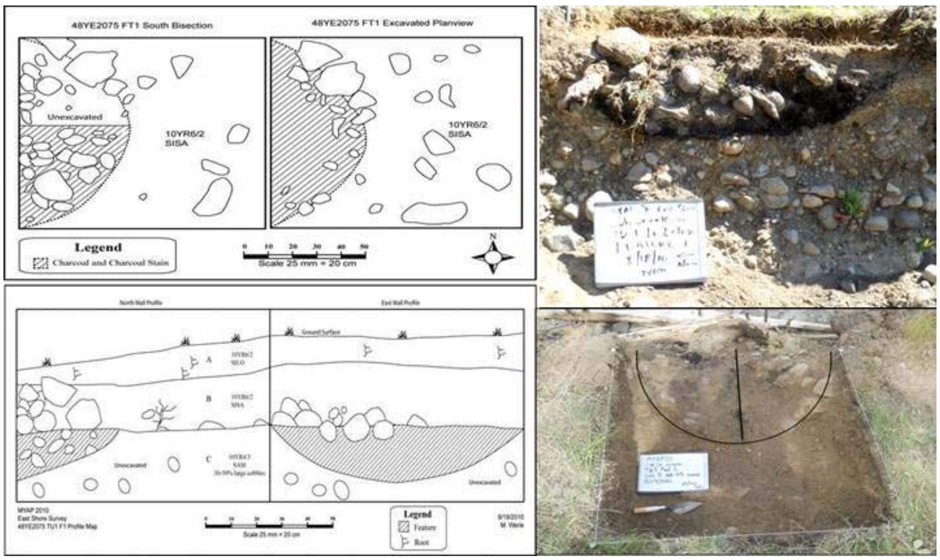


Figure 21: (Left) 48YE2075, FT. 1, schematic profile (left) (Livers, M.C. and Kristen Hare 2012:84, Figure 5); (Right) 48YE2075, FT. 1, profile during salvage and plan view, with bisection plan. (Livers, M.C. and Douglas H. MacDonald 2012:90, Photographs 16 and 17).

Feature 2/3, 48YE678 (East Shore): Several hearths were identified by MYAP field crews during survey of this site. Feature 2/3 as defined by Livers and MacDonald (2012), "is comprised of a concentration of 20-30 large cobbles with heavy charcoal staining in and around the concentration" with what appears to be associated dump piles of FCR and charcoal from episodes of cleaning out of the hearth (Livers, M.C. and Douglas H. MacDonald 2012:133-135). FCR was submitted for thermoluminescence (TL) analysis, and the feature dated to the Late

Figure 22: (Left) 48YE678, FT. 2/3, Overview of Feature 2, Feature 3, and Feature Profiles (Livers, M.C. and Douglas H. MacDonald 2012:135, Figure 35; (Right) 48YE678, FT. 2/3, dump feature east of FT. 2 (Livers, M.C. and Douglas H. MacDonald 2012:134, Photograph 35).

Archaic (1,400±40 B.P). Based on comparison to the Thoms Cooking Classification, it appears this feature is a *closed cooking, steaming pit or an open air stone boiling pit with a heating element fired nearby*. Both types of cooking features are defined by Thoms as basin shaped or surface hearths which are partially filled with heated rocks and intermixed with "ash, charcoal, oxidized sediments and a few pieces of FCR" (Thoms 2008:457, Table 5). The associated dump nearby may be indicative of repeated boiling, steaming or general cooking events which required periodic cleaning out of the feature, suggesting longer term use or repeated stays at this same encampment. Feature 2/3 contained both fuel and probable foodstuffs: nightshade, prickly pear cactus fruit, pine, other conifer type (non-pine).

Feature 3.1, 48YE1553 (North Shore): This feature was defined by MacDonald and Livers (2011) as a possible boiling pit given its depth and lack of charcoal staining, along with a gapped ring of rocks around the central pile. The site report notes the lack of soil discoloration around the feature, which suggests the heating elements were not fired in situ. The feature dated to the Late Prehistoric (1280+-40 B.P.). Based on comparison to the Thoms Cooking Classification, it appears this feature could indeed be a *closed cooking, stone boiling pit with rocks heated nearby*. The site report indicates that it is fairly shallow, at only 30-40 cm below the datum and no apparent "pit" was dug (MacDonald, D.H. and Michael C. Livers 2011:93). However, without heating elements fired in situ to create a hardening of sediments, pits are often difficult to conclusively identify. Thoms defines a pit as at least 15 cm deep and the comparatively dense, small to mid-sized rocks in a somewhat concentric concentration are the expected archaeological characteristics of a stone boiling pit (Thoms 2008:457, Table 5). No pollen analysis occurred at this feature for other possible archaeobotanical remains, but the lodgepole pine charcoal sample used for radiocarbon dating does indicate pine as a probable fuel source (MacDonald, D.H. and Michael C. Livers 2011:93).

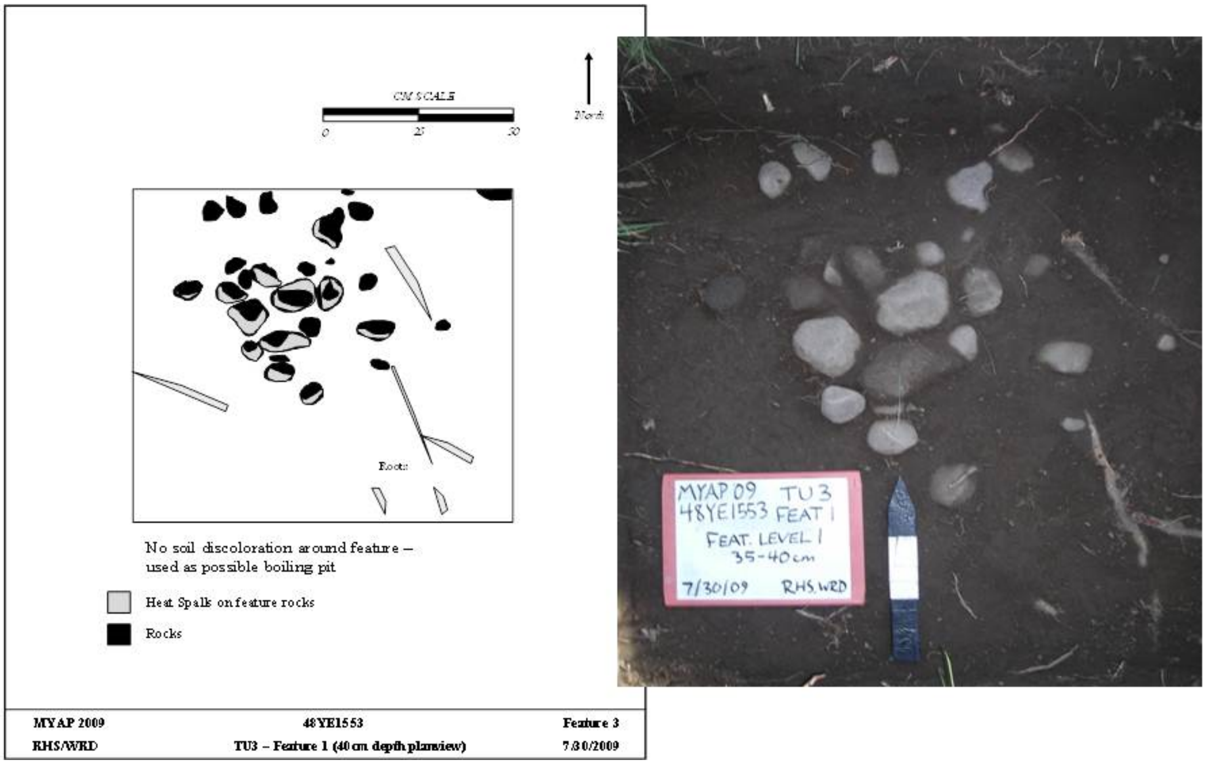


Figure 23: 48YE1553, Feature 1 Rock Concentration, view North (MacDonald, D.H. and Michael C. Livers 2011: 93, Photograph 29).

Feature 10, 48YE381 (North Shore): MacDonald and Livers (2011) define this feature as a surface hearth lacking depth or a dump pile with an unidentified associated pit. The site report states: "Feature 10 consists of approximately 25-30 blackened (charcoal) and/or fire-cracked rocks arranged in a circle within an area measuring 45 cm east-west and 50 cm north-south. Lodgepole pine charcoal is intermixed with the rocks, which were placed on the ground surface during their use" (MacDonald, D.H. and Michael C. Livers 2011:240).

Based on comparison to the Thoms Cooking Classification, it appears this feature is also *closed cooking, stone boiling hot-rock cooking facility with a rock heating element fired nearby.* This type of cooking facility is composed of these characteristics, according to Thoms: surface hearth; concentrations of small- and possibly medium sized FCR, comparatively dense scattered FCR in the immediate stone-boiling area (Thoms 2008:457, Table 5). No pollen analysis occurred for this feature for possible additional archaeobotanical remains, but the lodgepole pine charcoal sample used for radiocarbon dating does indicate pine as a probable fuel source (MacDonald, D.H. and Michael C. Livers 2011:240-241).

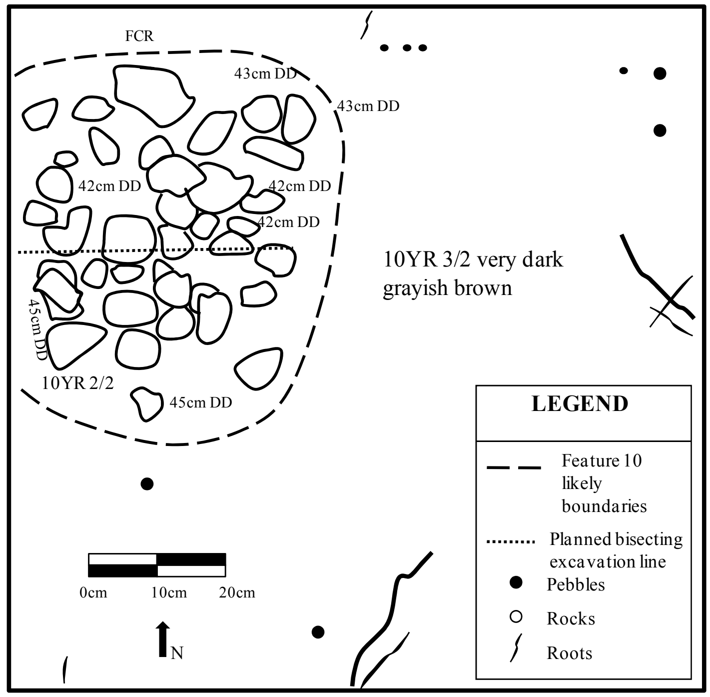


Figure 24: 48YE381, Feature 10, Late Prehistoric, Planview (MacDonald, D.H. and Michael C. Livers 2011:241, Figure 106).

Feature 1, 48YE549 (North Shore: Fishing Bridge): defined by Livers and MacDonald (2011) as a small, limited use surface hearth. This feature is the youngest dated feature, dating to the Late Prehistoric/Proto-historic (240+-40 B.P.). Based on comparison to the Thoms Cooking Classification, it appears this feature is an *open air, cook-stone grill fired in situ* based on the scatter of FCR, the thermally altered sediments (charcoal staining) and the presence of a projectile point and possible bone demonstrating activity near the feature. No additional pollen analysis occurred within this feature, but the lodgepole pine charcoal sample used for radiocarbon dating does indicate pine as a probable primary fuel source (Livers, M.C. and Douglas H. MacDonald 2011:25-27).

Figure 25: 48YE549, Feature 1 Planview showing FCR in South and Charcoal in North (Livers, M.C. and Douglas H. MacDonald 2011:27, Photograph 30).

Feature 2, 48YE549 (North Shore: Fishing Bridge): Livers and MacDonald (2011) defined this feature as a short-term basin shaped hearth, with a very shallow 3-5 cm depth and some chert and obsidian flakes within the fill of the feature. This feature dates to the Late Prehistoric (940±B.P.) (MacDonald, D.H. and Michael C. Livers 2011:28-30). Based on the site report description and in comparison to Thoms Cooking Classification, it appears this feature is an *open air, cook stone grill, fired in situ*, much like Feature 1 from this same site (detailed above). A soil sample collected from both sides of the feature was processed via flotation for archaeobotanical analysis. A single wild strawberry seed was recorded within this feature, along with the presence of unburned lodgepole pine parts (cones; needles) as well as the lodgepole pine charcoal sample used for radiocarbon dating (Livers, M.C. and Douglas H. MacDonald 2011:28-30).

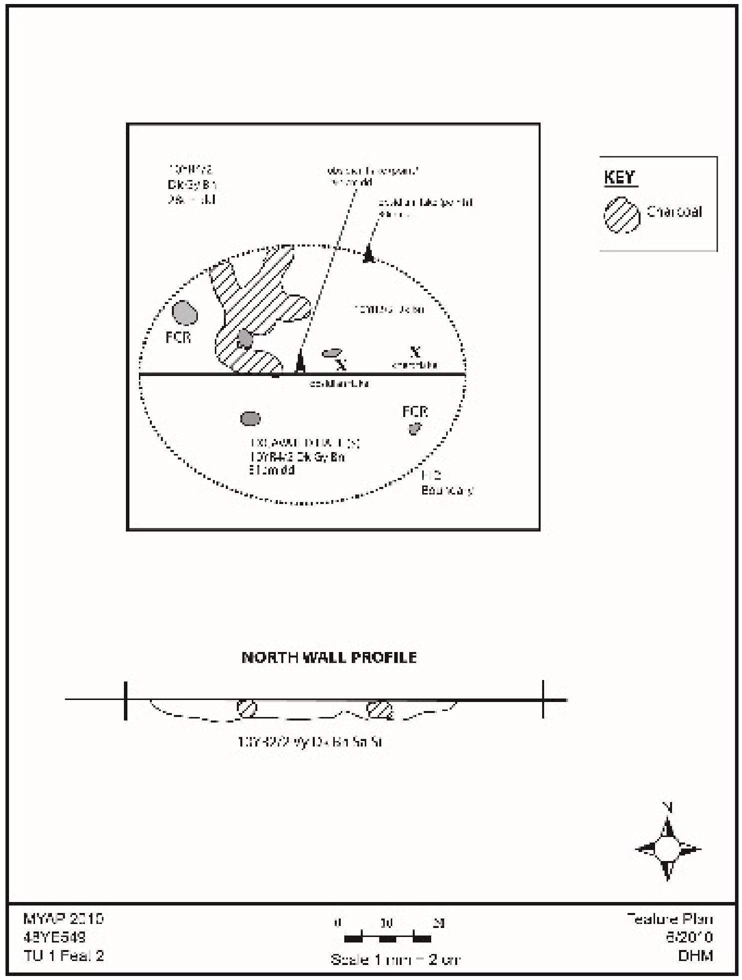


Figure 26: 48YE549, TU 1, Feature 2 Planview and Profile (Livers, M.C. and Douglas H. MacDonald 2011:29, Figure 21).

Feature 1, 48YE1332 (South Shore): MacDonald (2014) defined this feature in these terms: "Due to the concentration of charcoal and associated cultural materials, UM interprets this to be a cultural feature, likely an ephemeral surface hearth used for a brief period during the occupation (MacDonald, D.H. 2014:336). Based on comparison to the Thoms Cooking Classification, it appears this feature may be an *open air, cook stone grill, fired in situ.* Based on the concentration of thermally altered sediments (charcoal staining) and the presence of associated cultural materials demonstrating activity near the feature, this seems an appropriate designation. Archaeobotanical analysis conducted for this feature yielded several species of probable fuel sources including: pine, spruce and fir.

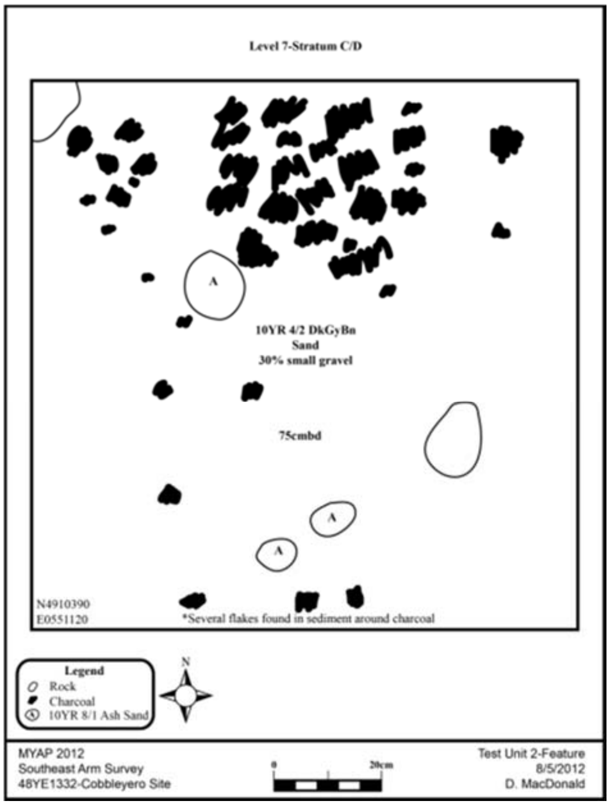


Figure 27: 48YE1332 Feature 1 Planview, TU 2 (MacDonald, D.H. 2014:340, Figure 172).

Feature 1, 48YE1383 (South Shore): MacDonald (2014) defined this feature as a surface hearth consisting of "five large cobbles and at least 6-8 large fragments of fire-reddened FCR. Three pieces of charcoal were collected from the interior of the feature, which measured 55-cm north-south and 50-cm east-west. There was no depth to the feature..." (MacDonald, D.H. 2014: 176). Based on comparison to the Thoms Cooking Classification, it appears this feature may be a *closed cooking, earth oven with rock heating element fired in situ*. The hallmark characteristics of this type of cooking facility are a shallow basin shape with “scattered FCR in the immediate vicinity” of the remains of the earth oven, “representing discard and scavenging activities” (Thoms 2008:457, Table 5).

Archaeobotanical analysis conducted for this feature yielded several species of probable fuel sources including mostly burned: pine, willow, spruce and aspen.

Photograph 2: Feature 1, Bodego Bay Site (MacDonald, D.H. 2014:176, Photograph 74).

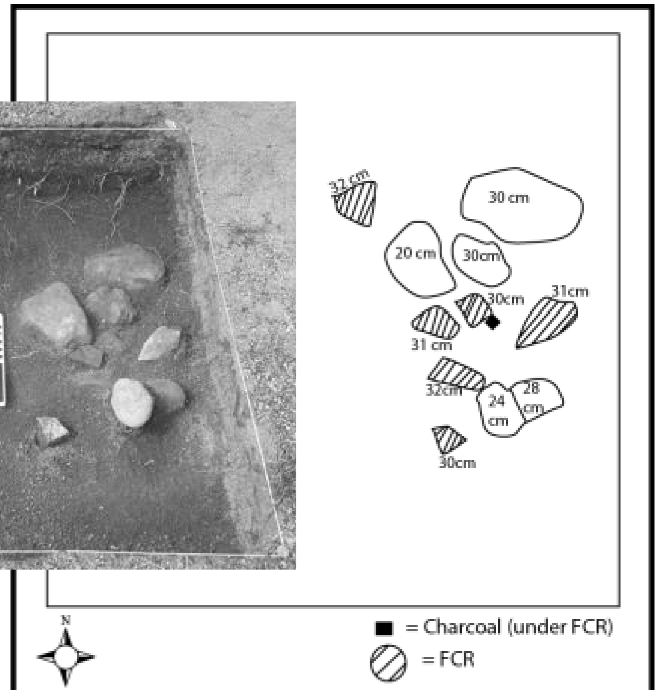


Figure 28: 48YE1383, Bodego Bay Site, Feature 1 Planview (MacDonald, D.H. 2014:176, Figure 89).

Below is a table summarizing the classification of these features in terms of style, type and heating elements.

Table 13: Hot-rock cookery feature analysis summary.

Hot-rock cookery feature classification	**Features (n)**
Style	
Open	n=4 48YE2075 (Feature 1, East Shore) 48YE549 (Feature 1, North Shore: Fishing Bridge)

	48YE549 (Feature 2, North Shore: Fishing Bridge) 48YE1332 (Feature 1, South Shore)
Closed	n=5 48YE1499 (Feature 1, East Shore) 48YE678 (Feature 2/3, East Shore) 48YE1553 (Feature 3.1, North Shore) 48YE1383 (Feature 1, South Shore) 48YE381 (Feature 10, North Shore)
Type	
Oven	n=3 48YE1499 (Feature 1, East Shore) 48YE2075 (Feature 1, East Shore) 48YE1383 (Feature 1, South Shore)
Pit	n=3 48YE678 (Feature 2/3, East Shore) 48YE1553 (Feature 3.1, North Shore) 48YE381 (Feature 10, North Shore)
Grill	n=3 48YE549 (Feature 1, North Shore: Fishing Bridge) 48YE549 (Feature 2, North Shore: Fishing Bridge) 48YE1332 (Feature 1, South Shore)
Heating Element	
Fired in situ	n=6 48YE1499 (Feature 1, East Shore) 48YE2075 (Feature 1, East Shore) 48YE549 (Feature 1, North Shore: Fishing Bridge) 48YE549 (Feature 2, North Shore: Fishing Bridge) 48YE1332 (Feature 1, South Shore) 48YE1383 (Feature 1, South Shore)
Fired nearby	n=3 48YE678 (Feature 2/3, East Shore) 48YE1553 (Feature 3.1, North Shore) 48YE381 (Feature 10, North Shore)

Tool associations with Cultural Features

Comparing the uniface to biface ratios calculated for the lithic tools analysis for various contextual scenarios at the 47 sites provided evidence for the interrelatedness of tool associations with cultural features and archaeobotanical remains. Thirty of the 47 sites (63%) examined did not have any cultural features present or located by the MYAP crews. Seventeen of the 47 sites (36%) had cultural features present. Twenty-four of the 47 sites (51%) had a unifacial to bifacial ratio of zero (0). The highest ratio of unifacial tools to bifacial tools is 0.89 for sites with features other than designated "hearths" (i.e., boiling pits, ovens, living floors; n=6), indicating that additional activities took place here that did not occur at sites with only hearth fire features. When compared with the ratios for all sites combined (0.49, n=47) and sites without features (0.39, n=30), an increased use of unifacial tools at sites with features is clear, indicating possible non-hunting activity areas based on the tasks unifacial tools accomplished. The greater unifacial to bifacial tool ratio of 0.66 at sites with archaeobotanical remains versus a ratio of 0.41 at sites without these remains suggests additional activities as well. The unifacial to bifacial tool ratios averaged for various scenarios appear in the descriptive table in Appendix C.

Table 14: Descriptive table for various feature and archaeobotanical remains associations based on unifacial and bifacial tool ratios.

Scenario	**Average U:B ratio**	**Number of Sites (n)**
all sites combined	0.49	n=47
sites w/ features	0.66	n=17
sites w/o features	0.39	n=30
sites w/ hearths	0.56	n=15
sites w/ feature types other than/in addition to hearths (e.g., living floor, boiling pit, rock cluster, soil stain(s),	0.89	n=6

stone circle)		
sites w/ ethnobotanical remains	0.66	n=15
sites w/o ethnobotanical remains	0.41	n=32
sites w/ ethnobotanical remains that are not primarily fuel sources	0.67	n=12
sites w/ ethnobotanical remains of only primarily fuel sources	0.44	n=25

To summarize, the majority of cultural features examined within the scope of this project represent short-term food processing activities. Prolonged use of cultural features is less evident overall. This is important, as possible activities that women were engaged in during precontact occupations at the lake (e.g. food procurement, food processing) illuminate engendered tasks and group subsistence activities (Morehart and Helmke 2008:60-62).

Radiocarbon dates from the cultural features provide chronological dating information, making these features the only directly dated cultural material in the project. The majority of cultural features are dated between the Late Archaic to the Late Prehistoric (n=26), ranging from 2,310 B.P. to 220 B.P. From the pre-Late Archaic to the Contact/Historic Period there appears to be periodic increases and decreases in the concentration of cultural features. A sharp decline of cultural features from the Contact/Historic Period is ethnohistorically documented as a direct result of establishment and systematic expulsion of Native Americans from the YNP area. The decline in concentration of cultural features for the 1,000 years leading up to the Late Archaic and then again in the Late Prehistoric suggests a dynamic change from wide-ranging settlement patterns in the Paleoindian to more tethered settlement by the Early Archaic, as MacDonald et al.

2011 highlight. The motivation for this switch may be the results of several factors, as discussed in detail in Chapter 8, section 8.4.

The nine selected cultural features reclassified using a more detailed cooking classification system (Thoms 2008), demonstrate that a great deal of variety existed in the construction, use and reuse of cultural fire features around Yellowstone Lake. Construction is often labor intensive and requires knowledge, resources and time. The inference is oversimplified, but if women were less invested in hunting activities than their male-counterparts, that would leave more time to construct labor intensive hot-rock cookery features (Hayden and Cousins 2004:140-154). If women were tasked with the majority of plant procurement and processing, this would also lend support to the female-specific use of these types of cultural features.

Micro-spatial analysis using classification based on Thoms (2008) hot-rock cookery expected archaeological characteristics of FCR and non-FCR elements (see Table 5), indicates potential female-specific activity areas at sites: 48YE1499, 48YE678, 48YE1553, 48YE381 and 48YE1383. The cultural features 1, 2/3, 3.1, 10 and 1 at these sites respectively were either closed earthen ovens or stone steaming/boiling pits. These types of features are more labor intensive than surface hearths or cookstone surface grills fired in situ, due to ground-breaking and the creation of secondary heating element areas and/or associated dumps for periodic cleaning out (Hayden and Cousins 2004:140-154).

The increased presence of unifacial tools at sites with a variety of features, not just basic hearths, indicates that additional activities took place here, likely related to cooking, such as roasting or boiling foodstuffs in pits. Whether these activity areas relate to female-specific cooking activity, larger groups requiring increased cooking activities, or simply a variation in cooking style based on foodstuffs being processed is indeterminate at this time. Further analysis and interpretation of these cultural features appears in Chapter 8, section 8.4.

Chapter 8: Discussion

8.1 Introduction

In archaeology context is always the driving force. The context of women's presence around Yellowstone Lake is no exception. The archaeological remnants of women's lifeways must be looked at within the context of the sites, in order to infer who made, used and discarded these items at a particular point in time at this specific place. The analysis and results presented in the preceding chapters are discussed in three parts, to represent the three major archaeological lines of evidence that were examined. Part one is a discussion of the lithic stone tool assemblage as a means to examine engendered tasks, based on the data presented in Chapter 5. Part two is a discussion of the archaeobotanical and ethnographic data from Chapter 6, as it represents a cornerstone for female specific labor based on traditional hunter-gatherer sexual divisions of labor. Part three is a discussion of the cultural features as they represent women's space, from the data presented in Chapter 7. This three-part discussion will summarize, appraise, interpret and explain the results. This discussion demonstrates the overall effectiveness of this research to engender the past at Yellowstone Lake, Yellowstone National Park, Wyoming.

8.2 An examination of dichotomous tool types and the male, female dichotomy.

The interrelatedness of subsistence-based tasks and tools used to carry out those tasks is used to consider the social agency of women. Working backwards in the archaeological record, first looking at a tool and determining the task it accomplished, then categorizing the tools collectively based on function, we can attempt to discern tool-use patterns, as it relates to gender. This is not to establish that men and women only used one type of tool or could only perform specific tasks. Rather it is looking at how tools types and associated tasks relate to distinctive archaeological contexts. This is the aim for hypotheses testing of the relationship between the material (lithic) record focused on cultural features as a unique aspect of encampment and cooking activity, geographic short-term settlement patterns, and social value placed on materials used in tool manufacture.

Based on the summary chart of tool types and presence of features within regions (Figure 8, left) and the uniface to biface tools ratio per square meter excavated (Figure 8, right), it is evident that bifacial tools are more frequently recovered from Yellowstone Lake archaeological sites. Given the dependence on meat in hunter-gatherer cultures that frequented the lake areas, it should be expected that this would impact what we see in the archaeological record (Waguespack 2005:668). An increase in the dependence on meat may increase the focus of women on hunting activities, whether participating in the actual kill or assisting with the myriad of activities associated with the hunt (scouting, butchering, processing meat and hides, etc.).

If women's activity is primarily focused on hunting, then it is plausible that women spent less time procuring plant resources. The tools utilized for plant resource procurement are different than those used for hunting tasks, thus women in hunting-centric cultures spend less time investing in tool technology related to activities outside of hunting. Based on Optimal Foraging-Theory, if more post-encounter payoff from manufacturing and utilizing a bifacial knife for hunting or processing kills is present, we should expect to see less investment in tools that accomplish "other" tasks, thus these tools would not appear as often in the archaeological record (MacDonald 1998:225-226; Waguespack 2005). As such, it cannot be assumed that bifacial tools and hunting were exclusively within the male domain. Likewise, we cannot assume that unifacial tools and plant procurement and processing fell exclusively within the female domain. Bifacial tools in greater quantities at each region around the lake may be more indicative of the primary focus on meat procurement for the entire culture (Waguespack 2005; MacDonald 1998) as opposed to exclusively male hunting activities.

The linear regression and average plots for all 47 sites do show a moderate to strong positive correlation for the increased number of total tools (bifacial tools correlation coefficient, r = 0.80; unifacial tools correlation coefficient, r = 0.63), as the number of features present at a site increases (Figure 9) . Logically the number of tools, regardless of tool type, should increase with the number of features present because we can assume that a) sites with multiple features present were more heavily used by occupants, leaving a greater footprint and b) sites surveyed with the possibility or known presence of features receive more attention in the form of increased excavation efforts and artifact collection. However, the initial outcome of unifacial to bifacial tool ratio and linear regression tests did not support the hypothesis that a *stronger* positive relationship exists between the presence of cultural features and unifacial tools versus bifacial tools.

Unifacial tools are ethnographically related to tasks accomplished in encampment and cooking activity areas (butchering, hide preparation, grinding seeds, nuts, etc.), therefore it was expected a greater presence of unifaces would be at sites with features where these activities likely occurred. The chi-square test provides a means to test if this relationship is statistically significant. The chi-square values for both unifacial and bifacial tools fall below the critical value in order for the relationship between tool type and sites with features to be considered statistically significant at the 95% confidence level ($p < 0.05$). This result is tempered by the small number of sites tested ($n = 47$), which hinders the robustness of a chi-square analysis. Further statistical analysis using a greater number of sites would establish a more robust chi-square test of significance, and may increase the statistical significance of the $\chi^2_{obt.}$ value for either tool type associated with cultural features.

The linear regressions performed test the hypothesis that stone tool materials (obsidian and chert) carried an assigned social value. Utilizing established lithic data sets from Yellowstone Lake, with a specific focus on how these lithics might reveal geographic patterns of use, suggests the potential for higher social value ascribed to obsidian. This interpretation relies on the underlying assumption that expedient tools were less valued by manufacturers and users. The bivariate linear regressions, based on regional distribution of tools as it relates to the tool material types, provide a solid basis for demonstrating “prehistoric technology as the embodiment of social rules” (Dobres 1995:29) dictated by availability of stone.

Collectively, relatively high coefficients of determination (R^2) exist for obsidian bifacial and unifacial tools and chert bifacial and unifacial tools, 0.94, 0.91, 0.86, 0.63 respectively (Figure 12). Again, we clearly see a dominance of obsidian, reflected in the near perfect positive relationship of obsidian and both bifacial and unifacial tools (R^2=0.94; 0.91, respectively). This arguably demonstrates the preference for using obsidian in all stone tool manufacture at all three regions of the lake. Chert appears to be a suitable alternative chosen for stone tool manufacture overall, with 13% of “other” types of materials being less desirable (Figure 11).

Looking at the regional distinctions (North, East and South shores) between the tool types and tool material types is a bit more revealing as it relates to geographical proximity to stone resources. The bivariate linear regressions for all three regions based on the two types of stone tool material examined reveals variation apparently based on the geographic proximity to both Obsidian Cliff (obsidian) and Crescent Hill (chert). For both the North and East shores the R^2 values are 0.98, an almost perfect positive association between bifacial tool types and obsidian. In statistics this would be considered a relative “fact” because these values are so high. This is in line with the results presented by MacDonald et al. 2012, where obsidian comprised 88% of the lithics recovered from the Northwest shore. As mirrored in the analysis presented here, MacDonald et al. 2012 found this percentage dropped off considerably as sites moved further from Obsidian Cliff, furthest being the Southeast shore with only 20% obsidian (Figure 11, B) . These linear regressions also demonstrate the dominant use of obsidian for stone tool making, in particular for bifacial tools, in the North and East shore regions (Figure 13).

In addition to corroborating MacDonald et al. 2012 findings, these linear regressions allow us to see the geographic shift in the overall use of obsidian based on distinct lake regions (North, East and South shores). These results also demonstrate a marked difference in the rate of use of obsidian as a material type for unifacial tools. The lower rate of use for obsidian unifacial tools collectively (Figure 12) may be due to the fact that unifacial tools are typically expedient and simple to make. As such, expedient tools may require less of a concerted effort in choosing a tool material type during the manufacturing process (MacDonald, *pers. communication* 2015; Gero 1991:169).

Arguably some social dynamics are at play here, with stipulations as to what particular tools were manufactured from stone materials depending on the availability of stone material types (Kelly 1988:717). A possible interpretation of this is that obsidian was imbued with a certain amount of social value as a raw material (Park 2011:116-131). Mirroring Gero's argument, obsidian held greater social value the more "exotic" it became based on availability (Gero 1991). As such, a restriction on the use of obsidian for particular types of stone tools that accomplish particular tasks may reflect the social value placed on those tasks as well. By extension, this may translate into the social value of women's work for which these types of tools were necessary. Alternatively, the differences seen between tool type and tool material type may suggest that primary bifacial tool manufacturers had a greater geographical range in which to accomplish their subsistence tasks, possibly coming into contact more often with obsidian from which to make bifacial tools. If those creating unifacial tools were more limited or restricted in their territorial range of activities, within encampments for example, this would decrease their contact with Obsidian sources and the overall availability of obsidian as a raw material for unifacial tool manufacture.

Yet another alternate interpretation is that short-term encampments and a focus on hunting for everyone in groups using the lake impacted the degree to which women curated their extended use household gear. Based on their technological attributes, bifacial tools are ideal in that they are multifunctional, flexible (easily reshaped and/or meeting a variety of needs) and easily transported; thus they tend to be curated as part of a tool kit for longer periods of time (Nelson 1991:73-75). Stone tool material is an important consideration as the *extended use* in personal or household (women's) gear calls for higher quality tools (Binford 1979:267-269). What we see here could simply be suggestive of the limited household gear tool kit curation process due to shorter length occupation around Yellowstone Lake, given the seasonality of the GYE. Archaeologically this translates into fewer women's task specific tools and less need for quality stone material for tools that accomplish those tasks.

Optimal Foraging Theory as it relates to tool manufacture efforts calls into question the traditional hunter-gatherer sexual division of labor seen ethnographically (i.e., men hunt, women gather), at least for the precontact groups at Yellowstone Lake. The absence of a consistent pattering of cultural feature activity areas and tool types in those areas (Figure 10) might suggest more flexible assignment of subsistence-based tasks. It is possible that a division of labor existed not dictated by gender or simply not as rigidly adhered to, as seen in contemporary hunter-gather cultures. Again, based on the Optimal Foraging Theory, this would be in the best interest of groups concentrating efforts on maximizing post-encounter payoffs for meat resources. This hypothesis is also supported given what we know about the seasonality of the GYE, which reduces the amount of time groups could spend in the area during the year.

This particular analysis for stone tool types and stone tool material types is taken from a smaller sample size (n=22, see Table 6). However, what it demonstrates is a trend suggesting that as people moved away from the main obsidian source in the region (Obsidian Cliff) that this stone material type held increasingly more value, inciting intra-group practices such as tool/tool material type exclusivity. MacDonald et al. (2012) come to a similar conclusion about the trend for obsidian use to decrease as groups moved further away from Obsidian Cliff. They conclude that this affected inter-group relations, in terms of probable trade for obsidian.

The paucity in use of obsidian for stone tools in the South shore region coincides with conclusions that much less obsidian available for stone tool production overall at the South shore is due to the distance from the major source of obsidian, Obsidian Cliff (MacDonald et al., 2012:277). These results also show that as groups occupying the regions of the lake moved further away from the major source of obsidian (Obsidian Cliff) the proportional rates of use for obsidian bifacial and unifacial tools begins to diverge, with a greater use of obsidian for bifacial over unifacial tools (Figure 13).

Because obsidian seems to be favored for bifacial tool manufacture, it seems logical that there may be a greater use of chert, the other prominent stone tool material type, for the manufacture of unifacial tools as a substitute material. However, the linear regressions performed for the East shore show equal rates of use for chert (bifaces R^2=0.96; unifaces R^2=0.96) and this pattern, similar to that of the use of Obsidian, emerges for the use of chert and stone tool types the further sites are from Crescent Hill. A caveat is that the total chert tool count is less than half the total tool count for obsidian tools (chert n=127; obsidian n=298). Also, the South shore chert linear regression, as pointed out in the results section, has such a low number of observation points (n=5; $n^{uniface}$=1) that it cannot not be considered statistically valid.

Nevertheless, the difference we see in choice of material for the two distinct tool types, bifaces and unifaces may suggest several things: 1) selection of raw material based purely on utilitarian standards. Obsidian is simply a better material choice for the making and purposeful use of bifacial tools. While it is evident obsidian primarily constitutes bifacial tool manufacture, we must also consider that another type of material was better suited for the tasks of a uniface; 2) the local versus exotic materials concept (Gero 1991) might substantiate distinctions found between the types of materials used for the types of tools based on the proximity to material types in relation to primary activity areas. This would not necessarily constitute gender exclusive access to certain material types for tool making based on social/cultural "rules", but rather a natural consequence of a sexual division of labor creating distinct activity areas, territories and boundaries from which to gain access to resources within; 3) the high versus low value argument as Gero (1991) defines it, inferring that "exotic" obsidian is imbued with higher social value, therefore social/cultural restrictions are placed on how and what it is used for. This might suggest that hunting activities were so highly valued based on a primary focus on meat procurement that a valuable material type such as obsidian was reserved for tools that accomplished this socially valued set of tasks.

Ultimately this analysis does two things: 1) reaffirms the findings that the MacDonald et al. 2012 analysis produced in terms of lithic stone material use around the lake regions; and 2) provides novel insight into potential patterns of intra-group lithic stone material use, suggesting social dynamics at play.

8.3 Detecting the presence of women through pollen.

The recovery of ethnobotanical remains from the MYAP excavated at Yellowstone Lake sites, while variable, is an exciting avenue to explore for indications of female specific activities and influences. Quantitative pollen analysis of archaeobotanical remains used since the 1960s in the United States (Magid 2004:3), and cross cultural correlates demonstrate that botanical knowledge and collection tends to reside within the female-specific sphere of lifeways in hunter-gatherer societies (Ember 2014). Archaeobotanical remains from Yellowstone Lake sites offer potential insights into the less archaeologically obvious tasks of plant gathering and use, due to the perishable nature of the materials employed in these tasks (Waguespack 2005:668; Magid 2004:7-8).

The charcoal and archaeobotanical remains found in the basin hearths at sites around Yellowstone Lake provides evidence of cooking and plant use (MacDonald and Hale 2013:215-218; Gish 2013:113-114). As discussed in Chapter 3, food processing, cooking and plant use may highlight women's specific gender roles in prehistoric hunter-gatherer groups. Given the seasonality of use of Yellowstone Lake and the surrounding areas, some division of subsistence tasks likely existed for men and women, due to the short time frame in which to accomplish a great deal of seasonal subsistence activities. However, with low population densities, this division of labor would necessarily be flexible, as restricting intra-group task achievement reduces the effectiveness of subsistence activities (Miller 2008:76-78).

Detailed pollen analysis for sites around Yellowstone Lake typically identified fuel sources such as: pine, cottonwood, willow, other non-pine coniferous tree species, other riparian plant species, spruce, fir, alder, sagebrush, grass, aspen, oak (e.g., MacDonald, D.H. and Michael C. Livers 2011:124, 133, 309; Livers, M.C. and Douglas H. MacDonald 2011:26, 30, 116; Livers, M.C. and Douglas H. MacDonald 2012:94, 136; MacDonald, D.H. 2014: 72, 116, 177) (Figure 15). When coupled with the presence of plant types based on chronology of the features they were recovered within, we see a strong patterning of Late Archaic use for the majority of the non-fuel type plants. Pine, spruce and fir, three major fuel resources, were used across all three major time periods (Middle Archaic, Late Archaic, Late Prehistoric) although these three plant types also are ethnographically documented for use as food, medicine and other means (see Figures 15, 17 and Table 10).

Seasonal use of Yellowstone Lake and the surrounding areas is an important factor for lifeways carried out by precontact peoples. The macrobotanical analysis results yielded small seeds and grasses, suggesting summer gathering activities. For example, site 48YE380 (FS 158) contained notably high values of sagebrush compared with other site subsurface samples (FS 157 PW), suggesting cultural use during summer gathering activities (Gish 2013:227-256). Gish found the remains of Cheno-Ams seeds within several features around Yellowstone Lake. The presence of Cheno-Ams, goosefoot (Chenopodium) among macroplant remains, suggests these common seeds were consumed or distributed naturally within encampment sites (Drass 1993:57; Greenhouse et al. 1981). One key insight is that the “botanical evidence for spring and early summer activities is often not visible in archaeological assemblages” (Drass 1993:61). Most Yellowstone researchers cite the spring and summer as primary times when precontact peoples were most intensively using the lake areas (Shortt 2001:239; Johnson 2002; MacDonald et al., 2012). This creates certain implications for archaeobotanicals found in features at the 47 sites analyzed for this thesis project.

The details for each plant that are ethnographically or ethnohistorically documented from three primary sources (Hart 1976; Moerman 1998; 2010; Nabokov and Loendorf 2002) is meant to build inferences for possible explanations as to why these particular types of taxa were found at these sites. It is not a comprehensive list, nor is it meant to replace direct evidence to how these plants were used. Understanding the possible uses of archaeobotanical remains establishes a holistic image of the multitude of activities and the vast amounts of knowledge required for life around Yellowstone Lake. Arguably, plants were a primary part of the female lifeways (Ember 2014) therefore understanding how or why these plants were used reveals the lifeways of women. For example, at site 24PA1081, juniper seed fragments point to juniper berry processing, as juniper berries can be eaten or used as flavoring for other foods (MacDonald et al. 2014:1-21).

Out of 36 unique plant species found, the ethnohistorical sources revealed that 20 of these plant types have documented use as food, 20 for medicinal or therapeutic drug use and 14 plants had other uses for everything from construction material to ritual incense (Figure 16). Of particular importance are specific references to women's use of these plants within these three broad categories. While these references to "women" and "females" are fairly sparse in the ethnohistoric sources, this is likely attributable to the dominance of male-ethnographers for the greater part of the 20th century (Nabokov and Loendorf 2002:22).

Examination of ethnohistoric uses revealed that Salish/Kutenai women specifically harvested the inner bark of ponderosa pine and (Northern?) Cheyenne women prepared prickly pear fruits for consumption (Hart 1976: 39, 50-51). There are only two references to women's specific uses of plants outside of food and medicine: (1) the "Sacred Woman" was the first to be incensed using sagebrush during *Tsitsistas* (Cheyenne) Sundances (Hart 1976:44-45); (2) fruits of plants from the parsley family were stuffed into a porcupine foot and tied into young *Natsitapii* (Blackfeet) girls' hair as a good luck charm, which might be translated as spiritual protection from harm or bad spirits (Moerman 1998:317).

References to "women's medicine" are of particular interest because the female sex organs create unique needs and experiences that the male sex organs do not. As such, medicinal plant use is mostly related to medicinal treatment for menstruation, pregnancy and postpartum. There are nine individual references to women's medicinal use of plant remains that were recovered from Yellowstone Lake sites in the selected ethnohistoric literature.

Tsitsistas (Cheyenne), Sioux (potentially *Thítȟuŋwaŋ*, the westernmost Sioux) and *Agaidika/Kukundiak/ Tukudika* ("Shoshone") women all drank a tea or infusion of sagebrush leaves for menstrual issues, although the texts make no reference to specific symptoms/issues addressed (e.g., abdominal cramps, water retention, spotting, cessation or protraction). Salish (Flathead)/Kutenai women drank tea made from alder for similar purposes (Hart 1976:5). Women never practiced the "cleaning out of insides" remedy that *Nimíipuu* (Nez Perce) men used by thrusting willow twigs down the throat to cause vomiting. The motivation of this practice was cleansing to face warfare, which is typically not within the female realm (although see Lewis 1941 and Lang 1998:305 for references to "manly-hearted women" in Native American cultures).

Juniper leaves burned or drank as a tea by *Tsitsistas* (Cheyenne) women promoted the delivery of a child (Moerman 1986:245), while *Apsaalooké* (Crow Nation) women drank juniper tea after birth for cleansing and healing (Hart 1976:36-37). Heated pine needles placed on the abdomen of Salish (Flathead)/Kutenai women also facilitated delivery of the placenta (Hart 1976: 50-51). Burned Draba seed(s) were recovered from a single site (South shore 48YE1384;

Feature 1: small firepit/hearth, dated to the Late Prehistoric (1330+-30 B.P.) (Table 9; MacDonald, D.H. 2014:166). While the species of Draba is not identified (Gish 2013:231, Table 3), there is one draba-type group in the Brassicaceae (mustard) family prominent in the Montana/Yellowstone Area, *Draba incerta*, commonly referred to as Yellowstone Whitlow-grass (Dorn 2001). There is only one reference to this plant, in the selected ethnohistorical literature used for this analysis. Moreman cites the *Natsitapii* (Blackfeet) using this plant as an abortifacient drug (to cause abortions), which is noted in another Montana-based ethnobotanical research article as well (Dexter et al. 2014). While the birth of children seems a focal point for the medicinal use of plants by women, just as important was the prevention or termination of pregnancy during a female's lifecycle (Bentley 1996:37-39). From a less individual agency based perspective, maintaining relatively low or manageable population densities in relationship to "resource levels" or "carrying capacity" throughout the year would have been important to hunter-gatherer groups moving through the Yellowstone region (Hayden 1972:205-221).

Exact knowledge of direct prehistoric use for each of the plant remains recovered from Yellowstone Lake relies heavily on the use of ethnographic artifacts, as done here. It is possible that certain plants food or medicine, were collected and prepared only by females, or that the entire system of food and medicinal knowledge was transmitted through women. This is difficult to ascertain based on the analysis herein and analysis of archaeobotanical remains is further complicated due to the lack of preservation of organic materials. However, the amount of knowledge curated over the millennia by both men and women using botanicals as food, drug or otherwise speaks to the highly sophisticated nature of prehistoric Native American cultures. This analysis provides a frame-of-reference from which to infer the basic uses of plant taxa found within cultural features in an archaeological context around Yellowstone Lake. To this end, it helps elucidate possible female-specific plant procurement practices for food, medicine, and other needs.

8.4 Exploring women's activity areas through hot-rock cooking systems

Establishing cultural features as activity areas reveals not only what activities occurred but also the organization of these areas within the broader landscape. This organization is likely based on subsistence tasks for the Yellowstone region, which may or may not be gender specific. The cultural features recovered by the MYAP in several areas around the lake are a valuable resource for exploration of female specific activity areas as well as possible gender relations based on distinctions of space. Meticulous excavation and details about each feature recorded by the MYAP team provides valuable information in order to analyze these cultural features as activity areas. Spatial analysis as it pertains to sites with cultural features provides the evidence needed to evaluate these "non-kill" activity areas with concentrated archaeological remains.

Chronology is an important aspect to examine, as organic materials (e.g., charcoal) found within excavated features is a reliable, testable material for radiocarbon dating, providing strong evidence for human occupation during specific phases, both pre-and post-contact. Using the radiocarbon dates acquired from the cultural features demonstrates chronological variation in occupation based on the frequency of cultural features. The majority of cultural features are dated between the Late Archaic to the Late Prehistoric (n=26), ranging from 2310 B.P. to 220 B.P. Sometimes what is *not* present can be the most suggestive way to discern gender as it relates to archaeological context. The periods containing only small, ephemeral features with primarily bifacial tools and no ethnobotanical remains are present could suggest male exclusive occupation events (Figures 18-19).

We see this possibility especially for the periods preceding and following the Late

Archaic and Late Prehistoric periods. For the 1,000 years leading up to the Late Archaic, there are only two dated cultural features (2890-2790 B.P.). This is followed by a dramatic increase in the frequency of cultural features for the Late Archaic (n=10, 2310-1400 B.P.), with a drop off in frequency after about 1500 B.P. leading into the Late Prehistoric. Another increase in the concentration of cultural features is seen about 1,000 years into the Late Prehistoric period (1380-220 B.P.), with yet another sharp decline in frequency after 220 B.P. (Proto-historic period, c. 1815). This may suggest a shift in settlement patterns from wide-ranging to tethered due to climactic changes (MacDonald et al. 2011:11-12).

Given that Yellowstone National Park was established by the United States Congress on March 1, 1872, this drop in overall occupation after 1815 is not surprising. As the park became a piece of Americana, Native American tribes utilizing the park areas for well over 3,000 years were systematically pushed out by park by government officials (Whittlesey 2002). The review of Native American presence in Yellowstone National Park by Nabokov and Loendorf cites a great deal of "fakelore" used in perpetuating and supporting "the positive, secure, non-Indian face which Yellowstone National Park from its establishment well into the 20th century, sought to present to potential clientele" (Nabokov and Loendorf 2002:22).

This information about the historical decline in the frequency of features, as it relates to the systematic expulsion of Native American's from YNP, can be used to infer that other periods of sharp decline in overall frequency of features also points to less occupation as well. The reasons may be varied and based on conjecture with the data presented here. It is possible that changing weather patterns as evidenced in archaeobotanical remains (Gish 2013), over-hunting, and decline in population densities of animals or humans due to disease or famine, or territorial disputes reduced the frequency of occupation and use of the Yellowstone Lake area during these times.

Based on the nine selected cultural features that were reclassified using a more detailed cooking classification system (Thoms 2008), it is demonstrated that a great deal of variety existed in the construction, use and reuse of cultural fire features around Yellowstone Lake. We should assume the construction and use of these features involved a great deal of individual involvement for various subsistence purposes, as construction is often labor intensive and requires knowledge, resources and time. While perhaps oversimplified, if women were less invested in hunting activities than their male-counterparts this leaves more time to construct labor intensive hot-rock cookery features, for the purposes of roasting, boiling or baking nuts, seeds and plants (Hayden and Cousins 2004:140-154).

Table 14 provides reasonable confirmation that sites where cultural features were present had a higher unifacial to bifacial tool ratio overall, indicating multi-purpose activity areas. There is also evidence that sites where archaeobotanical remains were recovered within these features also had a higher unifacial to bifacial tool ratio, versus sites without features and archaeobotanical remains. The increased presence of unifacial tools at sites with a variety of features, not just basic hearths, indicates that additional activities took place here that did not at sites with only hearth fire features. Additional activities likely were related to cooking, such as roasting or boiling foodstuffs in pits. Whether these activity areas relate to female-specific cooking activity, larger groups requiring increased cooking activities, or simply a variation in cooking style based on foodstuffs being processed is indeterminate at this time.

The presence of archaeobotanical remains, particularly where non-fuel source plants exist, has a higher unifacial to bifacial tool ratio (0.67, n=12), than sites with only fuel remains (0.44, n=25) or no archaeobotanical remains at all (0.41, n=32). This also suggests that activities beyond meat procurement and processing were occurring at these sites, with a greater focus on the use of plants. If a sexual division of labor existed, distinguished between those who hunted and those who gathered, this analysis provides evidence to support that interpretation. A more in-depth analysis of all cultural features recovered around the lake is warranted, and may reveal greater correlation between feature composition and female specific activity areas.

As cultural features relate to tools, an evaluation of these as activity areas provides some insight into potential performance of gender as it relates to these activities. The uniface to biface tool ratio is significantly higher at sites with features (0.66, n=17), versus sites without features (0.39, n=30). However, as described in the lithic tools analysis in Chapter 5, the chi-square test of significance failed to prove a *statistically significant* relationship between the presence of a particular tool type (i.e., bifaces; unifaces) and cultural features among all 47 sites combined. As with chi-square tests of significance, working with such small data sets (less than 100 cases) poses issues for descriptive statistics, making the results less robust.

For this analysis, a conservative definition of female-specific activity areas is used: (1) a presence of cultural fire features that are more labor intensive to create (versus surface hearths/grills) and (2) cultural features with indications of plant processing or use beyond fuel. While simplistic, eliminating all other variables of use solidifies women's role in the creation of these features (Pankonien 2008:107). Using this definition, five out of the nine cultural fire features fit criteria 1 (55%). The micro-spatial analysis using classification, based on Thoms (2008) hot-rock cookery expected archaeological characteristics of FCR and non-FCR elements (see Table 5), indicates potential female-specific activity areas at sites: 48YE1499, 48YE678, 48YE1553, 48YE381 and 48YE1383. The cultural features 1, 2/3, 3.1, 10 and 1 at these sites respectively were either closed earthen ovens or stone steaming/boiling pits. These types of features are more labor intensive than surface hearths or cookstone surface grills fired in situ, due to necessary ground-breaking and the creation of secondary heating element areas and/or associated dumps for periodic cleaning out (Hayden and Cousins 2004:140-154).

Out of these five sites, plant remains other than fuel resources were only recovered from site 48YE678, Feature 2/3, fitting definition criteria 2. However, float samples were not taken at sites 48YE381 and 48YE1553, which could have revealed a variety of plant resources used. Thus Feature 2/3 is the only feature examined here that meets both criterion, as a probable steaming or boiling pit containing nightshade, prickly pear cactus fruit, pine and other conifer type (non-pine) plant remains. As such, it can be positively identified as a female-specific activity area. Further investigations using a greater number of sites with cultural features using the methods presented in this analysis may reveal a stronger correlation between site composition and female specific activity areas. Future excavations that include archaeobotanical float sampling at all sites, especially within cultural features, would contribute greatly to an analysis such as this in order to move beyond the oversimplified and somewhat limited definition of "women's space" used here.

8.5 Future Directions

With no other direct exploration of gender itself using archaeological materials from the Yellowstone Lake area, this thesis is novel in offering expanded views and interpretations of actual lifeways of people (particularly women). Using other studies of both the Yellowstone region and gender-based research from other regions provided a platform from which to compare, contrast and integrate these results with the findings of other studies. In particular, the gendered lithic stone tool analysis by Joan Gero highlights a value-based system for the manufacture of stone tools (Gero 1991). This provides insight into possible social value attributed to obsidian as it becomes a more valuable resource the further groups move from

Obsidian Cliff. The results presented corroborate results from a study by MacDonald et al. (2012) which confirms a drop off in the rate of use of obsidian for stone tools as groups moved further from the primary source at Obsidian Cliff. Combining the results of these two studies demonstrates how gendered research, using well-established methods, can elucidate even greater details from already achieved results.

In analyzing archaeobotanical remains, utilizing ethnoarchaeological and ethnographic artifacts bridges the gap in understanding plant use in precontact Yellowstone. It is effectively utilized here to elucidate female-specific uses of plants recovered from archaeological sites. We know based on ethnographic evidence that these plants may have been primarily collected as part of female-specific subsistence tasks. The secondary ethnohistoric data for the culturally affiliated groups of this region presented here attributes the use of some these plants for female specific purposes only, further confirming that females used and curated a great deal of knowledge about plant resources. The results presented demonstrate why this "frame-of-reference" concept is an effective means for establishing cross-cultural correlates from which to make inferences about archaeological data.

Finally, the experimental and ethnoarchaeological study conducted by A.V. Thoms (2008) provides a classification rubric used to evaluate hot-rock cookery fire features, which are a prominent aspect of archaeological sites around Yellowstone Lake. Using the expected archaeological composition of FCR and non-FCR elements as Thoms defines provides microspatial details about the potential use and purpose of these cultural features. Furthermore, in the context of the Optimal Foraging Theory, there is evidence suggesting that the ovens and roasting pits in particular were likely female-specific activity areas where intensive cooking of both meat and plant products likely occurred. Using Thoms' hot-rock cookery rubric demonstrates why experimental and ethnoarchaeological methods play a vital role in determining feasible archaeological deposits, from which to draw conclusions about activity areas and activities therein.

This research project faced some methodological limitations that must be addressed. First, the study examined only 47 archaeological s with test unit excavation. This controls for variability in documentation and data sampling from other types of archaeological survey (i.e., pedestrian and STP). Limiting the scope of this research to sites with test unit excavation also kept data to a quantitatively manageable amount. However, the small sample size of sites reduces the robustness of all statistical findings, which relies on methods where sample size and representative cases plays a large role. Despite this, high correlation coefficients and coefficients of determination for stone tool material use revealed with bivariate linear regression models for regions of the lake warrants more in-depth analysis using a greater number of sites to further confirm these results.

Another methodological weakness is researcher bias. Gender-based archaeological research may be susceptible to interpretations that the material record does not support, especially in studies where a lack of a rich and varied artifact assemblage exists. Despite concerted efforts to remain unbiased and interpret data without "fitting" the data to the hypothesis, there are no strong methodological practices established by either gender or feminist based archaeological theory for practical application. Thus the overall theme of this research that is focused on women potentially creates research blind spots, making it more difficult to interpret results without bias. However, absence of research bias is not a prori to presenting results or interpretations made using archaeological data. Granted, this challenges the objectivity of science, but it is important to recognize that all researchers live with inherent biases, both subconscious and conscious, which influences the way data are compiled, interpreted and presented (Crasnow 2006:831-832; Conkey 2003:875). Despite pitfalls of potentially biased interpretation, not asking questions of gender does far more disservice to the overall interpretation of an area such as Yellowstone Lake (Gero and Conkey 1991).

In terms of future research, this research reveals another layer of complexity to life in precontact Yellowstone around Yellowstone Lake. Perhaps these results generate more questions than answers about gender dynamics, gender performance and sexual division of labor, but all of these results point to elements that warrant further investigation. A subsequent study encompassing a broader number of sites or the incorporation of gender as a research aim in future work conducted at Yellowstone would likely prove fruitful for interpreting the past lifeways of precontact hunter-gatherer groups in the Northern Plains region.

Conclusion

This original thesis examined three specific lines of evidence within the precontact archaeological record around Yellowstone Lake. As such, three lifeways were addressed: stone tool use, plant use and cooking activity areas. The results presented illuminated female specific aspects of all three of these lifeways:

(1) Bivariate linear regressions for rates of use for obsidian based on two major tool types, bifacial and unifacial, revealed that the less readily available obsidian is, depending on geographic proximity to the primary source in Yellowstone, Obsidian Cliff, the less often it is used to make unifacial tools. Unifacial tools arguably perform tasks traditionally undertaken by female members of hunter-gatherer groups.

(2) Ethnohistoric information based on the plants found through archaeobotanical assays revealed the presence of several plant types with ethnohistorically documented female-specific uses, mostly related to pregnancy (birth, termination) and menstruation.

(3) Microspatial examination of cultural fire features, also known as hot-rock cookery facilities, demonstrated that at least a portion of these selected features required a greater amount of time and effort to construct beyond ephemeral surface hearths. At least one feature also contained plant remains beyond what is typically defined as a fuel resource. The inference is that cultural features for roasting, boiling or baking, especially for plants, nuts and seeds, are female-specific activity areas.

This research is novel, in that it is the only recent work focused specifically on questions of gender and gender dynamics in precontact Yellowstone. The implications of these findings are three-fold:

(1) A clear demonstration of the effective use of common methodological approaches in archaeology (statistical, ethnography, spatial analysis), with a blend of theoretical perspectives to guide interpretation.

(2) Understanding the lifeways of precontact people provides greater understanding of sexual divisions of labor for resource procurement, use and restriction of use for precious raw materials and resources, and lends an element of social agency to interpretations, helping define human action and thought processes.

(3) Underscoring the importance of pre-existing archaeological data in order to build upon past research interpretations, in the interest of the sustainability of archaeological enterprise.

Looking at research problems from several different theoretical perspectives can provide a more holistic picture, as “the realities of research are that we focus on limited aspects of human behavior and attempt to contribute to the whole” (Nelson 1991:58). Because gender is not only a social construct but also essentially a form of social agency, investigating gender through agency potentially elucidates both individual and collective actions. This allows us to disentangle what is indicative of gender dynamics within broader social processes, by maintaining a focus on “gender as a process”; in other words examining how gender created, developed, implemented, changed and influenced the lifeways of these precontact mobile subsistence based societies.

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Appendices

Appendix A.

Descriptive data for Chapter 5 lithic analysis.

Site Region [1,2]	Citation	bifaces (in TUs)	unifaces (in TUs)	Feature(s)	U:B ratio (in TUs)	Unifaces: Obsidian	Bifaces: Obsidian	Unifaces: Chert	Bifaces: Chert	Unifaces: Quartz	Bifaces: Quartz	Unifaces: Pet. Wood	Bifaces: Pet. Wood	Unifaces: Dacite	Bifaces: Dacite	Unifaces. Chalcedony	Bifaces: Chalcedony	Unifaces: Moss Agate	Bifaces: Moss Agate	Unifaces: Other Materials	Bifaces: Other materials	Total Tools
48YE380 NW (NS)	Livers and MacDonald 2011; MacDonald and Livers 2011	7	0	3	0	1	11	1	4	0	3	3	0	0	0	0	0	0	0	0	0	23
48YE381 NW (NS)	Livers and MacDonald 2011; MacDonald and Livers 2011	60	35	6	0.583333	29	50	8	16	0	3	2	0	0	2	0	0	0	0	1	0	111
48YE1556 NW (NS)	Livers and MacDonald 2011; MacDonald and Livers 2011	6	1	0	0.166667	0	4	0	2	0	0	1	0	0	0	0	0	0	0	0	0	7
48YE1558 NW (NS)	Livers and MacDonald 2011; MacDonald and	47	26	5	0.553191	16	47	6	13	1	2	3	0	0	0	1	2	1	0	0	0	92

	Livers 2011																					
48YE1553 NW (NS)	Livers and MacDonald 2011; MacDonald and Livers 2011	13	9	1	0.692308	6	9	3	3	0	1	0	0	0	0	0	0	0	0	0	0	22
48YE549 NW (NS)	Livers and MacDonald 2011; MacDonald and Livers 2011	34	13	4	0.382353	5	17	3	2	1	0	0	0	0	0	0	0		0	0	0	28
48YE2111 NW (NS)	Livers and MacDonald 2011; MacDonald and Livers 2011	13	12	0	0.923077	9	11	1	1	1	0	0	1	0	0	0	0	1	0	0	0	25
48YE2075 NE (ES)	Livers and MacDonald 2011; MacDonald and Livers 2011	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48YE678 NE (ES)	Livers and MacDonald 2012	17	5	2	0.294118	0	4	3	3	0	2	1	0	0	0	0	1	0	0	0	0	14
48YE2080 NE (ES)	Livers and MacDonald 2012	28	30	0	1.071429	19	19	14	16	0	0	0	0	0	0	0	0	0	0	0	0	68
48YE2082 NE Shore (ES)	Livers and MacDonald 2012	12	6	0	0.5	3	6	2	8	0	0	0	0	0	0	0	0	0	0	2	1	22
48YE2083 NE (ES)	Livers and MacDona	8	9	0	1.125	5	5	5	6	0	0	0	0	0	0	0	0	0	0	3	0	24

	ld 2012																					
48YE2085 NE (ES)	Livers and MacDonald 2012	5	1	0	0.2	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	3
48YE1499 SE (ES)	Livers and MacDonald 2012	3	3	1	1	0	2	1	0	0	0	0	0	0	0	0	0	0	0	2	1	6
48YE2107 SE (ES)	Livers and MacDonald 2012	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48YE1660 SC/SW (SS)	MacDonald, 2012a	3	0	2	0	1	4	0	2	1	4	0	0	0	1	0	4	0	0	0	1	18
48YE1664 SC/SW (SS)	MacDonald, 2012a	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	2
48YE1670 SC/SW (SS)	MacDonald, 2012a	1	1	0	1	1	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	5
48YE2190 SC/SW (SS)	MacDonald, 2012a	4	0	1	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
48YE1384 SC/SW (SS)	MacDonald, 2012a	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	4
48YE1383 SC/SW (SS)	MacDonald, 2012a	2	4	1	2	3	0	0	0	0	0	1	0	0	0	1	2	0	0	0	0	7
48YE1601 SC/SW (SS)	MacDonald, 2012a	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48YE2084*ǂ NE (ES)	Livers and MacDonald 2012	3	3	0	1																	0
48YE696ǂ NE (ES)	Cannon et al., 1997																					0
48YE697ǂ NE (ES)	Cannon et al., 1997																					0
48YE701ǂ NE (ES)	Cannon et al., 1997																					0
48YE525ǂ NE (ES)	Lifeways, Vivian 2009																					0
48YE409/4	Lifeways, Johnson																					

10ǂ NE (ES)	et al., 2004																					
Total number of tools						100	198	48	79	5	16	11	1	0	3	2	10	2	0	8	4	48 7
Percentage of material type						0.5 7	0.6 4	0.2 7	0.2 5	0.0 3	0.0 5	0.0 6	0.00 3	0.0 0	0.0 1	0.0 1	0.0 3	0.0 1	0.0 0	0.0 5	0.0 1	.10

[1] Original region classification from site report listed. Region classification used for analysis in parenthesis.
[2] NS= North Shore; ES= East Shore; SS= South Shore; NW= Northwest; NE= Northeast; SE= Southeast; SC/SW= South Central/Southwest
* Data not available for the material types for tools.
ǂ Not used for analysis.

Appendix B.

Chi-square test results comparing relationship between the presence of features and tool types (bifacial and unifacial tools).

Features * Unifacial Tools Crosstabulation

			Unifaces Present		
			No	Yes	Total
Features Present	No	Count	17	13	30
		Expected Count	14.0	16.0	30.0
		% within Features Present	56.7%	43.3%	100.0%
		% within Unifaces Present	77.3%	52.0%	63.8%
		% of Total	36.2%	27.7%	63.8%
	Yes	Count	5	12	17
		Expected Count	8.0	9.0	17.0
		% within Features Present	29.4%	70.6%	100.0%
		% within Unifaces Present	22.7%	48.0%	36.2%
		% of Total	10.6%	25.5%	36.2%
Total		Count	22	25	47
		Expected Count	22.0	25.0	47.0
		% within Features Present	46.8%	53.2%	100.0%
		% within Unifaces Present	100.0%	100.0%	100.0%
		% of Total	46.8%	53.2%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.237[a]	1	.072		
Continuity Correction[b]	2.235	1	.135		
Likelihood Ratio	3.313	1	.069		
Fisher's Exact Test				.127	.067
N of Valid Cases	47				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 7.96.

b. Computed only for a 2x2 table

Features * Bifacial Tools Crosstabulaion

			Bifaces Present		Total
			No	Yes	
Features Present	No	Count	9	21	30
		Expected Count	7.0	23.0	30.0
		% within Features Present	30.0%	70.0%	100.0%
		% within Bifaces Present	81.8%	58.3%	63.8%
		% of Total	19.1%	44.7%	63.8%
	Yes	Count	2	15	17
		Expected Count	4.0	13.0	17.0
		% within Features Present	11.8%	88.2%	100.0%
		% within Bifaces Present	18.2%	41.7%	36.2%
		% of Total	4.3%	31.9%	36.2%
Total		Count	11	36	47
		Expected Count	11.0	36.0	47.0
		% within Features Present	23.4%	76.6%	100.0%
		% within Bifaces Present	100.0%	100.0%	100.0%
		% of Total	23.4%	76.6%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.013[a]	1	.156		
Continuity Correction[b]	1.124	1	.289		
Likelihood Ratio	2.180	1	.140		
Fisher's Exact Test				.282	.144
N of Valid Cases	47				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.98.

b. Computed only for a 2x2 table

Appendix C.

Feature Types and tool type ratios from all sites used for cultural feature, archaeobotanical analysis (used for scenarios in Table 12).

Site ID	Region	Number of features	Feature Types	Normalized U:B Ratio	Botanicals (y/n)	Site Age RCYBP	Citation
48YE2075	East	1	Hearth	0	Y	LA 1500±40 B.P.	Livers, M.C. and Douglas H. MacDonald 2012 Livers, M.C. and Kristen Hare 2011
48YE678	East	2	Hearth x 2	0.29	Y	LA, LP 1,460±40 B.P. 1,400±40 B.P	Livers, M.C. and Douglas H. MacDonald 2012 Livers, M.C. and Kristen Hare 2011
48YE1499	East	1	Hearth	1	Y	LA 1,220±130	Livers, M.C. and Douglas H. MacDonald 2012 Livers, M.C. and Kristen Hare 2011
48YE2080	East	0	No features	1.071429	N	LA, LP	Livers, M.C. and Douglas H. MacDonald 2012 Livers, M.C. and

							Kristen Hare 2011
48YE2082	East	0	No features	0.5	N	LA, LP	Livers, M.C. and Douglas H. MacDonald 2012 Livers, M.C. and Kristen Hare 2011
48YE2083	East	0	No features	1.125	N	LA, LP	Livers, M.C. and Douglas H. MacDonald 2012 Livers, M.C. and Kristen Hare 2011
48YE2084	East	0	No features	1	N	LA, LP	Livers, M.C. and Douglas H. MacDonald 2012 Livers, M.C. and Kristen Hare 2011
48YE2085	East	0	No features	0.2	N	MA, LP	Livers, M.C. and Douglas H. MacDonald 2012 Livers, M.C. and Kristen Hare 2011
48YE2088	East	0	No features	2.5	N	Unknown	Livers, M.C. and Douglas H.

							MacDonald 2012 Livers, M.C. and Kristen Hare 2011
48YE2089	East	0	No features	2.5	N	Unknown	Livers, M.C. and Douglas H. MacDonald 2012 Livers, M.C. and Kristen Hare 2011
48YE2090	East	0	No features	0.5	N	LP?	Livers, M.C. and Douglas H. MacDonald 2012 Livers, M.C. and Kristen Hare 2011
48YE2097	East	0	No features	0	N	Unknown	Livers, M.C. and Douglas H. MacDonald 2012 Livers, M.C. and Kristen Hare 2011
48YE2107	East	0	No features	0	N	Unknown	Livers, M.C. and Douglas H. MacDonald 2012 Livers, M.C. and Kristen

							Hare 2011
48YE380	North	3	Hearth x 2; 1 feat. indeterminate	0	Y	LA 1900±40 1570±40	MacDonald, D.H. and Michael C. Livers 2011
48YE381	North	7	Hearth x5; boiling(?) pit; rock cluster	0.58	N/A	EA, MA, LA, LP 770±40 1720±40 2840±40 2920±40 3100±40 5910±50	MacDonald, D.H. and Michael C. Livers 2011
48YE1553	North	1	pit	0.69	N/A	LP 1280±40	MacDonald, D.H. and Michael C. Livers 2011
48YE1558	North	5	Hearth x 4; stain	0.55	Y	A, LA, PH 1470±60 2130±40 2310±40 2790±40 3040±30	MacDonald, D.H. and Michael C. Livers 2011
48YE549	North	4	Hearth x 3; rock cluster	0.83	Y	LP/Proto-historic 240±40 940±40 360±40 220±40	Livers, M.C. and Douglas H. MacDonald 2011
48YE1556	North	0	No features	0.166667	N	Archaic?	MacDonald, D.H. and Michael C. Livers 2011
48YE417	North	0	No features	0	N	-	MacDonald, D.H. and Michael C. Livers 2011
48YE2111	North	0	No features	0.923077	N	LP	MacDonald, D.H. and

							Michael C. Livers 2011
48YE1(419)	North	0	No features	0	N	Prehistoric	Livers, M.C. and Douglas H. MacDonald 2011
48YE1642	South	2	Hearth x 2	0	Y	EA, MA, LA 1610±30 2890±30	MacDonald, D.H. 2014
48YE1660	South	2	Hearth x 2	0	Y	LA, MA, Paleo. 1690±30 1850±30	MacDonald, D.H. 2014
48YE2190	South	1	Hearth	0	Y	LP, LA, MA 1380±30	MacDonald, D.H. 2014
48YE1384	South	1	Hearth	1	Y	LP, LA 1330±30	MacDonald, D.H. 2014
48YE1383	South	1	Hearth	2	Y	EA?, LA, LP 2290±30	MacDonald, D.H. 2014
48YE1382	South	2	Hearth; living floor	0.71	Y	Paleo?, EA, LA 1970±30	MacDonald, D.H. 2014
48YE1388	South	2	Hearth x 2	1.5	Y	EA, MA, LA, LP 1530±30 1490±30	MacDonald, D.H. 2014
48YE1332	South	1	Hearth	0	Y	MA 2880±30	MacDonald, D.H. 2014
48YE1588	South	1	Stone circle	2	Y	Paleo, EA, LP 780±30	MacDonald, D.H. 2014
48YE1394	South	0	No features	0	N	MA	MacDonald, D.H. 2014
48YE1645	South	0	No features	0	N	LA, LP	MacDonald, D.H. 2014
48YE1664	South	0	No features	0	N	Paleo.	MacDonald, D.H. 2014
48YE1670	South	0	No features	1	N	LP	MacDonald, D.H.

							2014
48YE1608	South	0	No features	0	N	EA, MA	MacDonald, D.H. 2014
48YE1601	South	0	No features	0	N	LA, MA, EA, Paleo	MacDonald, D.H. 2014
48YE1337	South	0	No features	0	N	MA, LA, LP	MacDonald, D.H. 2014
48YE1331	South	0	No features	0.5	N	Paleo, MA	MacDonald, D.H. 2014
48YE1324	South	0	No features	0	N	Archaic	MacDonald, D.H. 2014
48YE1328	South	0	No features	0	N	-	MacDonald, D.H. 2014
48YE1329	South	0	No features	0	N	EA, MA, LP	MacDonald, D.H. 2014
48YE1707	South	0	No features	0	N	Paleo?, MA, LA	MacDonald, D.H. 2014
48YE1704	South	0	No features	0	N	-	MacDonald, D.H. 2014
48YE1580	South	0	No features	0	N	EA	MacDonald, D.H. 2014
48YE1578	South	0	No features	0	N	Paleo, MA, LA, LP	MacDonald, D.H. 2014
48YE736	South	0	No features	0	N	MA,LA, LP	MacDonald, D.H. 2014
TOTAL	47	37					

Appendix D.

Linear regression plots, along with correlation matrices for (1) the lake regions collectively; and (2) the lake regions independently (North, East, South shores).

These plots show the R^2 value for each stone tool type (X), based on material type (Y) and a short description of the coefficient of determination highlights the relationship between the two variables. A descriptive table of the data used for this analysis is in Appendix A.

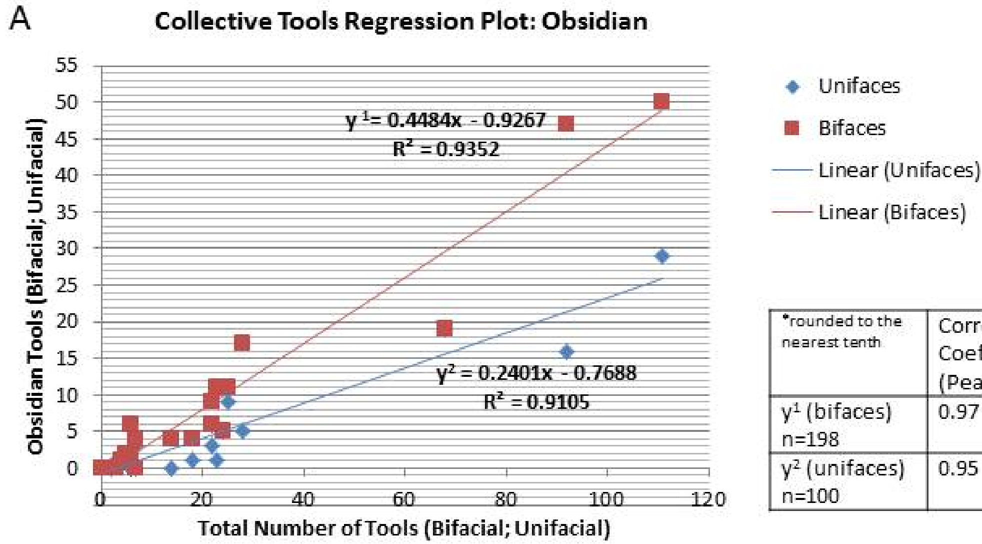
Linear Regression Plots with Correlation Matrices

Lake Regions Collectively

Collective Obsidian Tools Regression Plot Explained: The y^1 (obsidian bifaces) correlation coefficient represents 97% variation in Y (obsidian tools) that is explained by X (total tools). The y^2 (obsidian unifaces) correlation coefficient represents 95% variation in Y (obsidian tools) that is explained by X (total tools). The coefficient of determination indicates both relationships between bifacial and unifacial tools and obsidian is considered a strong association. Based on the slope for y^1 (obsidian bifaces), there are 0.45 obsidian bifaces for every obsidian tool present at the sites. Based on the slope for y^2 (obsidian unifaces) there are 0.24 obsidian unifaces for every obsidian tool present at the sites.

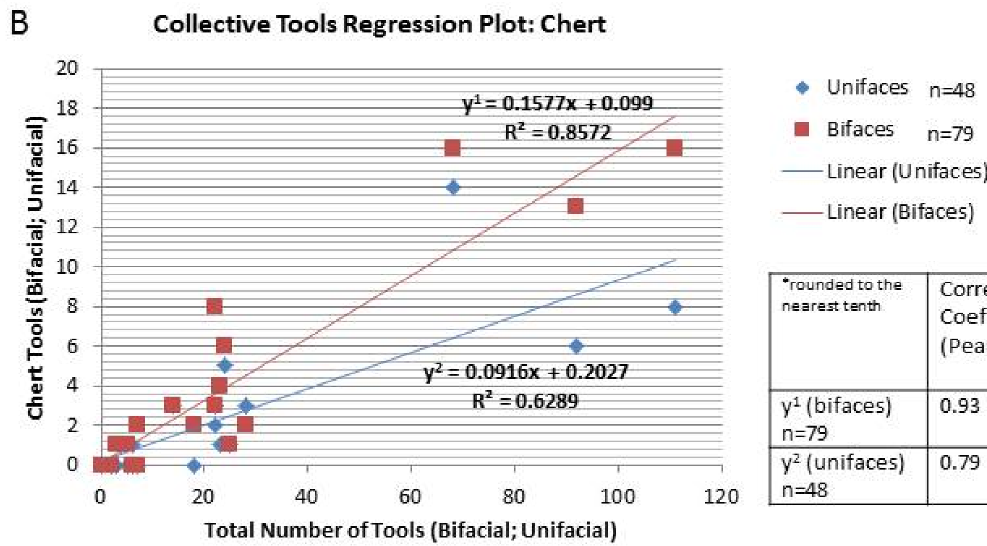
Collective Chert Tools Regression Plot Explained: The y^1 (bifaces) correlation coefficient represents 93% variation in Y (chert tools) that is explained by X (total tools). The y^2 (unifaces) correlation coefficient represents 79% variation in Y (chert tools) that is explained by X (total tools). The coefficient of determination indicates both relationships between bifacial and unifacial tools and chert is considered a strong association, although unifacial tools are less strongly associated when compared with bifacial tools based on the correlation coefficient. Based on the slope for y^1 (chert bifaces), there are 0.16 chert bifaces for every chert tool present at the sites. Based on the slope for y^2 (chert unifaces) there are 0.10 chert unifaces for every chert tool present at the sites.

A



*rounded to the nearest tenth	Correlation Coefficient (Pearson's r)*	Coefficient of Determination (r2)*	Strength of Association (Pearson's r)
y¹ (bifaces) n=198	0.97	0.94	Strong
y² (unifaces) n=100	0.95	0.91	Strong

B



*rounded to the nearest tenth	Correlation Coefficient (Pearson's r)*	Coefficient of Determination (r2)*	Strength of Association (Pearson's r)
y¹ (bifaces) n=79	0.93	0.86	Strong
y² (unifaces) n=48	0.79	0.63	Strong

Figure 29**:** Entire lake region obsidian tool linear regression plot.

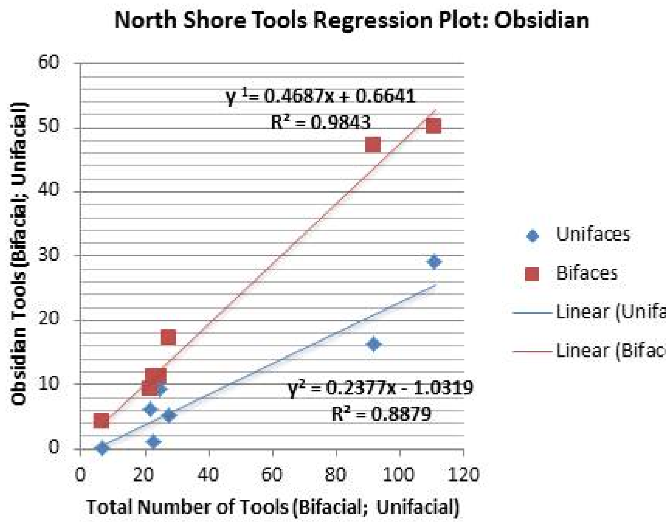
Figure 12 (A) shows a linear regression plot demonstrating the relationship between tool type and obsidian material type for all 3 lake regions examined (n=487). The photo inset is: 48YE551, FS 1 Late Archaic Projectile Point (obsidian biface) (Livers, M.C. and Douglas H. MacDonald 2011:170, Photograph 42). Figure 12 (B) shows a linear regression plot demonstrating the relationship between tool type and chert material type for all 3 lake regions examined (n=127). The photo inset is: 48YE549, Chert Endscraper (FS 54), Feature 2 (chert uniface) (Livers, M.C. and Douglas H. MacDonald 2011:152, Photograph 32).

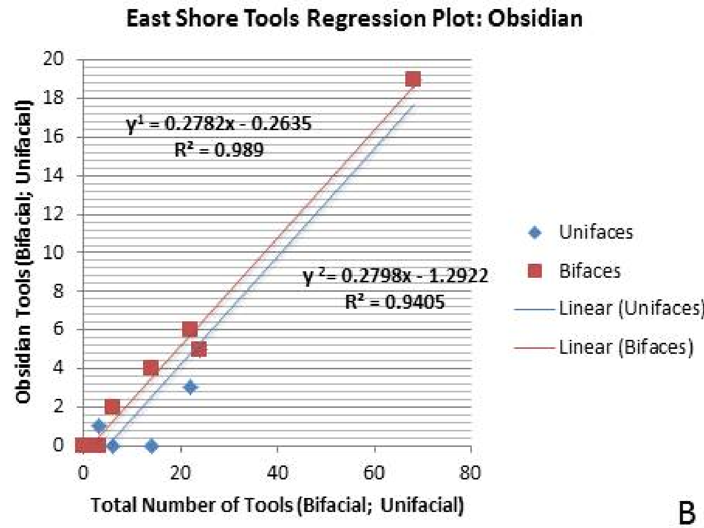
Lake Regions North, East and South Shores Independently, Obsidian

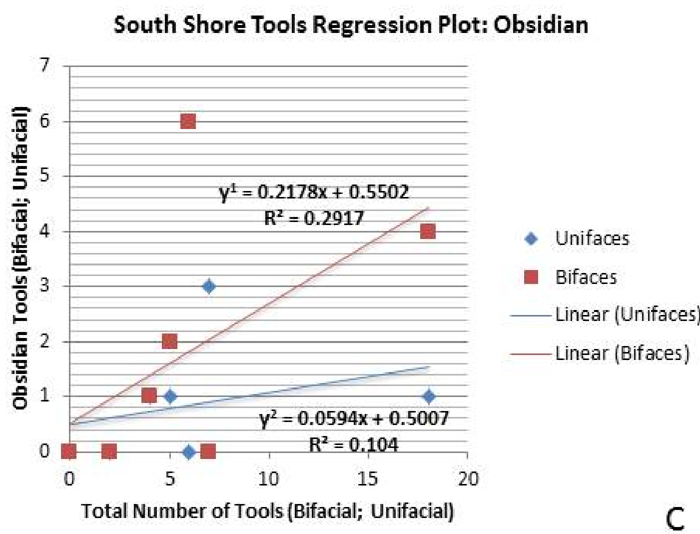
North Shore Regression explained: The y^1 (bifaces) correlation coefficient represents 99% variation in Y (obsidian tools) that is explained by X (total tools). The y^2 (unifaces) correlation coefficient represents 94% variation in Y (obsidian tools) that is explained by X (total tools). The coefficient of determination indicates both relationships between bifacial and unifacial tools and obsidian is considered a strong association, but unifacial tools are slightly weaker (by 10%) than the bifacial obsidian tools association. Based on the slope for y^1 (obsidian bifaces), there are 0.47 obsidian bifaces for every obsidian tool present at the sites. Based on the slope for y^2 (obsidian unifaces) there are 0.24 obsidian unifaces for every obsidian tool present at the sites.

East Shore Regression explained: The y^1 (bifaces) correlation coefficient represents 99% variation in Y (obsidian tools) that is explained by X (total tools). The y^2 (unifaces) correlation coefficient represents 97% variation in Y (obsidian tools) that is explained by X (total tools). The coefficient of determination indicates both relationships between bifacial and unifacial tools and obsidian is considered a strong association. Bifacial tools have a near perfect positive relationship (perfect positive relationship is R^2=1.00). Based on the slope for y^1 (obsidian bifaces), there are 0.28 obsidian bifaces for every obsidian tool present at the sites. Based on the slope for y^2 (obsidian unifaces) there are 0.28 obsidian unifaces for every obsidian tool present at the sites.

South Shore Regression explained: The y^1 (bifaces) correlation coefficient represents 54% variation in Y (obsidian tools) that is explained by X (total tools). The y^2 (unifaces) correlation coefficient represents 32% variation in Y (obsidian tools) that is explained by X (total tools). The coefficient of determination indicates both relationships between bifacial and unifacial tools and obsidian is considered a weak association. It is important to note that this is the region geographically furthest from Obsidian Cliff and that unifacial obsidian tools have a near negative relationship (R^2=0.104). Based on the slope for y^1 (obsidian bifaces), there are 0.22 obsidian bifaces for every obsidian tool present at the sites. Based on the slope for y^2 (obsidian unifaces) there are 0.06 obsidian unifaces for every obsidian tool present at the sites.







North Shore *rounded to the nearest tenth	Correlation Coefficient (Pearson's r)*	Coefficient of Determination (r^2)*	Strength of Association (Pearson's r)
y^1 (bifaces) n=149	0.99	0.98	Strong
y^2 (unifaces) n=66	0.94	0.89	Strong

East Shore *rounded to the nearest tenth	Correlation Coefficient (Pearson's r)*	Coefficient of Determination (r^2)*	Strength of Association (Pearson's r)
y^1 (bifaces) n=36	0.99	0.99	Strong
y^2 (unifaces) n=28	0.97	0.94	Strong

South Shore *rounded to the nearest tenth	Correlation Coefficient (Pearson's r)*	Coefficient of Determination (r^2)*	Strength of Association (Pearson's r)
y^1 (bifaces) n=13	0.54	0.29	Weak
y^2 (unifaces) n=6	0.32	0.10	Weak

D

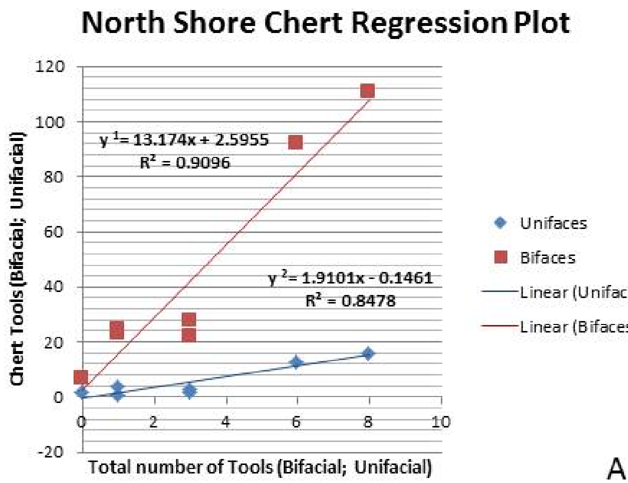
Figure 30: Linear regression plots (A-C) with correlation matrices (D) for obsidian tools by region.

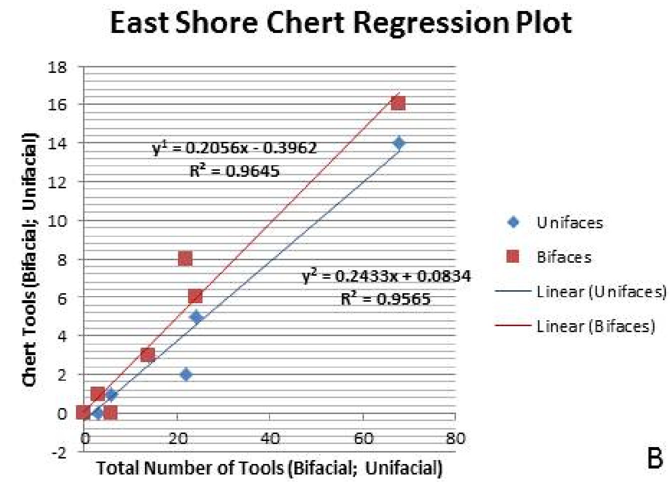
Lake Regions North, East and South Shores Independently, Chert

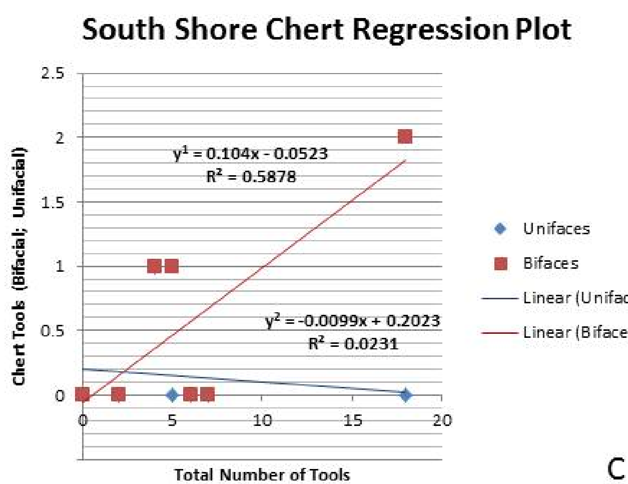
North Shore Regression explained: The y^1 (bifaces) correlation coefficient represents 95% variation in Y (chert tools) that is explained by X (total tools). The y^2 (unifaces) correlation coefficient represents 92% variation in Y (chert tools) that is explained by X (total tools). The coefficient of determination indicates both relationships between bifacial and unifacial tools and chert is considered a strong association. Based on the slope for y^1 (chert bifaces), there are 13.17 chert bifaces for every tool present at the sites. Based on the slope for y^2 (chert unifaces) there are 1.9 chert unifaces for every chert tool present at the sites.

East Shore Regression explained: The y^1 (bifaces) correlation coefficient represents 98% variation in Y (chert tools) that is explained by X (total tools). The y^2 (unifaces) correlation coefficient represents 98% variation in Y (chert tools) that is explained by X (total tools). The coefficient of determination indicates both relationships between bifacial and unifacial tools and chert is considered a strong association. Bifacial and unifacial tools have a near perfect positive relationship (perfect positive relationship is R^2=1.00). Based on the slope for y^1 (chert bifaces), there are 0.21 chert bifaces for every tool present at the sites. Based on the slope for y^2 (chert unifaces) there are 0.24 chert unifaces for every chert tool present at the sites.

South Shore Regression Explained: The y^1 (bifaces) correlation coefficient represents 77% variation in Y (chert tools) that is explained by X (total tools). The y^2 (unifaces) correlation coefficient represents 15% variation in Y (chert tools) that is explained by X (total tools). The coefficient of determination indicates the relationship between bifacial tools and obsidian is considered a strong association. In the case of unifacial tools, what we see in the regression is a negative slope with an extremely low coefficient of determination. This means that the predicted value for the dependent variable (bifacial tools, unifacial tools) decreases as the total number of tools increases. Unifacial chert tools have a near perfect negative relationship (a perfect negative relationship is a coefficient of determination R^2=0.00), while bifacial chert tools have a classifiably strong relationship, however not as strong as the same regions when considering obsidian tools. Based on the slope for y^1 (chert bifaces), there are 0.10 chert bifaces for every obsidian tool present at the sites. Based on the slope for y^2 (chert unifaces) there are -0.01 chert unifaces for every obsidian tool present at the sites. With only one unifacial chert tool recovered from these 22 South shore sites, this creates a negative slope, and is problematic for analysis due to the low frequency of unifacial chert tools at the South shore.







North Shore *rounded to the nearest tenth	Correlation Coefficient (Pearson's r)*	Coefficient of Determination (r^2)*	Strength of Association (Pearson's r)
y^1 (bifaces) n=41	0.95	0.91	Strong
y^2 (unifaces) n=22	0.92	0.85	Strong

East Shore *rounded to the nearest tenth	Correlation Coefficient (Pearson's r)*	Coefficient of Determination (r^2)*	Strength of Association (Pearson's r)
y^1 (bifaces) n=34	0.98	0.96	Strong
y^2 (unifaces) n=25	0.98	0.96	Strong

South Shore *rounded to the nearest tenth	Correlation Coefficient (Pearson's r)*	Coefficient of Determination (r^2)*	Strength of Association (Pearson's r)
y^1 (bifaces) n=4	0.77	0.59	Strong
y^2 (unifaces) n=1	0.15	0.02	Weak

D

Figure 31: Linear regression plots (A-C) with correlation matrices. (D) Linear regression plots for chert tools by region.