

Journal Of Northwest Anthropology

N

Zooarchaeology on the Northwest Coast of North America Gregory G. Monks.....	191
Understanding the Fire History of the San Juan Islands, Washington, Through Charcoal Accumulation Rates and Traditional Ecological Knowledge Sarah E. Coffey, Wendy B. Anderson, and Benjamin R. Tanner.....	243
The Influence of Coastal Geomorphic Processes on Terrestrial Archaeological Site Distributions: A Puget Sound Example J. Tait Elder, Melissa Cascella, and M. Shane Sparks.....	262
Why Are There No Pre-Clovis Mammoth Sites in the Columbia Plateau? Robert Lee Sappington.....	271
“Mammoths” and “Mammoth-Bisons” in Ancient Art of the Northern Far East Alexander I. Lebedintsev Translation by Richard L. Bland.....	304
Abstracts from the 71st Annual Northwest Anthropological Conference, Boise, Idaho, 28–31 March 2018	311

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CONTENTS

VOLUME 53, NUMBER 1

- 1 Makahs, Quileutes, and the Precontact History of the Northwestern Olympic Peninsula, Washington**
Gary C. Wessen
- 54 Not Even Hearsay? The Oral Narratives of the First Nations of British Columbia**
David Henige
- 78 “I Was Surprised”: The UBC School and Hearsay—A Reply to David Henige**
Charles R. Menzies and Andrew Martindale
- 108 Portable Engravings of the Northeastern Paleosiatatics (Late Neolithic and Paleometal): An Attempt at Semantic and Ethnic Interpretation**
Margarita A. Kir’yak (Dikova)
Translation by Richard L. Bland
- 121 A Comment from Mark G. Plew on Kir’yak’s Portable Engravings of the Northeastern Paleosiatatics**
Mark G. Plew
- 124 Why Don’t We Write More? Essays on Writing and Publishing Anthropological Research**
Introduction—Darby C. Stapp and Julia G. Longenecker
Part I Essays—Virginia L. Butler, Kenneth M. Ames, Roy Carlson, Alice B. Kehoe, R. Lee Lyman, Robert R. Mierendorf, and Mark G. Plew
Part II Essays—Thomas F. King, Dennis Griffin, Dale R. Croes, Kevin J. Lyons, Madonna L. Moss, Mark S. Warner, and Dennis Dauble
Part III Essays—Bruce Granville Miller, Jay Miller, Nathaniel D. Reynolds, Astrida R. Blukis Onat, and Rodney Frey
Conclusion—Tiffany J. Fulkerson and Shannon Tushingham

VOLUME 53, NUMBER 2

- 191 Zooarchaeology on the Northwest Coast of North America**
Gregory G. Monks
- 243 Understanding the Fire History of the San Juan Islands, Washington, Through Charcoal Accumulation Rates and Traditional Ecological Knowledge**
Sarah E. Coffey, Wendy B. Anderson, and Benjamin R. Tanner
- 262 The Influence of Coastal Geomorphic Processes on Terrestrial Archaeological Site Distributions: A Puget Sound Example**
J. Tait Elder, Melissa Cascella, and M. Shane Sparks
- 271 Why Are There No Pre-Clovis Mammoth Sites in the Columbia Plateau?**
Robert Lee Sappington
- 304 “Mammoths” and “Mammoth-Bisons” in Ancient Art of the Northern Far East**
Alexander I. Lebedintsev
Translation by Richard L. Bland
- 311 Abstracts from the 71st Annual Northwest Anthropological Conference, Boise, Idaho, 28–31 March 2018**

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Zooarchaeology on the Northwest Coast of North America

Gregory G. Monks

Abstract *This article presents a summary of zooarchaeological research conducted on the Northwest Coast, and it is organized according to themes. Following the Introduction, the chronological dimension of zooarchaeological research is presented by decade, along with pioneer and formative researchers in the field. There follows a synthetic review that is divided into sections that survey the taxa that have received attention, methods and techniques that have been employed, and the topics that have been addressed. The article concludes with a summary and discussion section. There is a necessary and deliberate overlap of information between sections so that readers who wish to use the article as a resource, rather than wade through it from beginning to end, will be able to focus on the parts of greatest relevance to them. The primary focus is on published literature, although some significant theses and dissertations have been included. The grey literature of contract archaeology and other reports is not addressed here. The article is dedicated to the memory of Donald H. Mitchell—professor, mentor, and friend.*

Introduction

Archaeological fieldwork and laboratory analysis on the Northwest Coast of North America (henceforth Northwest Coast or NWC) is a relatively recent endeavor in comparison to such work elsewhere in the world. This context has advantages and disadvantages for an article such as this one because, on the one hand, relatively little literature is available while, on the other hand, an opportunity is available to look in some detail at the history and content of that literature. It may seem presumptuous to attempt to cover the zooarchaeology of such a vast area in a mere journal article when a book might be the more appropriate presentation, so what follows might best be thought of as an introduction to the topic that subsequent effort might profitably expand. The body of this article is therefore organized into an overview of the history of zooarchaeological research in the area with an eye to showing how the practice has changed over a relatively brief time. There follows a section that examines themes and approaches to NWC zooarchaeology. The final section will evaluate the current state of zooarchaeological studies in the area and venture some suggestions as to where it might, or should, go in future. This organization necessarily involves some redundancy, but, as a hopefully useful resource, it allows the reader to explore the integration of Northwest Coast zooarchaeological research to date or to go directly to a specific section of interest.

The Northwest Coast culture area was defined by A. L. Kroeber (Kroeber 1939), a student of Franz Boas. This point is important because, as the founder of the first Anthropology Department in North America at Columbia University, Boas's view that the discipline consisted of ethnology (now more commonly referred to as sociocultural anthropology), archaeology, physical anthropology (now often

called biological anthropology) and linguistics has formed the template for many, if not most, anthropology departments at North American universities. This historical development has led to differences between these universities and those in Europe where social anthropology is often found in separate departments from archaeology/prehistory, and it has also influenced the approach to archaeology that is dominant in North American universities; namely, that “New World archaeology is anthropology or it is nothing” (Phillips 1955:246). Thus, the notion that archaeology is as much cultural anthropology as is ethnology/sociocultural anthropology sets the parameters for much of the archaeological activity in North American universities. Somewhat more recently, European archaeologists have found it advantageous to explore the relationship between archaeology/prehistory and social anthropology (Bender 1978; Hodder 1983; Renfrew et al. 1983; Renfrew 1984) and archaeological interpretation involving past cultural and individual lives (Shanks and Tilley 1988; Hodder 2000).

These observations are made here to contextualize this article. The Boasian cultural historical approach to archaeology, critiqued by Radin (1933), dominated the early archaeology of the Northwest Coast. The emphasis on diagnostic artifacts and culture historical sequences, and methods, e.g., excavation by arbitrary levels that could mix culturally different strata, and theories designed to attain those aims, prevailed in the archaeology of this area until roughly 1970, at which time an expanded view of what constituted important archaeological material became evident. A major component of that expanded view was faunal remains, and the inclusion of them, first as laundry lists followed quickly by detailed identification and quantification, began to fall in line with the prevailing disciplinary focus on cultural ecology and environmental archaeology. As well, ethnographic and archaeological studies on the Northwest Coast by this time had made it clear that the area was quite distinctive because of the chiefdom level of social complexity that was found among these semi-sedentary hunter-fisher-gatherers and the lessons that the archaeology of the area could provide for the evolution of cultural complexity in general (Ames 1981, 1991, 1994, 1995, 2002, 2006; Arnold 1996).

Suttles (1990:5–12, Figure 5) summarizes various anthropological definitions of the Northwest Coast. In this article, the north-south geographic extent is understood to stretch from Cape Mendocino in the south to Icy Bay in the north, thus encompassing all of Canada’s west coast and substantial portions of the United States to the north and south. The east-west geographic extent follows Kroeber (1939:31), who limits the inland extent of the area to include only coastal areas in proximity to river mouths and both sheltered and open salt water. This geographic area contains large river systems in which are found five major populations of Pacific salmon (*Oncorhynchus* spp.), a major food resource that was harvested *en masse* and stored (Schalk 1977).

Salmon, however, was not everything. Other important food resources include rockfish (*Sebastes* spp.), Pacific herring (*Clupea harengus pallasii*), anchovy (*Engraulis mordax*), Pacific halibut (*Hippoglossus stenolepis*), small flatfish (Pleuronectiformes), and Gadidae—Pacific hake (*Merluccius productus*), Pacific cod (*Gadus macrocephalus*) and pollock (*Theragra chalcogramma*)—are commonly found within the area, although halibut is less abundant on the coasts of Washington,

Oregon, and California. Molluscan food resources include butter clam (*Saxidomus gigantea*), basket cockle (*Clinocardium nuttallii*), and littleneck clam (*Protothaca staminea*), and are ubiquitous in the intertidal zone. Similarly, California mussel (*Mytilus californianus*) is found on rocky substrate in the high intertidal zone of shoreline exposed to the Pacific Ocean groundswell, and giant acorn barnacle (*Balanus nubilus*) is found in association with it. Bay mussel (*Mytilus edulis*) is abundant on hard substrate in more protected littoral waters. Pinniped mammals exploited in the area consist of harbor seal (*Phoca vitulina*), northern (Stellar) sea lion (*Eumetopias jubatus*), California sea lion (*Zalophus californianus*), northern fur seal (*Callorhinus ursinus*), and northern elephant seal (*Mirounga angustirostris*). As well, sea otters (*Enhydra lutris*) were widely found in the area, although their prehistoric use does not seem to have been intense, and their historic distribution is now much less as a result of widespread extirpation in the early contact period fur trade. Cetacea include a variety of Delphinidae that were hunted, as well as killer whales (*Orcinus orca*) and Balaenidae, especially humpback whales (*Megaptera novaengliae*), grey whales (*Eschrichtius robustus*), and Pacific right whale (*Eubalaena japonica*). Reliance on land mammals, especially deer (*Odocoileus* sp.), elk (*Cervus elephas*), and brown bear (*Ursus americanus*), tended to be relatively lower than that on sea mammals, fish, and marine invertebrates. Birds were not a heavily used resource but were taken on occasion, either for food or for their products, e.g., feathers, talons, and bones. A variety of gulls are ubiquitous, as are common shore birds such as cormorants, scoters, grebes, herons, and a variety of diving and dabbling ducks. Bald eagles (*Haliaeetus leucocephalus*) and short-tailed albatross (*Phoebastria albatrus*) were also taken. Among terrestrial birds, flickers and pileated woodpeckers were sometimes taken for their plumage.

In all, a rich array of animal resources was available in the area, largely due to the temperate maritime climate and the intersection of land, sea and rivers. These intersections included varying degrees of exposed and sheltered locations, latitude variations from warm temperate to cool sub-arctic, and littoral environments from extensive sand flats to precipitous bedrock drop-offs.

This taxonomic richness and environmental variability has been described for the Strait of Georgia/Puget Sound region as being marked by local variability, seasonal variability, annual variability, and unpredictability (Suttles 1962). To that list can be added long-term variability that arises due to climatic and associated environmental variability. These sources of variability in environment and resources can be extrapolated, in an expanded fashion, to the whole NWC. For example, the suite of rockfish taxa that is available in the south is richer than that in the north due to cooler ocean waters in the latter area. Similarly, halibut, due to its preference for cooler water, is more abundant in the north. The Klamath River in northwestern California formerly held an important salmon population, but it was not on the same order of magnitude as the Columbia, Fraser, Nass, and Skeena rivers further north. Breeding distributions of some taxa have changed markedly because of European incursions in the area. Short-tailed albatross, a littoral species, was extirpated on much of the coast in the early historic period. Similarly, the early maritime fur trade eradicated in a short time much of the sea otter population along the coast (see Lyman 1988), and this had major ecological consequences for sea urchin

populations, kelp forests, littoral fish species, and shoreline erosion (Orchard 2007). Northern fur seal populations were also heavily depleted throughout much of the area; while their remains are common in many exposed coastal sites, they breed now only in the Pribilof Islands of Bering Sea (see discussions by Moss et al. 2006 and Newsome et al. 2007).

The dimension of time is therefore an important factor in the consideration of NWC zooarchaeology. Short, medium, and long-term scales reveal different processes that have affected, and continue to influence, the animal taxa that occupy the area. Climate change, human activity, especially EuroCanadian and EuroAmerican, and geomorphological processes are three of the major influences on animal resources in the study area. Climate change and geomorphological processes are more likely to be seen at the medium and long-term time scales, while European impacts are more likely to be seen in the short term. This latter impact has important implications for addressing the “shifting baseline” issue in the area and, consequently, for assessing the historical ecological relations that have existed in the past.

These two concepts deserve consideration here, for they are linked. The “shifting baseline” concept is attributed to McHarg (1969) who advocated an ecological approach to landscape design and development and who pointed out that modern environments are not necessarily natural or those of the past. This idea was applied to fisheries management practice by Pauley (1995) who identified Shifting Baseline Syndrome (SDS) as the acceptance, for fish populations, of different points of reference that overlooked the effects of human fishing practices. Subsequently, it has been recognized that a “shifting baseline” can exist due to non-human agencies as well and reflects the changing (shifting) attributes of a healthy population (Dayton 1998:821). Principally, however, the SDS exists in relation to human perception of the “natural” state of the environment and “involves a gradual change in the accepted norms for the condition of the natural environment due to a lack of experience, memory and/or knowledge of its past condition” (Soga and Gaston 2018:222).

Historical ecology (HE) is linked to McHarg’s premise that humans and their environment are inextricably intertwined and that a dimension of time is involved. Crumley (1994) identified this relationship in anthropological terms as HE. A version of Evolutionary Ecology (see Winterhalder 1994), HE focuses on the effects that humans have on their landscape, and vice versa, over time (Crumley 1994:5–6). The landscape is “the material manifestation of the relation between humans and the environment,” and HE as “the study of past ecosystems by charting the change on landscapes over time” (Crumley 1994:6). Ballée (1998:7) also adopts the concept of landscape, and he argues that HE is a “research program” based on the premises that “1) humans have impacted almost all Earth’s habitable environments in physical or material ways; 2) different societies impact environments in distinctive ways due to differences of their internal ordering and structures; 3) human nature is indifferent to species diversity; 4) total phenomena—global ecology—are the result of uniting the historical ecologies of the world into a single, synthetic matrix...” He also asserts that “the environments with which humans interact are constantly changing” and “maintenance of diversity—both natural and cultural—of these environments is a worthy aspiration by society” (Ballée 1998:8). His formulation is clearly aimed at

contemporary environmental preservation, but his first and second premises and his acknowledgment that the environment is constantly changing are important for the study of NWC zooarchaeology.

History

A history of zooarchaeological research in British Columbia was published 20 years ago (Driver 1993), a dissertation (Hanson 1991) reviewed zooarchaeology in the Strait of Georgia, and Moss (2004:180–181) has provided a useful historical sketch of archaeological work in southeast Alaska. Volumes on the general archaeology and prehistory of the area and its regions have also appeared in the same period (Lyman 1991; Stein 1992; Matson and Coupland 1995; Ames and Maschner 1999). None of these sources addresses the zooarchaeology of the whole NWC, so this article will attempt to expand on these existing contributions and formulate a useful areal overview. To set this overview in a North American context, see Lyman (2016).

Earliest Work

Charles Hill-Tout (1895) reported on the extensive shell midden deposits at the Eburne (Marpole) midden on the north arm of the Fraser River in what is now south Vancouver, British Columbia. An English school Headmaster, he observed that the midden was composed of clam, which he identified as *Tridacna*, mussel (*Mytilus*) and “other refuse matter” (Hill-Tout 1895:103). Shortly thereafter, Harlan I. Smith, of the Jesup North Pacific Expedition, sponsored by the American Museum of Natural History and the Anthropology Department of Columbia University, mined the Eburne (Marpole) shell midden. While the main aim of that work was the collection of human skeletal remains (mostly skulls) and artifacts for Franz Boas, he noted an extensive list of animal remains and artifacts made of animal bones in the huge shell midden (Smith 1903:134–144, 171). Smith also excavated and reported briefly on the extensive shell midden and trench embankment at Deep Bay on the central east coast of Vancouver Island (Smith 1907).

1950s and 1960s

A lacuna of about 40 years passed without much archaeological work in British Columbia until Charles Borden began his series of publications in 1950 based on active field research. The godfather of Northwest Coast archaeology, he was heavily influenced by the Boasian approach, i.e., historical particularism and time/space systematics as summarized comprehensively in Willey and Phillips (1958). Searching for the origins of Northwest Coast culture and the relationships between archaeological remains in southwestern British Columbia, he grappled with temporal and spatial relationships of the few archaeological assemblages that he and others were excavating in the 1950s and 1960s, e.g., Borden (1951, 1962). Not surprisingly, Borden focused on artifact typology and diagnostic artifacts to produce his scheme of space/time relationships and cultural affinities and origins. His formulations set the foundation for subsequent culture history of that region. Not all agreed with his formulations, and they have been expanded and modified, as needed, to other parts of the NWC, but the culture historical foundations set out

by Borden continue to be used (Matson and Coupland 1995; Ames and Maschner 1999; Clark 2013). Although not a zooarchaeologist, he does mention salmon as the basic staple for most of the lower Fraser River and Fraser Delta prehistory, and he mentions fauna based on inferred functions of recovered artifact types (Borden 1968:17–23).

Elsewhere at approximately the same time, Fredrica de Laguna published the results of her 1949 and 1950 fieldwork at Angoon, Alaska (de Laguna 1960), and her 1949–1953 fieldwork in Yakutat Bay, Alaska (de Laguna 1964). Fauna from Daxatkanata Island are enumerated by species and Number of Identified Specimens (NISP) (de Laguna 1960:91–93, Appendix). One section of her second book consists of an analysis conducted in 1952 and 1953 of recovered faunal remains (Freed and Lane 1964:77) that consisted of a count (NISP) and a Minimum Number of Individuals (MNI) estimate for mammals by arbitrary level within each excavation area (Freed and Lane 1964:Table 1), an analysis of mammalian skeletal element representation by arbitrary level within each excavation area (Freed and Lane 1964:Table 2), an estimate of the density of mammal bone by arbitrary level and excavation area (Freed and Lane 1964:Table 3), and a presence-absence analysis of marine invertebrates by arbitrary level and excavation area. Fish bone was too poorly preserved to be recovered, and bird bone could not be identified (Freed and Lane 1964:77). For the time, these treatments of faunal remains were exemplary; the former provided taxonomic identification of all recovered fauna and quantification of those remains, while the latter was an advanced zooarchaeological analysis for the time. With the exception of Bryan (1963), faunal remains did not receive the same level of attention elsewhere on the Northwest Coast for some time afterwards. Subsequently, research on the lower Skeena River and Prince Rupert Harbour by George MacDonald of the National Museum of Canada's Archaeological Survey of Canada set in motion a number of students who turned their attention to faunal remains (Stewart 1977). Further to the south, three influential archaeologists followed in Borden's footsteps.¹ One, trained by Borden, was Donald H. Mitchell whose career was spent in the Anthropology Department at the University of Victoria. Another, who founded the Archaeology Department at Simon Fraser University, was Roy L. Carlson. Both these men straddled the culture-historical and processual traditions in North American archaeology but paid relatively little attention to faunal remains. Mitchell, however, provided "laundry list" reporting of example fauna from several sites, and later discussed methodological issues pertaining to faunal quantification (Mitchell 1990). The third, Richard ("Doc") Daugherty of Washington State University's Anthropology Department, excavated the site of Ozette on the western shore of the State of Washington, just south of Cape Flattery. Buried by a catastrophic mudslide, the site yielded phenomenal amounts of organic artifacts and faunal remains that required decades of laboratory research by Daugherty and his students (Samuels 1994).

1970s

The 1970s was a time of important transition in the zooarchaeology of the Northwest Coast in that the example set by de Laguna and her students came to be more widely taken up. At the beginning of the decade, fauna was reported as

presence-absence laundry lists of species noted, and sometimes collected, during excavation, e.g., Mitchell (1971a:149–150, 1971b:161, 1979:94). Similarly, Carlson (1960:582–3, Table 4) describes categories of faunal taxa present and provides quantities of land mammals but does not mention fauna in a later report (Carlson 1970). Lyman (2015) has critiqued the pejorative connotation of “laundry list” and has asserted that such data are analytically useful. NWC zooarchaeology during the 1970s, however, bore a greater resemblance to Lyman’s 1900 to 1959 period than to his 1960 to 1979 period. Prose descriptions of arbitrarily recovered faunal material continued to be common in this period, both on the northern coast, e.g., Allaire (1979), MacDonald and Inglis (1980), Ames (1979), and in Washington and Oregon, e.g., Munsell (1976). At the same time, however, more detailed analyses of entire faunal assemblages began to appear, e.g., Calvert (1970, 1980), Boehm (1973), Zontek (1983), Monks (1977), and analyses of specific taxa also began to be undertaken, e.g., Gustafson (1968), Snyder (1978), Ham and Irvine (1976). As well, Conover (1978:68–69) introduced the subject of different field sampling strategies for Namu faunal remains.

This decade of transition was exciting. The New Archaeology (i.e., processualist archaeology), though excessive in some ways, had nevertheless provided opportunities for new ideas and approaches to be applied. Nominally, Steward’s (1955) cultural ecology approach was highly influential and was framed in terms of systems theory, which necessarily required consideration of the natural environment. An archaeologically obvious element of that environment, and one with which past populations clearly interacted, was the animal populations on which they depended for food and other products (Meighan et al. 1958). So, Flannery’s (1968) procurement system concept, for example, influenced several Northwest Coast graduate students (Roll 1974; Monks 1977) to apply it in their dissertations. Similarly, the interest in site formation processes stimulated by such writers as Ascher (1968), Schiffer (1972, 1976) and Binford (1978) was taken up by Lyman in the late 1970s and resulted in his dissertation early in the next decade (Lyman 1982). As well, the cultural implications of faunal remains came into discussion (Boehm 1973; Lyman 1977).

1980s

Beginning in the 1980s, zooarchaeological analyses and reports tended to become routinely more sophisticated relative to most previous reports, though a processualist/positivist approach continued to predominate. NISP counts, MNI calculations and complete taxonomic identifications of entire assemblages, or samples thereof, characterize the literature of this period, e.g., Zontek (1983) cited in Lyman (1991) and Huelsbeck (1983). Throughout the decade, interest in specialized analyses, e.g., seasonality, also appeared (Monks 1981). Methodologically, analytic approaches arising from NISP, e.g., %NISP, MNI, %MNI, meat weight, caloric estimates, and utility indices (MGUI, FUI) after Binford (1978) and Metcalfe and Jones (1988), began to come into use e.g., Ham (1982). A cultural-ecological positivist approach to zooarchaeology continued to dominate during this decade, in addition to the extant cultural historical focus. Principally, the chronological emergence and cultural and social implications of storage, particularly of salmon, came under discussion (Ames 1985, 1991, 1995; Monks 1987).

1990s

Taphonomic issues, both diagenetic and biostratinomic, came into wider consideration during this period. Most post-5000 BP coastal sites contain abundant shell, which fosters bone preservation relatively well. Small, delicate bones, e.g., herring cranial elements, are thus preserved in quantity, and the generally excellent preservation of bone in coastal shell midden re-kindles discussion of sample size sufficiency. A conundrum that emerged during this decade, and that continues to bedevil NWC zooarchaeologists, is the issue of salmon cranial elements (see Butler and Chatters 1994). Not an idle observation, the question of why they are so seldom represented in archaeological deposits is important because autumn processing of salmon for winter storage normally involves decapitation of the fish. Thus, the relative presence or absence of salmon cranial element in different sites of different ages has the potential to signal when storage and logistic harvesting strategies began. This issue is of concern beyond the Northwest Coast, e.g., Hoffman et al. (2000), O'Leary (1992). Use of what could be called "archaeological science," though nascent in previous decades, e.g., soil pH evaluation (Monks 1977), expanded to include radiography of salmon vertebrae (Cannon 1988), and interest in seasonality continued (Bernick and Wigen 1990). At the same time, monograph-length analyses of zooarchaeological assemblages were published (Lyman 1991; Huelsbeck 1994a), and social implications of archaeozoological analysis began to appear (Moss 1993). Sophisticated measures of the relative value of skeletal elements were applied to a broadening range of taxa in order to understand cultural choices that may have affected the frequencies of prey body parts in archaeological sites, e.g., Lyman et al. (1992), Savelle et al. (1996).

2000s

The taphonomic interest in NWC zooarchaeology that was begun in the previous decade continued and expanded in this one. For example, rockfish otolith absence in midden deposits, like salmon cranial element absence, was noted (Collins 2010; Steffen and Mackie 2005; Steffen 2006). As well, isotopic analysis of clam shell growth increments created a quantum leap in fine-grained, accurate estimations of season of death of the clams and, by extension, season of occupancy of the sites in which they were found. Similarly, ancient DNA analysis of salmon (Speller et al. 2005), whales (Arndt 2011), and northern fur seals (Moss et al. 2006) appeared.

Theoretical issues are addressed, e.g., Butler and Campbell's (2004) evaluation of resource depression on the NWC, which fall within the positivist paradigm of Human Behavioural Ecology and optimization strategies. Historical Ecology, also positivist and popularized in North America in the previous decade by Crumley (1994) and Ballée (1998), resonated with Northwest Coast zooarchaeologists and took root in the 2000s. It was clear to many that the environment of today is not the same as the one occupied by precontact groups at different times in the past. The further realization that interactions of humans and different parts of the natural environment had mutually impacted all participants, both directly and indirectly, over long periods of time, in addition to the more egregious environmental effects attendant on recent European colonization, has prompted many Northwest Coast zooarchaeologists to re-focus their earlier synchronic, functionalist cultural

ecological perspective into a diachronic, mutually interactive one. In that perspective, humans become simply another agent in the web of ecological relations that shift and change over time and space.

Gifford-Gonzalez et al. (2005) considered the temporal dimension of the relationship between humans and northern fur seals (NFS). Implementing C-N isotopic assays of NFS bones from the Pacific coast of North America and $\delta O^{16}/\delta O^{18}$ analysis of *Mytilus californianus*, they were able to cautiously conclude that two different populations of the species formerly resided along the coast and that climate change likely played no part in the decline of the non-Aleutian NFS population (Gifford-Gonzalez et al. 2005:34). Moss et al. (2006) also used C-N isotopic analysis and aDNA to characterize a sample of NFS remains from three locations on the Northwest Coast. The isotopic analyses showed no discernible differences with similar analyses of the Pribilof Islands population, although the signatures were different from those in California. The DNA analyses were unable to indicate membership in different breeding populations, due, in large part, to the paucity of comparative data (Moss et al. 2006:184). The authors advocated that further research on NFS and other species should be undertaken in order to provide archaeological data pertinent to understanding the baseline conditions for these species over time (Moss et al. 2006:185). Similarly, Szpak et al.'s (2009) reconstruction of food webs remained within the positivist ecological paradigm. As well, the list of species that are considered by zooarchaeologists grew. Beyond a strong emphasis on salmon (Cannon 2001; Cannon and Yang 2006; Matson 2006), research interest expanded beyond earlier studies of flatfish as a storable resource (Wigen and Stucki 1988; Croes 1992) and whales (Acheson and Wigen 2002) to focus intensively on whales (Monks 2001, 2003; Monks et al. 2001; Losey and Yang 2007), butter clams (Hallman et al. 2009), rockfish (Steffen 2006; Collins 2010), NFS (Burton et al. 2001, 2002; Gifford et al. 2005; Moss et al. 2006), Bluefin tuna (McMillan 1979; Crockford 1994, 1997), lampreys (Smith and Butler 2008) and, following the earlier work of Stewart (1977), herring (Monks 1977, 1987; Ham 1982) became important subjects of research interest. Regional variability among sites in resource use was identified as an important interpretive issue (McMillan et al. 2008).

2010s

This decade is ending at the time of this writing, but it has moved NWC zooarchaeology in interesting directions. Fascination with salmon continues unabated (Coupland et al. 2010), but so too does attention to other fish species (see Moss and Cannon 2011). Historical Ecology continues to be an important approach, and it is showcased in a recent volume on seals, sea lions, and sea otters from Alaska to California (Braje and Rick 2011). McKechnie and Wigen (2011) also adopt an historical ecological perspective in their analysis of pinniped and sea otter hunting in south coastal British Columbia. They analyze data spanning the past 5,000 years and show that, despite fewer excavated sites in the earlier time periods, residents of the Strait of Georgia routinely used land mammals more than sea mammals, and that residents of the exposed Pacific coast routinely exploited sea mammals more than land mammals. They conclude three taxa, NFS, harbor seal, and Stellar sea lion, are the most intensively exploited in the area. They also

conclude that comparison of currently endangered species with archaeological data provides a means of assessing pre-European human-pinniped relations over time. Finally, they conclude that northern fur seal was the primary target species for aboriginal groups occupying the Pacific coast of Vancouver Island and neighboring Washington State (McKechnie and Wigen 2011:157–158). Such studies “help unravel the complex interwoven cultural and ecological histories of the Northwest Coast” (McKechnie and Wigen 2011:158).

Following earlier observations of a shift from rockfish to salmon in NWC assemblages (Frederick and Crockford 2005; McKechnie 2005; Orchard and Clark 2005), the 2010 ICAZ conference in Paris also saw the inclusion of climate change as reflected in zooarchaeological assemblages become a clearly enunciated research focus (Monks 2017). Oxygen isotopic analyses of butter clam shells continues to advance the technological, methodological, and theoretical knowledge of seasonality, climate change, and local variability on the NWC. Isotopic analysis of carbon and nitrogen has also recently been used by Orchard and Szpak (2011) to aid in identifying salmon species and also to investigate the historical ecology of sea otter (*Enhydra lutris*) (Szpak et al. 2012). Ancient DNA analysis has expanded to include whales (Arndt 2011) and Pacific cod is added as a species of interest (Moss 2011a). Royle et al. (2018) illustrate the conservation-focused interest within historical ecology by showing that, using two DNA co-amplifications, archaeological salmon remains can be assigned to sex within species, thereby making possible the investigation of whether ancient Indigenous salmon fisheries management was practiced. Synthetic work involving faunal remains from many sites has also begun to appear recently (Easton 1990; Szpak et al. 2009; Clark 2013; McKechnie et al. 2014).

Synthetic Review

This section examines in more detail the various focal species, the methods and techniques, and the topics that constitute the zooarchaeological literature to date on the NWC. Where the preceding section on history was organized chronologically, the headings in this section aim to cross-cut the historical dimension and tie together literature that is intellectually related. There will necessarily be duplication of references because most studies involve several of these cross-cutting dimensions.

Species

a. Fish. One would be remiss in not discussing salmon first. Long hailed as the key to understanding Northwest Coast cultures of the ethnographic and archaeological past, perceptions of that importance have become more sophisticated since about the 1990s. The antiquity of salmon use on the NWC is considerable and well attested. Salmon dated to 9300–8200 BP at the Dalles on the lower Columbia River have been shown to be of cultural origin (Butler 1993; Butler and O’Connor 2004:7). The St. Mungo Cannery site near the mouth of the Fraser River showed that salmon were taken at least by 4000 BP (Calvert 1970) while Matson (1976:96, 300; 1980:73, Figure 24) states that salmon were abundant at the neighboring Glenrose Cannery Site from late Old Cordilleran times onward. At Namu on the central British Columbia coast, salmon were heavily exploited as early as 6000 BP (Conover 1978; Cannon

and Yang 2006). And in Prince Rupert Harbour at the mouth of the Skeena River intensive salmon exploitation at GbTo-77 dates back at least to 1430–1120 cal BC (Coupland et al. 2010: Table 2, Table 12).

The intensity with which salmon was exploited remains a topic of discussion. Because of observations by explorers, traders, settlers, bureaucrats, and ethnographers, there was a commonly held view that salmon was key to understanding NWC cultures in time and space. While this species is undoubtedly important as a food resource, recent work has shown that it was not always as important in many areas as it has heretofore been thought. Outer coast locations, particularly those on the west coast of Vancouver Island and on the more isolated islands of Haida Gwaii (formerly the Queen Charlotte Islands), were relatively impoverished in salmon resources because of their relatively small watersheds and short rivers compared to the mainland coast. The north-south extent of the culture area also meant that the warming effects of El Niño/ENSO fluctuations in the Pacific Ocean and north-south variability in the latitude of the North Pacific current differentially affected the coastline of the area; consequently, salmon productivity tended to be greater in the north than in the south. Qualifying that large-scale effect, however, is the relative long-term stability of the salmon resource in the Columbia River while at the same time there was regional and short- and medium-term variability throughout the area according to the species in question, and the atmospheric and ocean currents as the affected spawning return rates, hatching rates, and survivorship of fry (Finney et al. 2002).

It has become apparent within the last decade that, at least in some areas, there has been a temporal trend in salmon utilization. A number of researchers have noted and/or unknowingly documented a shift from a fish assemblage dominated by rockfish to one dominated by salmon between 600–800 BP (Frederick and Crockford 2005; McKechnie 2005; Orchard and Clark 2005; Monks 2006), and Clark (2013:152, 209) expands these typical suites into rockfish and deer in contrast to salmon and herring. Interestingly, this transition is noted in Haida Gwaii, on western Vancouver Island, and in the Strait of Georgia regions, which suggests that some factor(s) extrinsic to each ethnographic area (Haida, Nuuchahnulth, Salish) may have been at work. Recently, Monks (2017) has suggested that, at least for the Nuuchahnulth area, the transition from the Medieval Climatic Anomaly to the Little Ice Age may have played a role in the shifted emphasis on important fish taxa.

The uses to which salmon was put, both direct and indirect, include the emergence of storage, the role of surplus production, and the emergence of social inequality. These topics are discussed under headings which follow.

Another major fish resource that has received some general attention is herring. A rich marine resource on the NWC, this species, together with salmon, was a major stored resource in the past (Monks 1977; Ham 1982; Kopperl 2001; Kopperl and Butler 2002; Moss et al. 2011). Some current thinking (Orchard and Clark 2005; Monks 2006; McMillan et al. 2008; Clark 2013) suggests that heavy reliance on the combination of salmon and herring may be a phenomenon only of the last 800 years or so in some areas of the NWC (Haida Gwaii, Gulf of Georgia, western Vancouver Island). These same studies propose that an emphasis on other species, notably rockfish may have preceded the emergence of a salmon-herring

dominance, at least in these areas. This is an emergent discussion at present, and more will be learned as time passes.

Rockfish was only one of a number of other fish taxa that have received archaeological attention. Pacific cod (*Gadus macrocephalus*) has been identified as an important resource on the northern Northwest Coast (Bowers and Moss 2001; Moss 2004, 2011a, 2011b), and here, too, there is a suggestion that this resource may have been more important between AD 400–700 and later relinquished its dominant role to salmon (Moss 2004:163). Halibut and smaller flatfish (sole, founder) have also been identified as important species and have been proposed as a storable resource in place of, or in addition to, salmon (Wigen and Stucki 1988; Croes 1995). Some discussion around the capture and importance of bluefin tuna (*Thunnus orientalis*) has occurred (McMillan 1979; Crockford 1994, 1997), but this discussion is not widespread. Individuals of this species produce a large quantity of food, but their appearance on the coast is very infrequent, and their swimming speed makes capture difficult. The economic importance of other fish species has largely gone unexplored. One surprise in this area is eulachon (*Thaleichthys pacificus*), which is an oily fish that was highly prized on the northern Northwest Coast for its abundance and the oil that was rendered from it. The Nass River and Skeena River area was particularly well known for this practice, yet there is little archaeological knowledge of the distribution and chronology of this practice.

Moss and Cannon (2011) have recently published an edited volume of papers on aboriginal north Pacific fisheries that contain highly useful recent research pertaining to NWC fish and fishing. The reader is enthusiastically directed to that resource for extensive detailed examination of the subject.

b. Shellfish. Shellfish constitute one of the largest components of occupation sites on the Northwest Coast. Prized as a staple food, their shells were dumped in vast numbers around houses, and to some extent in them, throughout the area. Both bivalves and gastropods were taken, along with lesser amounts of intertidal invertebrates such as chitons, urchins, and limpets, e.g., Belcher (1998), Wessen (1994), and Croes (2015).

Shellfish deposition created a soil chemistry environment favorable to the preservation of bone; consequently, even fine, small fish bones, e.g., herring cranial elements, tend to be well preserved. More will be said of this matter in the section on taphonomy below.

Individual species of shellfish have received differing amounts of attention. Principal among these has been the butter clam (*Saxidomus gigantea*), partly because of its widespread distribution, partly because of its consequent heavy exploitation by Indigenous populations of the past, and partly because its growth increments are highly visible and relatively easy to read. This latter characteristic has been valuable to those interested in seasonality, as the discussion below will note.

Zooarchaeological interest has focused on bivalves because of the heavy use that was made of them for food and their consequent abundance in shell middens. Early efforts to determine seasonality focused on butter clams (Ham and Irvine 1976) and on little neck clams (*Protothaca stamiea*) (Maxwell 1989, 2003), and simple attempts at quantification using the weight method were made by Monks

(1977). The study of butter clams has blossomed into sophisticated analyses of sclerochronology (Hallman et al. 2009), age profiles (Cannon and Burchell 2009), seasonality (Burchell et al. 2013a, b, c), temperature and salinity records of coastal waters (Hallman et al. 2011), and harvest intensity and resource management (Cannon and Burchell 2017).

Barnacles have received slight attention (but see Fournier and Dewhirst 1980; Moss and Erlandson 2010) because of their relatively small dietary contribution, in part, and also because they grow in the intertidal zone rocky shores exposed to ocean groundswell. Difficult and limited access to this resource, and difficulty in removing the shells from the rocky substrate likely kept this resource from being more than an occasional meal item. In more protected waters, barnacles were of a different, much smaller species and were not exploited for food.

Shellfish in general have recently been explored for their contribution to understanding non-material aspects of culture. The social and symbolic meanings of shellfish in Tlingit and Kwakwaka'wakw culture are explored by Moss (2013), while Cannon (2013) considers the history and regional organization of settlement and human interactions with their environment on the central coast of British Columbia.

c. Sea Mammals. Both Caniformia (principally Phocidae and Otariidae) and Cetacea (mainly Balaenoptera) have received attention from NWC zooarchaeologists. Each group will be discussed separately here.

Caniformia, formerly referred to as pinnipeds, plus the mustelid *Enhydra lutris* (sea otter) are the subject of a recent edited volume covering the west coast of North America from California to the Bering Sea (Braje and Rick 2011). Of particular interest is the chapter by Lyman (2011:19–40), which surveys the history and current state of research on these marine mammals on the Pacific coast of North America. The reader is directed to that volume for the most recent research on this subject. In that volume and in the literature more generally, northern fur seals have received much attention (Gustafson 1968; Lyman 1988, 1989, 1991, 1995, 2003; Gifford-Gonzalez et al. 2005; Moss et al. 2006; Newsome et al. 2007; Crockford and Frederick 2011; Gifford-Gonzalez 2011; Whitaker and Hildebrandt 2011). This species has attracted zooarchaeological attention because of the large numbers of its bones in archaeological sites throughout the Northwest Coast, while its current breeding location is only in the Pribilof Islands of Bering Sea. Adult males and independent juveniles presently feed in the open north Pacific Ocean, while females and young of the year forage offshore as far south as California. The numbers, sex distributions, and age distributions of the archaeological remains seem difficult to reconcile with these modern breeding and migration patterns, so research has been devoted to investigating this discrepancy. The techniques that have been applied to this investigation include morphometrics (Etnier 2002), aDNA (Moss et al. 2006; Newsome et al. 2007), and isotopic analysis of carbon and nitrogen (Moss et al. 2006).

The attention given to northern fur seals highlights another more general issue that NWC zooarchaeologists have begun to consider; namely, the biogeography and evolutionary history of sea mammals, e.g., Lyman et al. (2002). While land mammals have also been included in this discussion (see next section), the difficulty

of the “shifting baseline” in wildlife management and fisheries management is an area in which zooarchaeologists have been able to contribute by their command of the dimension of time. Linked to the problem of shifting baseline is the causation of variation in abundances of taxa over long time spans, which leads to attention being paid to larger issues of environmental variation and climate change on the Northwest Coast. These phenomena are beginning to emerge as important research areas in NWC zooarchaeology, and they link our discipline, beyond archaeology and anthropology, to researchers in oceanography, historical meteorology, glaciology, limnology, climatology, oceanography, fisheries, ornithology, and wildlife management (see also Lyman 2011:21–28).

Theoretical approaches have also been advanced using seals and sea lions as test data. Lyman (2003), for example, evaluated the possibility of resource depression at different scales of analysis. The role of ecological niches in seal and sea lion behavior, i.e., ecological variability and its effects on these taxa, has recently been explored by Moss and Losey (2011). Behavioural Ecology, particularly optimization models for the exploitation of seals, sea lions, and walrus, have been developed in the Bering Sea area by Betts et al. (2011) and Lech et al. (2011), and they have been used more generally for several faunal taxa further south (Monks 2011). These models, and the links they make to climate change and their links to an historical ecological conceptual framework, are approaches that have rich potential for application further south in the Alaska panhandle, coastal British Columbia, Washington, and Oregon.

Northern sea lion (*Eumetopias jubatus*), California sea lion (*Zalophus californianus*), northern elephant seal (*Miroounga angustirostris*), and harbor seal (*Phoca vitulina*) have received relatively less attention, although they are discussed in depth in the literature on coastal California. The exception is Lyman’s publications (1988, 1989, 1991, 1995, 2003) on the evolution of sea mammal hunting and sea mammal exploitation on the southern Northwest Coast (see also Hildebrandt and Jones 2001; Rick et al. 2009). Cetaceans also played a significant role in the economic, social, and ritual life of Northwest Coast peoples. Small cetaceans such as Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), harbor porpoise (*Phocoena phocoena*), and Dall’s porpoise (*Phocoenoides dalli*) are found in coastal sites, though seldom in great numbers (Frederick and Crockford 2005; Monks 2006). Similarly, killer whales (*Orcinus orca*) are also recovered in some sites. The methods of capture of these animals have not been the subject of detailed investigation, and their role in the emergence of open-ocean whaling is unclear.

Hunting and scavenging of great whales (*Balaeonptera*) has, however, received some attention (Calvert 1980; Fiskin 1994; Huelsbeck 1994b; Acheson and Wigen 2002; Monks 2001, 2003, 2004, in press; Monks et al. 2001; Losey and Yang 2007; Arndt 2011). Remains of baleen whales have been found in sites on the western shore of southern Haida Gwaii (Acheson and Wigen 2002), but it is not clear whether these animals were actively hunted or were “drift whales,” i.e., dead whales floating in the ocean. Active hunting ca. 1,300–1,600 BP is documented by Losey and Yang (2007) through a combination of visual inspection and aDNA analysis. Consistent active whale hunting in the open Pacific Ocean is documented ethnographically and archaeologically for the Nuu-chah-nulth (formerly Nootka)

of western Vancouver Island and coastal northwest Washington State. In this area, grey whales (*Eschrichtius robustus*) are recorded ethnographically as the preferred species, but archaeological analyses through visual inspection (Fiskin 1994; Huelsbeck 1994a, b; Monks et al. 2001) and subsequently by aDNA (Arndt 2011) have shown that humpback whale (*Megaptera novaeangliae*) and Pacific right whale (*Eubalaena japonica*) were all important quarry.

The antiquity of active whale hunting remains an open question. Artifacts associated with the hunt have not been recovered in dated contexts, and direct evidence in the form of bones bearing harpoon points or their impressions, date only to the last 2,500 years (Monks et al. 2001; Acheson and Wigen 2002; Losey and Yang 2007). There is speculation, though, that a scapula exhibiting what may be a killing lance wound may be as old as 2,500–3,000 years (Monks et al. 2001:66). Whales played an important role in Nuu-chah-nulth life. Not only were they abundant sources of fat and protein, but they also played a major role in social organization, economic relations within and between groups, and ritual life.

d. Land Mammals. The marine focus of most pre-European Northwest Coast cultures meant that relatively less emphasis was placed on the acquisition of terrestrial animals. The ubiquitous distribution of deer (*Odocoileus* spp.) and bears (*Ursus* spp.) has led to their common recovery in zooarchaeological assemblages. Mountain sheep (*Ovis canadensis*) and mountain goat (*Oreamnos americanus*) are seldom found in coastal sites, although their geographic distributions and exchange between interior and coastal cultural groups has led to the occasional find (Nagorsen and Keddie 2000).

Dogs/canids are frequently recovered in coastal archaeological sites. Ethnographies along the coast record at least two types, large dogs that were used in hunting, and small dogs that were prized for their long hair that was used in weaving (“wool dogs”). Dogs/canids were not used as food, so archaeological attention to them has been limited (but see Gleeson 1970). They are, however, important as hunting aids to humans, and they have been used via osteometric and aDNA analyses to study New World dog phylogeny and domestication and as proxies to track human movements in western North America (Crockford 1997; Crockford and Pye 1997; Koop et al. 2000; Barta 2006; Crockford et al. 2011).

e. Birds. Birds have generally not garnered a great amount of attention by NWC zooarchaeologists (but see Hester and Nelson 1978:Appendix A; Friedman 1980; Krieger 1989; DePuydt 1994; Bovy 2005, 2007a, 2007b, 2011, 2012, 2014; Moss 2007). The reasons for that are unclear, but there exists considerable potential to understand past environment, subsistence, and ecological relationships through their study. A notable exception to the inattention to this animal group is a discussion pertaining to a comparative distribution of albatross skeletal elements and those of other local ducks and gulls (Crockford et al. 1997). It was suggested that the preponderance of albatross humeri resulted from selective curation of these elements for tool manufacture. Bovy (2012) determined that differential transport or discard may account for the relatively greater number of distal wing bones of ducks, loons, grebes, and geese in Gulf of Georgia sites of northern Washington State.

Methods and Techniques

a. Sampling. Northwest Coast zooarchaeologists have taken some pains to ensure that their assemblages are representative of the matrix contents, and these concerns have been evidenced in the field and in the laboratory. Field sampling among sites and within sites, although constrained by funding, access, time, and some older, arbitrary sampling procedures, has also included random sampling procedures emanating from the processualist paradigm (see Binford 1964:427–429). The objective has been, in all cases, to obtain as representative a sample as possible of the deposited faunal remains (e.g., Cannon and Yang 2006:128–130), although generally the excavated sample sizes represent small to very small proportions of the universe of either sites or individual deposits. House 1 at Huu7ii in Barkley Sound, for example, was approximately 17% excavated to a depth of about 1 m after two field seasons with a substantial crew (McMillan and St. Claire 2012:72, Figure 4–11). Time, cost, and recognition hinder full, wide-area excavations in the typically deep middens of the NWC (see Ames et al. 1992:276).

Many sites on the Northwest Coast are shell middens dating within the last 5,000 years, following post-glacial stabilization of the eustatic-isostatic relationship. As noted earlier, the matrix chemistry of these deposits is favourable to bone preservation, with the result that deep and extensive sites have formed, and these sites are full of generally well-preserved shells and bones. Even with rudimentary screening with 1/4 in. mesh, the volume of recovered material is prodigious, and that mesh size fails to capture small fish bones, which are usually abundant. Use of smaller mesh size in the field captures many of these small bones, but collection is laborious and time consuming, and personal experience plus testing by others has shown that even 1/8 in. mesh fails to capture all identifiable small fish bones. Only 1 mm geological sieves appear to reliably capture all identifiable herring and anchovy in samples I have tested. A major result of this approach is huge samples of materials that then require much time, effort, and money to process, or which must be further sampled to a manageable size in the laboratory. Water-screened deposits such as Hoko River (Croes and Blinman 1980; Croes 1992), Ozette (Huelsbeck 1994a), Little Qualicum River (Bernick 1976), and Haida Gwaii (Fedje et al. 2001) also produce abundant small, well-preserved faunal collections that pose subsequent sampling issues.

The field sampling “bottleneck” has been addressed in several ways. First, column sampling (Casteel 1976) has been proposed and is commonly used. The method allows statements to be made about the abundance of a taxon by matrix volume, and these ratios can be compared to determine relative abundances within the deposits (e.g., McKechnie 2003). A second approach to this issue is the use of some form of coring device. Cannon (2000) has advocated the use of bucket augers to produce matrix samples, and soil probes have also been employed. These techniques have the advantage of producing manageable sample sizes, especially of small faunal remains, but they also have obvious disadvantages. First among these is the inability to recover medium and large size remains. A second is the representativeness of such small samples in a large volume of matrix. Third, such techniques can severely damage medium to large faunal elements and render any recovered fragments unidentifiable. Fourth, the abundant shell and stone content of many site matrices prevents penetration of probes and augers. Such a limitation

may be relatively minor in a shallow (1 m) deposit, but it is very consequential in a deep site (4 m), as upper deposits are more likely to be represented by the recovered fauna than are the lower deposits.

Laboratory sampling of assemblages recovered in the field often uses nested geological sieves and geological soil splitters. This is a technique that I have used to advantage in addressing the Toquaht fauna, as has McKechnie in addressing the Benson Island fauna (McKechnie 2003).

The question has arisen among Northwest Coast zooarchaeologists, as it has elsewhere, as to the size of zooarchaeological sample needed to produce an accurate representation of the site contents and to enable reliable statistical analysis. Where, on the curve of declining new information (Grayson 1984) is it legitimate to stop? Sampling to redundancy has been suggested by Lyman and Ames (2004, 2007) and applied by Lepofsky and Lertzman (2005). While the concept is appealing, the criteria for redundancy are still unclear. The richness and evenness of the assemblage govern the amount of time or number of elements that must be examined in order to add another taxon or to stabilize the variation in evenness of an assemblage, thus redundancy can be considered in terms of both richness and of evenness. These issues were addressed in a faunal report by Butler (2005) in which she sought to identify the size of sample required to describe a sample at the Family level. Earlier, Bobrowsky (1985) and Bobrowsky and Ball (1989) review algorithms that predict observed and expected taxonomic diversity. The number of identified taxa relative to the predicted total number of taxa can then be assessed and decisions can be made to continue or not. I used another approach to this question by analyzing an entire assemblage, then determining how large a sample would be required to obtain the same results. My conclusion was that 40% of the record lines in the database gave the same result as the full analysis for that assemblage (Monks 2000). While both examples focus on observed versus expected taxonomic richness, variation in evenness can also be considered. Highly focal assemblages, where a small number of taxa heavily dominate, will quickly stabilize their variability (relatively small sample size required), but subtle, and perhaps meaningful, variation in the less abundant taxa will be masked. Assemblages characterized by evenness across taxa require larger sample sizes to achieve stable variability among taxa. Detailed consideration of these issues are rare on the Northwest Coast, but their ramifications are discussed below under the heading of resource depression.

b. Radiography. Salmon species identification has been the primary use of radiography on the Northwest Coast. Cannon (1988) initiated this approach, and he (Cannon and Yang 2006) and others (Coupland et al. 2002; Trost 2005; Clark 2007; Orchard and Szpak 2011) have been the primary users of this technique. Used alone, the technique is thought to produce equivocal results (Cannon and Yang 2006:128), but this conclusion is questioned by Orchard and Szpak (2011:20–21). As well, using digital radiographic technology (Orchard and Szpak 2011:22–23) in combination with metric analysis of vertebral transverse diameter, aDNA and C/N isotopic analysis can reliably identify each species of Pacific salmon. While aDNA analysis may be the “gold standard” for identification accuracy, metric and radiographic analyses may provide good accuracy with cost-effectiveness (Orchard and Szpak 2011:25).

c. Isotopes. Stable isotope analysis has contributed valuable information to Northwest Coast zooarchaeology. Chisholm et al. (1982, 1983) used carbon isotopes in human bone to show the long dietary dependence on fish. More recently, oxygen isotope analysis has been applied with great benefit to clam shells, and carbon/nitrogen isotope analysis has been applied to both salmon and northern fur seals.

Season of death of clams has been a major interest to Northwest Coast zooarchaeologists because clam shells are found in most sites, usually in great abundance, and because they were a staple food of all Northwest Coast groups. Also, because clams were eaten or processed for storage immediately after being collected and because shells were discarded at the site of use, they can be used as reliable indicators of the season(s) when the site was occupied. Clam shells, like many other exo- and endoskeletal elements in other animals, record in their structure a history of their growth. That structural history has long been used by archaeologists, e.g., Weide (1969), Coutts and Higham (1971), Koike (1973, 1975, 1979, 1980), Ham and Irvine (1976), but reliable separation of annual growth cessations from other ontogenetic and environmental disturbances has often frustrated efforts to make reliable seasonality determinations.

The potential of oxygen isotope analysis of marine shells was demonstrated by Shackleton (1973), but it was not taken up in practice by Northwest Coast zooarchaeologists. Recent technological advances have permitted a new level of precision in applying stable oxygen isotope analysis to clam shells, though, and now it is possible to characterize fortnightly growth cycles and to monitor the ambient water temperature variations experienced by each animal (Hallman et al. 2009, 2013; Burchell et al. 2013a, b, c). The implication of this capability is that, like dendrochronology and as envisioned by Koike (1980), it is possible to establish the precise season when the animal died (Burchell et al. 2013b:272). As well, close monitoring of ambient littoral water temperature provides information on longer-term environmental and climatic changes that occurred in the past.

Isotopic analysis of carbon and nitrogen has been used to differentiate salmon species and the feeding and migration habits of northern fur seals (*Callorhinus ursinus*) (NFS) over time. Orchard (2011:117) and Orchard and Szpak (2011:23–25) capitalized on the feeding habits and life cycle patterns of each of the five Pacific salmon species to identify three species as those most likely to predominate in the Gwaii Haanas assemblages. Carbon-nitrogen isotopic analysis of NFS has been aimed at a different problem; namely, the abundance of NFS bones in archaeological sites, including fetal bone, in contrast to the current biogeographic and breeding distribution of this species. Burton et al. (2001, 2002) and Gifford-Gonzalez et al. (2005) were able to show that California NFS constituted a resident population and that it ceased to exist prior to the arrival of Europeans. Instead, the decline of this population may have been associated with the onset of the Medieval Climatic Anomaly (Gifford-Gonzalez et al. 2005:28–31). Samples from Alaska, however, identified a separate breeding and migration pattern, much like that of today, wherein breeding occurs on the Pribilof Islands with males subsequently forging in the open North Pacific Ocean and females and juveniles foraging in offshore mid-latitude waters (Gifford-Gonzalez et al. 2005:30). In Oregon, Washington, and British Columbia, NFS become absent from the zooarchaeological record at or

after European contact, while in Alaska they are present well after contact in some sites and absent well before contact in others (Gifford-Gonzalez et al. 2005:Figure 3). Crookford et al. (2002), citing Gustafson (1968), make a strong argument that a NFS rookery existed near Cape Flattery, Washington State, in the late 1800s and that it was available to the aboriginal inhabitants of that area as to their relatives to the north on western Vancouver Island. They also make a case for this population being morphologically, behaviorally, and probably genetically distinct from the Pribilof breeding population. In northern California, Hildebrandt (1981, 1984a, 1984b) documents the presence of NFS in the Indigenous hunting regime.

Szpak et al. (2012) examined the C-N isotope levels of sea otters in northern British Columbia over the last 5,000 years. Formerly present in this area, sea otters have been extirpated because of the maritime fur trade. The archaeological specimens revealed that they were an important food resource species for aboriginal populations and that pre-European human predation may have influenced sea otter populations. Isotopic analysis of rockfish revealed that extirpation of sea otters increased sea urchin abundance but reduced kelp abundance, thereby reducing the carbon signature in rockfish after the maritime fur trade; however, the nitrogen signature remained constant signifying continued feeding at the same trophic level (Szpak et al. 2013).

d. aDNA. Salmon, again, has been one of the focal species for aDNA analysis. Butler and Bowers (1998) capitalized on the emergent technology to show that salmon could be identified using this method, that the method could be applied to bones as old as 9,000 years, and that one species could tentatively be identified. Yang et al. (2004) and Cannon and Yang (2006) used this method to determine that the majority of salmon bones from Namu, on the central coast of British Columbia, were mainly pink salmon. Like Cannon and Yang, Moss et al. (2014) were interested in the relationship between morphometric and aDNA analysis. Based on a sample from Coffman Cove, Alaska, they determined that the morphometric method of Huber et al. (2011) did not accurately characterize the salmon species frequencies according to the aDNA results. Grier et al. (2013) also used aDNA and morphometrics to evaluate the salmon taken at Dionisio Point in the Gulf Islands of southern British Columbia. They found, like Moss et al. that the Huber et al. osteometric method discriminated less effectively among archaeological salmon species than among modern samples and that aDNA was to be preferred (Grier et al. 2013:545). They also used a larger sample size from the same site than Ewonus et al. (2011) and concluded that salmon species breadth was greater than previously stated and that the seasons of occupation were longer (Grier et al. 2013:545). Royle et al. (2018) have shown that sex of salmon can be determined with a high degree of accuracy for each salmon species. The way now appears open to assessment of possible Indigenous salmon management strategies through selective harvesting in the past.

Northern fur seals also have been the focus of aDNA examination (Moss et al. 2006; Newsome et al. 2007; Gifford-Gonzalez 2011). Preliminary indications suggest that, despite intensive harvesting in the northeastern Pacific Ocean in the eighteenth and nineteenth centuries, the metapopulation size now is about the same as it was 1,000–2,000 year ago. As well, migration rates within the population

were such that sub-populations were not able to develop. This position is at odds with that of Crockford et al. (2002). Finally, the metapopulation possessed sufficient adaptability to successfully adjust to a variety of climatic and oceanographic changes in the north and east Pacific area (Gifford-Gonzalez 2011:229–231). Moss and her co-authors determined that there was no relationship between the haplogroups they identified and any particular geographic locations, thus a migratory life cycle is indicated, although the existence of different breeding distributions in the past compared to the present cannot be ruled out (Moss et al. 2006:183–185).

Sea otters in Oregon and California were also examined by aDNA (Jones et al. 2011). The pre-European presence of sea otter on the Oregon coast, its subsequent demise during the maritime fur trade, and failed attempts to re-introduce the species were considered by Valentine et al. (2008). They determined that the archaeological population more closely resembled the genetic structure of the present California sea otter population, whereas attempted re-introductions had been undertaken with Alaskan animals. California sea otters were assigned to gender using aDNA, and the results indicated that mainly females had been harvested at the CA-SLO-2 site, and that pattern appears to have held over the last 5,000 years (Jones et al. 2011).

Whales have been examined by aDNA as well (Arndt 2011; Arndt and Yang 2012). Moving beyond older visual species identification methods (Fiskin 1994; Monks et al. 2001), Arndt examined modern and archaeological whale remains from two sites in Barkley Sound, western Vancouver Island, and found that the vast majority of the elements were from humpback whales, followed distantly by gray whale, then by very small percentages of other whale (Arndt 2011; Arndt and Yang 2012:Table 1). Arndt was further able to show that this predominance appears to have persisted for approximately the last 5,000 years, which led her to suggest that active whaling may be indicated for this period (Arndt 2011). Finally, her analysis of the humpback haplotypes suggested, much like the Jones et al. (2011) study of sea otters, that contemporary humpback whale populations exhibit a similar genetic composition to that of the pre-European period, indicating a considerable resilience despite heavy harvest pressure in the nineteenth and early twentieth centuries (Arndt 2011).

Recently, rockfish have received attention through aDNA analysis (Rodrigues et al. 2018).

e. Spatial Analysis. Spatial analyses of faunal materials are not yet heavily undertaken on the Northwest Coast (but see Brewster and Martindale 2011; Trost et al. 2011), although spatial analysis based on other data is not foreign to the area (Maschner and Stein 1995; Mackie 2003). One exception, though indirect, is a Master's thesis by Rahn (2002) in which he determined through Nearest Neighbor Analysis that sites of the most recent period in a sample from the north shore of Barkley Sound on western Vancouver Island tended to be distributed mainly in relation to resource production locations. In the preceding time period, sites tended to be distributed, instead, mainly on the basis of social distance (Rahn 2002:110–111).

Rahn's conclusion led to an evaluation of faunal remains from two recent-period sites, one situated in an inner, protected location near the mouth of a salmon-producing river and the other in an exposed, open-ocean location (Monks

2011). The conclusion was reached that shellfish, because they remain spatially fixed during their lives, were better able to distinguish between sites than were fish and sea mammals, which possess greater mobility (Monks 2011:145).

f. Taphonomy. Fish, because of their central importance to all Northwest Coast groups, have been the subject of taphonomic study. Both natural and cultural taphonomic processes have been considered, and, perhaps not surprisingly, salmon and rockfish have been focal genera. Nevertheless, marine and terrestrial mammals have also received attention.

Steffen and Mackie (2005) subjected rockfish remains to fire in order to learn which bones survived. They found that rockfish bones most likely to remain after such exposure were denser elements and that otoliths disintegrated. These results suggested to Steffen (2006:111–114) that Northwest Coast zooarchaeologists should understand better the relationship between fish bone density and element survivorship.

Salmon were examined for density-mediated survivorship by Butler and Chatters (1994). Using X ray absorptiometry to measure bone density of cranial and post-cranial elements of variously-sized chinook (spring) salmon (*Oncorhynchus tshawytscha*), they evaluated salmon bone survivorship in three archaeological assemblages and determined that density-mediated destruction had likely occurred to cranial elements in two of them and that cultural behaviour had resulted in the near absence of cranial bones in the third (Butler and Chatters 1994:417–420). Bone density was thus confirmed as an important factor to consider in accounting for salmon skeletal element frequencies, and the study also pointed out that variation in density of cranial elements, particularly the angular, otolith, and pectoral fin rays, may help evaluate more effectively the role of density-mediated versus culturally affected element representation (Butler and Chatters 1994:422).

Collins (2010) also focused on salmon cranial and post-cranial skeletal elements to determine whether either group deteriorated more rapidly than the other under acidic or alkaline conditions. He used cooked bones and found no difference in survival between the two groups, but he did show that relatively acidic and relatively alkaline environments each had destructive effects on both bone groups (Collins 2010:296–298).

Hoffman et al. (2000) examined salmon remains from two sites on Unimak Island in the Aleutian Islands, Alaska. Although not within the Northwest, the study bears on the discussion here. One site was identified as a salmon procurement site on a stream, and the other site was identified as a village site where stored salmon was consumed. Both sites dated within the last 1,000 years. At the former, cranial elements were abundant, which was consistent with ethnographic descriptions of fresh salmon consumption at harvesting locations. At the latter, cranial elements were relatively rare, also in conformity with ethnographic descriptions (Hoffman et al. 2000:703). Like Butler and Chatters, these authors point to the presence of specific non-vertebral bones in arguing the case for or against storage (Hoffman et al. 2000:707). The sites had the benefit of relatively young age (<1,000 years) and excellent preservation (Hoffman et al. 2000:706), which may have provided optimal conditions for their study.

Crockford et al. (1997) and Bovy (2012) have focused on the over-representation of wing elements of albatross and ducks. Cultural practice, rather than diagenetic processes, were deemed most likely in both cases. In contrast, Moss and Erlandson (2002) exhort all archaeologists to pay close attention to non-human animals that can contribute faunal remains to archaeological sites.

The taphonomy of both terrestrial and marine mammals was examined by Lyman (1991) and Lyman and Bennett (1991). Three Oregon coast sites were considered: Umpqua/Eden (35DO83), Seal Rock (35LNC14), and Whale Cove (35LNC60) (Lyman 1991:Figure 2.2). Detailed observations on natural history, ontogeny, age-sex profiles, and butchering are provided in the chapters that deal with each site, and a summary of the butchering patterns and their larger implications is provided as part of a summary chapter. Bones of deer (*Odocoileus* sp.) and elk (*Cervus elaphus*) tended to be heavily fragmented relative to sea mammal bones (Lyman 1991:Table 8.7), probably because of the marrow available in the former animals, especially elk. As well, Lyman indicates that there was variation in the emphasis on production of meat, hides, and marrow between the sites he examined, based on the butchering marks and degree of bone breakage. Sea otters and young seals were often brought whole onto the sites, although adult harbor seals (*Phoca vitulina*), northern sea lion (*Eumetopias jubatus*), California sea lion (*Zalophus californianus*), and northern fur seal (*Callorhinus ursinus*) adults probably required field processing before transport to the sites, thereby eliminating some skeletal elements from the faunal assemblages (Lyman 1991:302–305).

Lyman's study refers to a slightly earlier one by Wigen and Stucki (1988), which deals with taphonomic processes in relation to northern fur seals at the Hoko River site near the mouth of Juan de Fuca Strait in northwestern Washington State. They suggest that fragmentary northern fur seal forelimb bones are more identifiable than fragmentary hind limb bones, that the meat value of forelimb bones may mean that they are more likely to be transported to sites than hind limb bones, and that there may be differential butchering attention and/or variation in the durability of these bones (Wigen and Stucki 1988:109).

Lyman's analysis of Oregon coast sites gave scant attention to whales, other than to note that not many identifiable whale elements were found at the Umpqua/Eden site, although unidentifiable fragmentary remains were counted (Lyman 1991:150), only the presence of whale remains was noted for the Seal Rock site (Lyman 1991:226), and the Whale Cove site produced NISP counts and weights for the unidentified whale bone fragments (Lyman 1991:273). Further north, whale remains have been recovered in abundance from the Ozette Site in northwestern Washington State (Fiskin 1994; Huelsbeck 1994a), from Barkley Sound and Hesquiat Harbour sites on western Vancouver Island (Calvert 1980; Monks et al. 2001; Frederick and Crockford 2005; Frederick 2012), and from sites in southern Haida Gwaii (Acheson and Wigen 2002). These reports deal, in some cases, with species identification, and in most cases with quantification. Few studies deal with taphonomy of whale bones other than to say, like Lyman, that many fragments of such bones were found and that few were identifiable due to their friable nature. Two studies, however, look at cultural taphonomic processes affecting whale bones (Monks 2003, 2005). The first of these papers argued for a broader consideration

of both the ethnographic and archaeological records in terms of the full range of products that whale carcasses represented (meat, bone, bone oil, sinew, baleen, viscera) and the uses for which bones, in particular, were transported onto a site. The second of these papers posited that the yellow fat content of the trabecular spaces could be used to predict the frequency of occurrence of skeletal elements in the habitation site middens that were examined.

Finally, macro-taphonomic processes have influenced Northwest Coast zooarchaeology. Lyman (1991:24–41), for example, points out that sea level stabilization ca. 5000 BP on the Oregon coast may have led to the accumulation of shell middens, which tend to preserve bone and antler well. Earlier shell-bearing sites may now be underwater or hidden on raised beach lines, and non-shell-bearing sites may not be well represented in the archaeological literature and would be less likely than shell middens to preserve bone and antler well. Thus natural geological and biostratigraphic processes over long time spans, in conjunction with cultural practices of both former coastal occupants and contemporary archaeologists, likely limit the amount of data currently available for zooarchaeological study in the area generally (but see Fladmark 1975, 1979; Fedje and Christensen 1999; Josenhans et al. 1995, 1997; Fedje and Josenhans 2000; Hetherington and Reid 2003; Fedje et al. 2004, 2005a, 2005b, 2009; Mackie and Sumpter 2005; McLaren et al. 2005, 2011, 2014; Hetherington et al. 2007).

Topics

a. Seasonality. Seasonality estimation, especially of butter clam (*Saxidomus gigantea*) harvesting, was inspired by Margaret Weide's study of Pismo clams in California (Weide 1969). First to apply her approach to seasonality estimation were Ham and Irvine (1976), who sectioned and counted summer and winter growth increments under low power magnification to estimate the amount of growth in the year of death and thereby estimate the broad season of collection. Attempting to refine that process, Monks and Johnston (1993) suggested a mathematical solution based on the previous year's complete growth. Application in their test case proved to be satisfactory, but van Neer et al. (1999) found it inapplicable to North Sea fish species. Seasonality of clam harvesting in Puget Sound was evaluated by Belcher (1998).

Since then, significant technological advances have been made that now allow micro-analysis of growth laminae using micro-drilling and oxygen isotope analysis (Cannon and Burchell 2009; Hallman et al. 2009, 2013; Burchell et al. 2013a, b, c). This approach has provided much more reliable counting of growth increments, and consequently much more reliable estimation of an animal's age and season of death. As well, the isotopic ratio indicates intra-annual temperature fluctuations and, by comparison with other individuals analyzed by the same technique, longer-term trends in environmental temperature fluctuations. This is a significant advance in the zooarchaeological capability to address both seasonality and long-term marine temperature fluctuation.

An important implication of this new methodology is the possibility of its application to the incremental growth structures of other skeletal elements in other taxa. For instance, the possibility exists to apply it to growth increments in fish bones and to the cementum and/or dentin increments in mammalian tooth roots.

Caution would be required, though, because the biological processes in different taxa will not be uniform, and the interactions between the individual species and their environments will not be the same. Nevertheless, the potential for important new applications exists and will doubtless be explored in the next decade or two.

b. Storage. Salmon storage, because of its important implications for the emergence of social inequality, has had a relatively long history of discussion. Despite this long history, the matter is still far from resolved. Matson and Coupland (1995:145–154) and Ames and Maschner (1999:251) each suggest that salmon storage became important somewhere in the 3500–4000 BP time range. Croes and Hackenberger (1988) posit that populations at the Hoko River site in northwestern Washington State first stored flatfish and only later included salmon storage beginning between 2400–1400 BP (Croes and Hackenberger 1988:74–78). More recent work has provided support for the views and reviews incorporated in these publications. The importance of salmon seems to have varied both locally and chronologically. Frederick and Crockford (2005), McKechnie (2005), Monks (2006), and Orchard and Clark (2005) make clear that, at least on major offshore islands, reliance on salmon, thus storage of it in abundance, likely occurred within the last 500–800 years. In contrast, Cannon and Yang (2006) make a strong case for salmon storage at Namu on the central British Columbia coast by 6000 BP. The local variabilities and regional similarities stressed by Ames and Maschner seem to receive continued support from emerging research. Similarly, Clark's (2013) re-analysis of the Marpole cultural manifestation argues that this cultural phenomenon had a clear, and more restricted geographic distribution than heretofore thought, and that Salish groups of the San Juan Islands had a different relationship with the salmon resource base than did their neighbors who relied on fishing in the Fraser River. Thus, the timing of the reliance on salmon storage may vary over the coast, although a number of published sources for the central and northern Northwest Coast agree that post-glacial stabilization of relative land and sea levels ca. 5000 BP likely played a role in the abundance of salmon and hence its availability as a storable resource.

The search for archaeological evidence of salmon storage, however, seems to be as elusive as the fish itself. The ethnographically described processes for storing salmon usually involve some detachment of the head from the body and a separation of the spinal column, if not its outright removal, from the two fillets. In this scenario, it makes sense that the relative abundance of cranial elements to post-cranial elements should indicate whether fresh (whole) or stored (headless) predominated in an archaeological deposit. The troubling piece is that most salmon cranial elements are not heavily ossified and tend to decompose, even in the slightly basic chemistry of shell midden soils (Hoffman et al. 2000).

Cannon et al. (1988) used radiography of salmon vertebral centra to separate vertebrae into groups that, in some cases, corresponded to a single species, and in other cases corresponded to one of two species (Cannon et al. 1988:106). Salmon taken in the fall, when most of the year's growth had taken place, were considered possibly to have been stored. More recently, Cannon and Yang applied aDNA analysis to a series of salmon bones and determined that the salmon taken at Namu were sockeye (*Oncorhynchus nerka*), which likely were taken for fresh consumption, and

chum salmon (*Oncorhynchus keta*) and pink salmon (*Oncorhynchus gorbuscha*), which were taken for storage (Cannon and Yang 2006:133).

Another approach to identifying the practice of storage has been the search for durable cranial elements that indicate the spawning condition of the fish. Dentaries and premaxillae of male, and to a lesser extent female, chum (or “dog”) salmon (*Oncorhynchus keta*) fit this requirement because they become “hooked” as the fish reach spawning readiness. Thus, the presence of them in an archaeological deposit suggests the presence of heads, which, if not near a spawning stream, may imply fresh consumption, not stored resource. There are a number of weaknesses to this approach. The first is the transportability of fish. Canoe travel, the norm on the Northwest Coast, is fairly cost-efficient, and many fish can be transported a considerable distance, even to multi-season villages that were also occupied in winter when fresh salmon were unavailable and stored salmon was the main menu item. The second is the relative scarcity of these skeletal elements compared to the numerous vertebrae of salmon. A few such elements in a large faunal assemblage is most common, so any quantitative measures that one might wish to use are not sufficiently robust due to small sample sizes. The third is the propensity of zooarchaeologists concerned with this problem to empirically investigate it (apart from Hoffman). Finally, in these circumstances, negative evidence (absence of cranial elements) cannot be taken for the practice of salmon storage. Looking on the bright side, there is much research opportunity in the area of taphonomy, as discussed below.

I made the point in an earlier publication that food chains and resource blooms were capitalized on by human groups to harvest a locally and temporally super-abundance of a variety of resources (Monks 1987). That point was made in reference to herring and the predators that fed on them as they spawned. Herring were also harvested in great numbers and stored for later consumption at many locations along the Northwest Coast (Ham 1982; Monks 1987; Kopperl and Butler 2002; Szpak et al 2009; Caldwell 2011; Moss et al. 2011; McKechnie et al. 2014). Again, the chronology of this development is not well known, although at several places along the British Columbia coast the shift from an emphasis on rockfish to an emphasis on salmon and herring appears to have occurred within the last 600–800 years. By contrast, Cannon and Yang (2006:126) observe the abundance of herring remains in early deposits at Namu. Croes and Hackenberger (1988:58–63) argue that flatfish, especially halibut (*Hippoglossus stenolepis*) provide an abundant and relatively constant fish resource, and the same can be said of rockfish in the littoral zone. Thus, a change to storage of a resource that was only available for a limited time, or, as Ames and Maschner (1999:251) argue, an increased emphasis on long-known storage technology, can be explained in evolutionary terms as providing a reproductive advantage over earlier practice. So, apart from detailed investigations into the timing of increased emphasis on storage, the question arises as to which resources were first subjected to this emphasis. Was it salmon? Was it herring? Was it one or more other species? Where and when did these changes occur? Future Northwest Coast zooarchaeologists will undoubtedly tackle these questions.

Storage of physical material is addressed in the preceding discussion, but social storage is indirectly involved in a zooarchaeological discussion. Social storage

occurs when a social bond is created between the recipient of a gift acknowledges a moral obligation to reciprocate. Often, temporary food surpluses initiate such exchanges. On the NWC, exchange of prestige foods within and between villages according to established social conventions created reciprocal rights and obligations that affected the type, quantity, and distribution of animals and their remains. A lengthy discussion of this subject is not warranted here, but the implications for zooarchaeology of social organization in its broadest sense, especially in the context of storage technology, must be mentioned.

c. Social and Cultural Complexity. Storage, at least on a large scale, has long been accepted as the basis of social complexity on the Northwest Coast (Matson and Coupland 1995:197–198), but Ames and Maschner (1999:113–117) provide a more multi-faceted discussion of that relationship. My own bias, consistent with the latter view, is that storage of a variety of foods, as well as social storage of foods that could not be kept, was one of many contributing factors to the emergence of social complexity. In terms of zooarchaeology, though, the discussion of emergent social inequality and social complexity ultimately rests on the evidence of processing and storage of a number of food resource species, from bivalves to herring, salmon, halibut, and rendered oil products from eulachon and various sea mammals. Archaeobotanical research will also need to be considered in conjunction with zooarchaeological data to fully grasp the diversity of resources and the timing of their uptake in the shifted emphasis towards reliance on storage technologies and their roles in the emergence of social complexity (Ames and Maschner 1999:127–146) for which Northwest Coast hunter-fisher-gatherers are justly noteworthy.

Theoretical discussions of emergent social and cultural complexity among NWC hunter-fisher-gatherers has largely emerged from considerations of storage technology, especially the presence or absence of salmon cranial elements, as noted above. Recent attention has begun to focus on a broader set of issues, such as mass harvesting infrastructure and household size and contents that have direct and indirect zooarchaeological implications. Mass harvesting infrastructure on the Northwest Coast includes stake and basketry weirs in rivers and intertidal zones of beaches and intertidal rock wall fish traps. Other technologies, such as gaffing and dip-netting in rivers, and river and reef netting are much more difficult to identify. The theoretical implications of the existence of such large-scale, permanent infrastructures suggest that they were built by significantly-sized corporate groups that were internally organized, and that operated and benefited from the products of communal labor. Thus, the dating of these structures and the zooarchaeological signatures of their production contribute to the discussion of local emergence of social complexity (e.g., Moss et al. 1990; Moss 2004; Caldwell 2008, 2011). Some wooden stake weirs have been radiocarbon dated (Moss et al. 1990; Caldwell 2011), and those at Comox Harbour appear to have been used to catch herring (Caldwell 2011:243; Greene et al. 2015). The dated weir stakes in the Comox study belong mainly to the post-1200 BP range, although some approach 2,500 years in age, while those reported by Moss et al. (1990:Table 1) date as early as almost 3500 BP. The differences in dates may result from sampling strategy, or they may result from regional variation in technological and social developments along the coast,

and the chronological implications of the logistical organization necessary for the construction, maintenance, and operation of these structures and the faunal remains they produce is important in understanding the evolution of cultural complexity on the Northwest Coast (see Moss et al. 1990:143). That herring are thought to be the most likely focus of the Comox Harbour weirs and that emphasis on herring and salmon appears, at least on major offshore islands, to have begun only about 600–800 BP, future zooarchaeological analyses of sites proximate to these structures should be analyzed for the relationships between major fish taxa to determine which weirs were used when to obtain which types of fish.

Intertidal stone fish traps also require a large, organized labor input, but I suggest here that they are more difficult to build. They are also difficult to date. My observation of some of the stones used in the Deep Bay fish trap, for example, each weigh as much as 50 kg. (Monks 1987:Figure 3). The increased labor investment required to construct a large, extensive tidal trap would have been significant, thus the group undertaking such a task and hoping to profit from it would be large, well organized, and have a reasonable certainty that the payoff would justify the input in the long term. At Deep Bay, herring dominate the zooarchaeological remains after ca. 2500 BP, suggesting that production from the adjacent trap increased at about that time and that large, corporate group structure(s) were consequently in place at or before that time (Monks 1987:129). Such a line of reasoning may be a useful way to infer construction dates and, consequently, the requisite social formations.

d. Household Archaeology. Household archaeology, a conceptual approach related to storage and social complexity, has become important in NWC archaeology in the last 20–30 years (Coupland 1985, 1996; Ames 1996, 2006; Arnold 1996; also see Moss 2004 for a critique). House size is taken as one proxy measure of the existence of internally organized corporate groups and sub-groups (Coupland 1985, 1996, 2013; Coupland and Banning 1996). Within that framework, Grier (2003:180–181) states that extra-local salmon in House 2 at Dionisio Point indicate access by occupants of that structure to salmon runs on one or more rivers on eastern Vancouver Island and the Fraser River. The species of salmon from House 2 has been a subject of debate (Grier 2001, 2006; Ewonus 2011a, 2011b, 2012, 2017; Ewonus et al. 2011; Grier et al. 2013; Grier and Lukowski 2012) because species identity and quantity are seen as fundamental to the season of site occupancy and the social structure of House 2 occupants. As well, Ewonus (2017:353) argues that herring was the main fish species exploited. The nearby site of Shingle Point was also subject to a household archaeology analysis (Matson 2003), and zooarchaeological analysis there suggested that two different family groups, possibly of different social position, occupied adjacent compartments of a Salish house (Matson 2003:92). Ames's (1996) examination of Northwest Coast plank houses suggests that their very appearance in the archaeological record is an indication of storage (Ames 1996:140). Such storage was required to support the large number of occupants that would, on the basis of floor estimates, have lived there. While he does not speak directly about zooarchaeology, his estimates of the lumber requirements to build such houses rests on essentially the same argument made above respecting labor required to build, maintain, and operate fish weirs and stone-walled intertidal traps.

Two house structures have undergone extensive zooarchaeological analysis. Most famously, the buried houses at Ozette provide abundant evidence of differentially distributed faunal remains that indicate important aspects of social complexity during the late prehistoric period on the Pacific coast of Washington State (Huelsbeck 1994b).

The other site is Huu7ii in Barkley Sound on western Vancouver Island where the largest house, located in the center of the linear village, was excavated to examine the remains inside the most prestigious house at the site (McMillan and St. Claire 2012:71). Analysis of the horizontal distributions of zooarchaeological remains was aimed at determining if activity areas or areas suggesting status differentiation among house occupants could be seen (Frederick 2012:140). Status differentiation by area was unclear, largely due to sample size concerns, while an activity area pertaining to sea mammals was tentatively identified adjacent to the central hearth (Frederick 2012:153). The concern with sample size affects many aspects of zooarchaeology and household archaeology. McMillan and St. Claire (2012) state, and cite Ames (2005:12) in support, that wide-area excavation in coastal shell middens that can easily reach four meters in depth are well beyond most labor budgets. Thus, only houses with visible remains on present site surfaces are likely to be examined, which biases the sample and provides information only on relatively recent sites. Zooarchaeological analyses focused on simple identification and quantification can certainly be done in these instances, and isotopic and genetic studies of faunal remains can be done, but the social implications of intra-house distribution of those remains appears limited to recent prehistory. Until criteria for the detection and sampling of more deeply buried house remains are established, household archaeology in general, and associated zooarchaeological analyses in particular, will be limited.

e. Conservation Zooarchaeology. New life has been breathed into Northwest Coast zooarchaeology by the recognition that it can provide badly needed temporally controlled data on the distribution and abundance of species of current interest in fisheries and wildlife resource management, what Lyman (2011:23) has called “applied zooarchaeology.” Zooarchaeologists have been able to provide useful information to scientists and managers that helps them address the “shifting baseline” problem (Finney et al. 2000; Finney et al. 2002; Newsome et al. 2007). This problem refers to the situation wherein very good detailed records of modern taxa and their biogeography are available for a relatively short period, perhaps 50 years at most. Such periods, however, cannot be assumed to reflect longer-term events for which no information is available, nor can the environmental and ecological conditions under which modern observations were made be assumed to have pertained in the past. Thus zooarchaeologists, with their command of time and the remains of taxonomic abundance and distribution in the past can provide information on distributions, abundances, and contexts of individual taxa or suites of them.

This approach in zooarchaeology is primarily a phenomenon of the last 15 years (Butler and Delacorte 2004; Lyman and Cannon 2004; Lyman 2006, 2012; Frazier 2007; Wolverton and Lyman 2012), although, as Lyman (2011:23) notes, the potential of archaeology to enlighten zoological discussion was enunciated by

William Wintemberg in 1919. Northwest Coast contributions to this effort include the studies by numerous researchers on the biogeography and historical ecology of northern fur seals (Gustafson 1968; Etnier 2002, 2007; Darwent and Darwent 2004; Gifford-Gonzalez et al. 2005; Moss et al. 2006; Newsome et al. 2007), although the question of sustainable fishing has also been addressed (McKechnie 2007; Royle et al. 2018). The importance of long time-spans to the understanding of climate and taxonomic biogeography is well exemplified where salmon are concerned (Finney et al. 2000, 2002; Misarti et al. 2009).

Summary and Discussion

Northwest Coast zooarchaeology does not have a long history, but it has, fortunately, developed at a time of rapidly increasing communication among scholars and rapidly advancing technological and theoretical developments. The pool of information that can be accessed by all zooarchaeologists is immense and comes in the form of online journals, repositories, interest groups at different levels, and online discussion groups. Access to the substantive, methodological, and theoretical contributions (and plain old accumulated wisdom) of colleagues around the world allows Northwest Coast zooarchaeologists to learn from, apply locally, and contribute to the collective effort of the international community.

The snapshot of Northwest Coast zooarchaeology provided in the preceding pages shows that, despite a relatively late start, zooarchaeology in this area of the world has progressed rapidly. From rare mentions of fauna in the 1940s and 1950s to full engagement with current international discussions of theory and methodology and active participation in topical interest of wide importance, researchers in this area now take from, and bring to, the table in equal measure.

It would be untrue to say that all Northwest Coast zooarchaeologists are equally interested in each of the areas of theory, method, and empirical knowledge. Similarly, some topic areas are less suited to evaluation here than elsewhere. One example from earlier in the article pertains to household archaeology in deep, highly stratified shell midden sites. Unless site survey data reveals old house remains on site surfaces, adequate knowledge of those houses, and the faunal remains within them, research on this topic will not move forward quickly.

Where should and/or will Northwest Coast zooarchaeology go from here? I encourage those who will continue this work to keep current with archaeological theory and apply it in their research. We have started in this direction, and it should expand. Having said this, Moss's (2004:188) admonition not to let discourse outstrip empirical support rings loud. Many of the theoretical frameworks that are currently employed belong to the positivist tradition, and that means the field of post-processual interpretation is wide open. Similarly, technological advances applicable to zooarchaeology should continue to be applied to our data to extract ever more finely tuned understandings of the past in this area. Notable existing contributions include aDNA studies, such as those coming out of Simon Fraser University, oxygen and carbon-nitrogen isotope studies, such as those published by Orchard and Szpak (2011) or Gifford-Gonzalez et al. (2005), and microanalysis of growth increment structures, such as Hallman et al. (2009) and Burchell et al.

(2013a, b). Involvement in research teams with members from other disciplines will enable this to happen, to the benefit of zooarchaeology and the other disciplines.

Areas that bear further examination on the NWC because of their detailed considerations elsewhere include such topics as evaluations of bone morphological identification, especially fish (see Gobalet 2001), applicability of quantification measures, taphonomic processes, and zooarchaeological symbolism. Nevertheless, all NWC zooarchaeologists can look forward with optimism to the continuing evolution of the discipline and to another retrospective such as this one at some point in the future.

ENDNOTES

1. Elsewhere (Monks 2017), William Folan is erroneously included in a similar list. Instead, James Hester should have been added.

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ZOOARCHAEOLOGY ON THE NORTHWEST COAST OF NORTH AMERICA

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Understanding the Fire History of the San Juan Islands, Washington, Through Charcoal Accumulation Rates and Traditional Ecological Knowledge

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Abstract *Coast Salish peoples in the San Juan Islands have traditionally used fire in the grasslands to manage native plant communities for agriculture. Their displacement by Euro-American settlers has reduced fire frequency on the islands, leading to ecological succession from grasslands to shrubland and woodland. Previous tree ring fire studies in forests adjacent to the grasslands have demonstrated greater fire frequency in the grasslands before Euro-American settlement, supporting what is known about the regular use of fire by Coast Salish peoples. We aimed to supplement those studies with an analysis of charcoal in sediments of wetlands in forests adjacent to the grasslands. We also recognized that the oral history, as shared by representatives of local tribes, is a valuable source of traditional ecological knowledge (TEK) and should be integrated into the conclusions of the study. Our cores showed mean fire intervals (MFIs) of 120 to 170 years, which were higher than MFIs determined from local tree ring records; however, our conversations with local tribal representatives confirm that grassland fires were small, patchy, annual fires. Thus, we conclude that the fires recorded in the wetland sediment cores are most likely representative of either naturally started fires or fires started for land clearing and that the annual grassland fires documented through the TEK shared orally are not represented by these types of measurements.*

Introduction

The San Juan Islands National Monument comprises lands that are both biologically and culturally significant. The historic grasslands, also known as meadows or prairies, have at least 71 species of native and non-native herbaceous plants and shrubs (Anderson et al. 2015). Though the grasslands formed due to a warm, dry climatic period dating between 9,500 to 4,500 years before present (1950), they were actively maintained by Coast Salish peoples (Boyd 1999). Several studies have noted the recent encroachment of shrubs onto the meadows (Spurbeck and Keenum 2003; Anderson et al. 2015). In the absence of fire or other management techniques such as mowing, grazing, or manual removal, ecological succession in these areas tends to follow a pattern of “grass-dominated systems to shrub-dominated systems to tree-dominated systems,” with the most rapid migration appearing to occur along surface or near surface hydrologic flows (Anderson et al. 2015). Moreover, the combined influences of Euro-American settlers, who used the land more heavily for grazing, and more recent land development trends for luxury retirement and tourism economies, have led to an increase in non-native plant invasions (MacDougall et al. 2004). The grassland ecosystems were originally maintained for cultivation

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by Coast Salish peoples through the use of fire (Keely 2002; Spurbeck and Keenum 2003; Shebitz and Storm 2006), but even without human intervention, they have been slow to shift uniformly into shrubland primarily because of intense sun and wind exposure of their south-facing slopes (Agee and Dunwiddie 1984).

There is a general concern and debate over how to manage these lands now and into the future. The U.S. Bureau of Land Management, who currently manages these lands, must consider if their goal is to preserve cultural landscapes and to promote the proliferation of grassland species unique to the islands, or if they should allow ecological succession to occur without human influence. Such decisions are made within a complex socioecological landscape, and the local BLM office that stewards the San Juan Islands National Monument actively engages with local stakeholders to seek advice and feedback on their Resource Management Plan. Some researchers have suggested mowing the shrubs, which has worked in the Southern Appalachians to maintain the unique vegetative communities of grassy balds (Bratton and Lindsay 1979), but the steep, rocky slopes of the San Juan Island grasslands make this technique not only impractical but dangerous (Bratton and Lindsay 1979; Anderson et al. 2015). Mechanical removal by hand or small equipment would be time- and energy-intensive and would require heavier foot traffic in the off-path areas, threatening the fragile, existing lichen and plant communities (Anderson et al. 2015). The moist seeps where the shrubs are encroaching most aggressively are well enough defined that controlled burns may be feasible but may also put at risk the private homes and land that surround these windy sites (MacDougall et al. 2004; Anderson et al. 2015). As the stakeholders in these management decisions consider the use of controlled burns, they will benefit from both a greater understanding of historical fire frequencies and spatial scales and the inclusion of local tribal representatives to honor their traditional knowledge and practices by being involved in the planning and implementation of management strategies of their traditional lands.

Native peoples of the Americas have played an active role in regional fire regimes and, thus, have greatly impacted species composition in plant communities. In the Pacific Northwest, “anthropogenic fire was by far the most important tool of environmental manipulation” (Boyd 1999). Since they have been displaced from their traditional lands, fire in these areas has often decreased, been actively suppressed, or used primarily for land clearing rather than ecosystem management, changing the composition that was observed at the time of European settlement (Delcourt and Delcourt 1997; Christensen and Fesenmeyer 2010). In the San Juan Islands, the ceding of the lands of First Peoples to the U.S. Government began in the mid-nineteenth century. Despite being removed from their traditional lands, the people of Lummi Nation still have a strong cultural presence in the area, and many still live in the region off the coast of Bellingham, Washington, on Lummi Island (Lawrence, personal communication, 2017:Figure 1).

Lummi Nation, Samish Indian Nation, Swinomish Nation, Songhees Nation, and Saanich Nation are just some of the Coast Salish tribes that once coexisted on what is now San Juan Archipelago (Taylor et al. 2011). Bulbs from great camas (*Camassia leichtlinii*) were a staple of the Coast Salish diet, and though this carbohydrate-rich food was naturally abundant (Lepofsky et al. 2005), they actively

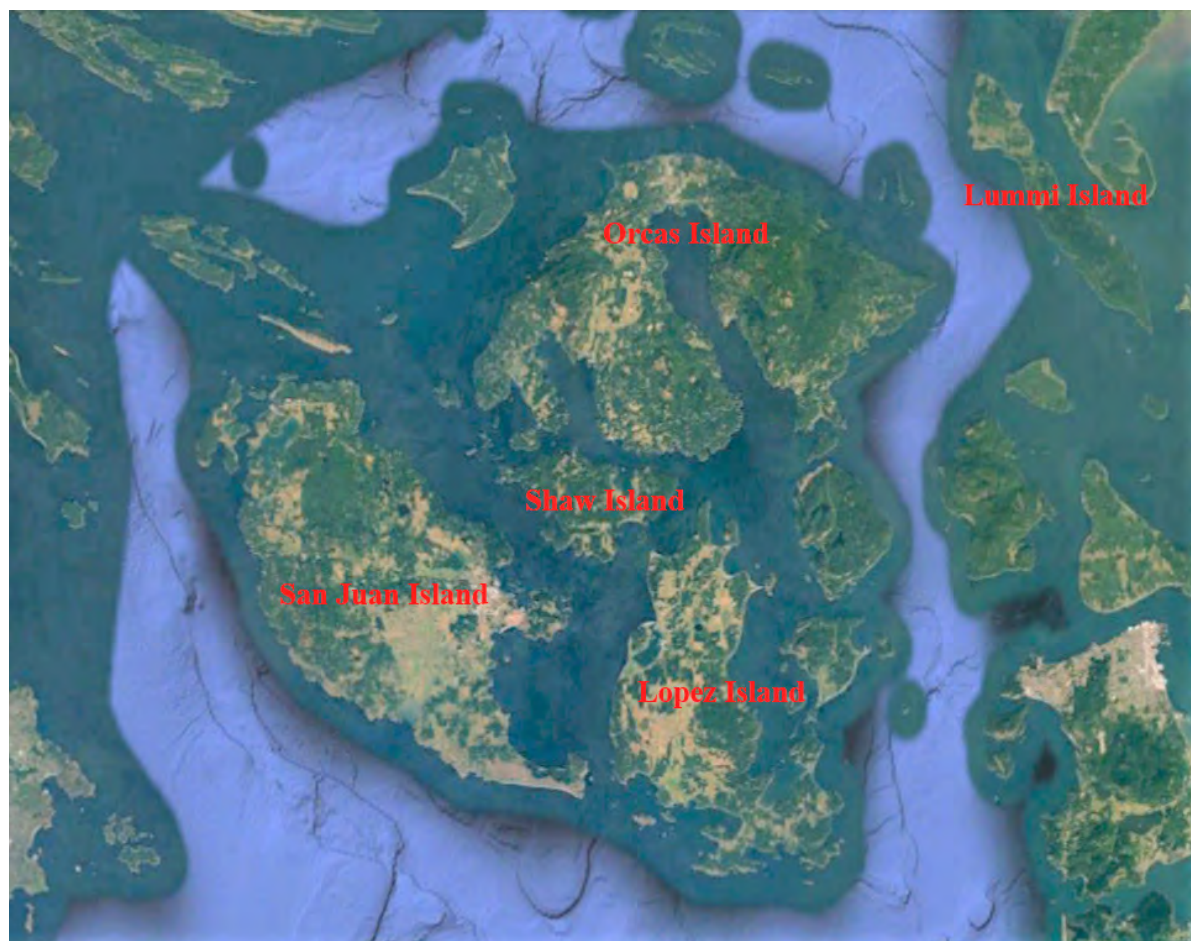


Figure 1. San Juan Archipelago, USA. Image from Google Earth.

managed camas beds to keep this food source dependable. While the islands were shared by many tribes, individual families had traditional grounds for camas beds for at least 2,000 years (Taylor et al. 2011), coinciding with population growth and greater cultural complexity in Coast Salish social systems (Boyd 1999). The Coast Salish set fire to camas (and other root crop) beds following the late May to June harvest to ensure a productive crop the following year (Boyd 1999). A study on the productivity of one species of camas (*Camassia quamash*) in response to varying burn intervals showed that camas burned annually or biannually was significantly more productive than if it was burned less frequently (Shebitz and Storm 2006). Derr (2014) explains that Coast Salish peoples on Valdes Island, northwest of the San Juan Islands, also used fire regularly in their management of crops, leading to the formation of complex economies.

Ecological knowledge accumulated by the Coast Salish allowed them to burn and to plant at the right times for successful harvests (Derr 2014). Their use of fire to keep the grasslands from becoming shrub- or tree-dominated demonstrates their understanding of ecological succession in plants (Boyd 1999). Their spiritual practices were also tied closely with seasons of their physical environment (Grim and Tucker 2014). These involved showing gratitude for agriculture, hunting, and fishing, as these processes nurtured and gave life to the Salish people. It is the tradition of

many of these tribes to hold ceremonies honoring the root crops, including great camas, that involved song, dance, feasting, and healing (Grim and Tucker 2014). Their spiritual and ecological knowledge, considered to be inherently linked, have nurtured a value of environmental stewardship in these communities.

Ecologists and anthropologists alike have often disregarded the role that humans have played in ecosystem functioning and have overlooked traditional ecological knowledge (TEK). Sadly, much of this critical information has been lost with the passing of the tribal elders (Boyd 1999), and yet the need to learn and apply their knowledge only increases with time. This study integrates paleoecological data with a cultural consideration of traditional land management strategies of the San Juan Islands, using firsthand accounts from Native peoples to provide a more complete picture of fire history in the San Juan Islands. Analyzing charcoal accumulation rates (CHAR) collected from wetlands within forests adjacent to two major grasslands on Lopez Island and San Juan Island, we hypothesized that fire frequency declined after Euro-American settlement as the Coast Salish tribes were largely displaced during this time. We also expected that the results from the sediment cores would closely resemble the fire frequency known from Coast Salish oral history.

Methodology

San Juan Archipelago

The San Juan Archipelago comprises over 400 islands in the Salish Sea (Figure 1). The islands are characterized by relatively cool, dry summers and wet, mild winters, with prevailing west winds. The islands are much drier than most of the region as they are in the rain shadow of the Olympic Mountains, which receive up to 500 cm of precipitation each year (Agee and Dunwiddie 1984). Orcas Island is higher in elevation than San Juan and Lopez Islands, so it receives between 76–114 cm of rainfall a year compared with 51–64 cm in the other two islands (Taylor et al. 2011). The islands are characterized by their rocky beaches, open grasslands and rock outcrops, and coniferous forests dominated by Douglas-fir (*Pseudotsuga menziesii*), grand fir (*Abies grandis*), western red cedar (*Thuja plicata*), and western hemlock (*Tsuga heterophylla*) (Taylor et al. 2011).

Iceberg Point

Two of the four organic sediment cores were collected from wetland depressions dominated by rushes (*Juncus* spp.) and horsetails (*Equisetum* spp.) and surrounded by red alders (*Alnus rubra*) on forested private property adjacent to Iceberg Point (Figure 2; see Table 1 for coordinates). Iceberg Point is on the southwest shore of Lopez Island, Washington, and overlooks the Strait of Juan de Fuca. The federally protected public area, now managed by the Bureau of Land Management (BLM), is a designated “Area of Critical Environmental Concern” (ACEC) (Spurbeck and Keenum 2003). This site contains almost every habitat within the San Juan Archipelago. Some of the most notable grassland species include those traditionally cultivated by the Coast Salish, including great camas, chocolate lilies (*Fritillaria camschatcensis*), Hooker’s onions (*Allium acuminatum*), and harvest brodiaea (*Brodiaea coronaria*). Thomas (2006) provides historical and



Figure 2. Lopez Island study sites. Images from Google Earth.

paleoecological evidence that Native people used fire to manage grassland species at this site. This site is a high priority for conservation not only for its unique flora and cultural history, but also because the grassland habitats are being threatened by a number of anthropogenic and ecological forces including encroachment of shrub species into the grasslands.

Cattle Point and American Camp

The other two organic sediment cores were taken from wetland depressions on private property adjacent to the American Camp unit of the San Juan Island National Historical Park, which includes a large south-facing grassland that is contiguous with the Cattle Point area (Figure 2; see Table 1 for coordinates). One of these wetland depressions was dominated by rushes and sedges (*Carex* spp.) and was in an open field previously used for grazing, and prior to that, forested. The other wetland depression was in a forested area similar to the two sites near Iceberg Point on Lopez Island. Cattle Point, which is managed by the BLM, is on the southeast corner of San Juan Island, west of Iceberg Point, and overlooking Cattle Pass, a narrow straight that separates San Juan Island from Lopez Island. Clay bowls and stone structures dating between 2,500 and 3,500 years ago (ya) have been found at archaeological digs at Cattle Point (Stein 2000). Others claim that people have used the grasslands along the south shore of San Juan Island for at least 5,000 years (Thomas 2006). Regardless of how long humans have utilized its

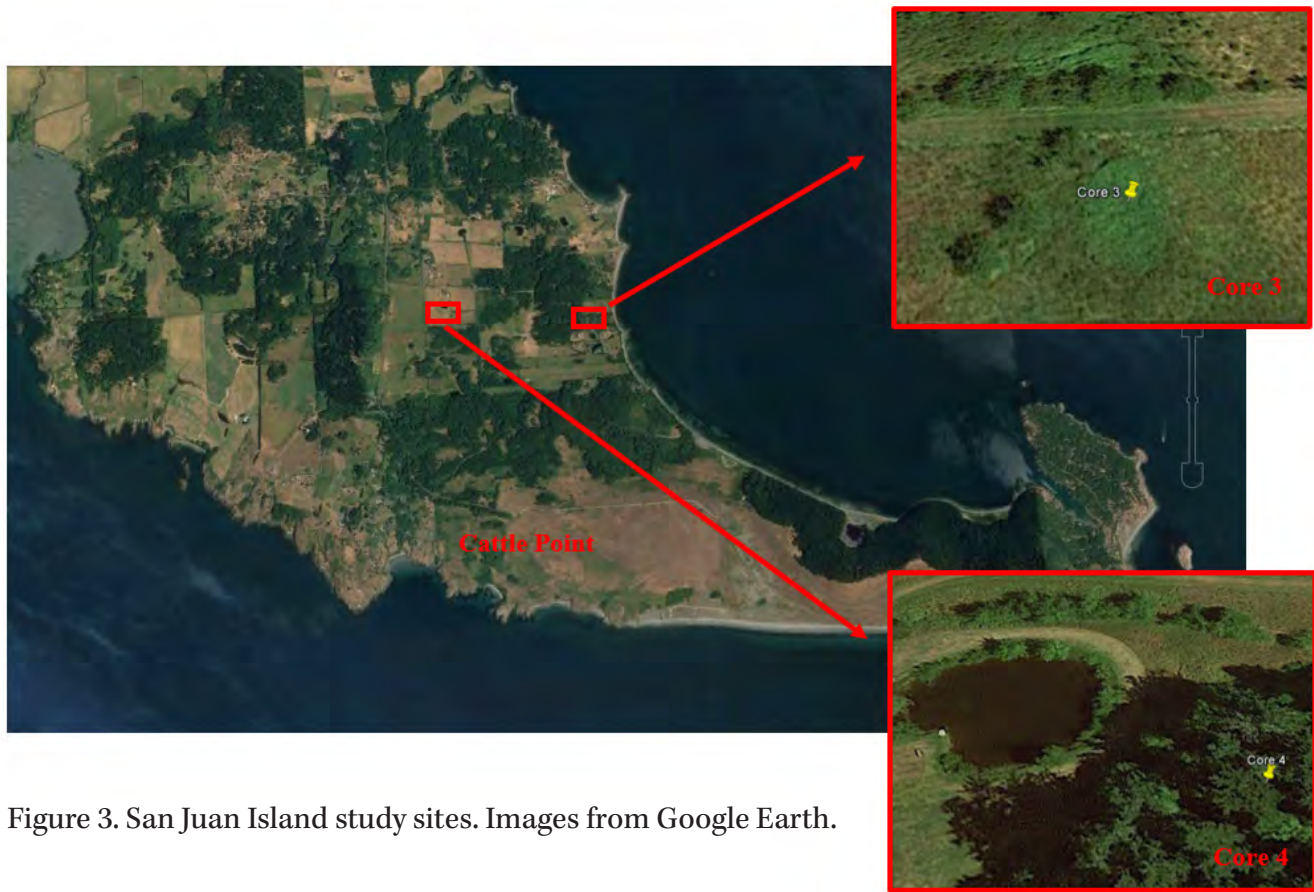


Figure 3. San Juan Island study sites. Images from Google Earth.

Table 1. Site Descriptions for Cores 1–4

	Core 1	Core 2	Core 3	Core 4
Site	Lopez Island		San Juan Island	
Location	(48.42345, -122.87788)	(48.42359, -122.87687)	(48.47272, -123.02669)	(48.47191, -123.01144)
Distance from the Grasslands	~200 m	~250 m	~700 m	~800 m
Core Length	36 cm	50 cm	36 cm	37 cm

southern exposure grasslands, Cattle Point was most likely occupied seasonally, and particularly in the summer during the salmon runs (Stein 2000). Agee (1987) suggests the southeastern slopes of San Juan have been an historic grassland rather than a forest because of its sandy substrate, fierce winds, and little rainfall; thus, it is highly unlikely that people would have built houses or lived at Cattle Point for the entire year.

Organic Sediment Collection

Four sediment cores were taken from different wetlands of San Juan Island and Lopez Island that were dominated by rushes and sedges (Figure 4). All cores were collected using a half-spoon, 4-cm diameter by 1-m length Eijkelpush corer (Figure 4) and coring proceeded to refusal (bedrock). Cores were not taken in the dry grasslands on public land because, unlike grasslands, wetlands can provide a continuous fire history. The anaerobic conditions in wetlands are more likely to preserve soil organic matter, while upland sites are more likely to be impacted by wind, erosion, oxidation of organic matter, and other factors, which can result in gaps and mixing within the sediment record (Gavin 2003; Grissino-Mayer et al. 2008).

Radiocarbon Analysis

Four basal samples and two mid-core samples of organic sediments were sent to International Chemical Analysis for AMS radiocarbon dating of bulk organic sediments. Radiocarbon analysis was performed following standard procedures for organic sediments and calibrations were calculated using CALIB Rev. 7.1.0 and the IntCal13 calibration database (Reimer et al. 2013). Linear interpolation was used to assign ages between dated horizons and the age/depth models were based on the mid-point of the sediment section used for radiocarbon analysis and the median, 2σ age in cal yr BP (present = 1950).



Figure 4. Collecting a soil core from a fen, characterized by the rushes and sedges, on San Juan Island.

Macroscopic Charcoal Analysis

The soil cores were sampled for macroscopic charcoal at 1 cm intervals using a 1.5 cm diameter plastic syringe, sampling along the long axis of the cores beginning at the core base. The syringe was inserted 1 cm into the core, and the sample was removed for further processing. The remaining portion of that sample interval (outside of the 1.5 cm sampled volume) was sliced from the core using a blade. The next 1 cm interval was then sampled as described above and the process was repeated for the full length of the core. Samples were then processed for macroscopic charcoal counting using standard methods (Whitlock and Larsen 2001; Mooney and Tinner 2011). Briefly, samples were soaked in a 3% solution of cosmetic grade H₂O₂ for 24 hours in order to bleach the non-charcoal organic sediments to aid in identification of charcoal particles (Schlachter and Horn 2009). Samples were then passed through nested 240 µm and 120 µm sieves using water. The 120 µm fraction was transferred to a petri dish, air dried, and then counted using a binocular microscope at 10–40x magnification. Charcoal counts were divided by sample volume and then multiplied by the sedimentation rate in order to calculate charcoal accumulation rates, or CHAR, in number of pieces per square centimeter per year. Charcoal counts were used to estimate fire history instead of area or volume tabulations, as the method is simpler, and research has shown that the three proxies provide comparable results (Ali et al. 2009). Macroscopic charcoal records have been used extensively in the Pacific Northwest to reconstruct local fire histories (Walsh et al. 2015 provides a synthesis and references many local records).

Charcoal records for sites 1, 3, and 4 were separated into background and peak components and a threshold was used to identify fire events at or near the sample site using a statistical analysis with CharAnalysis software and established methods (Higuera et al. 2008; Higuera et al. 2009). Briefly, CHAR was interpolated to time steps corresponding approximately to the median temporal resolution of each record for Cores 1 (13 years), 3 (24 years), and 4 (23 years) separately. The records were not log transformed. Background CHAR was estimated using a LOWESS smoother, robust to outliers. The low frequency background component was subtracted from the interpolated charcoal distribution to construct a residual series (charcoal peaks). A Gaussian mixture model was used to identify noise, which can result from sediment mixing, sampling, analysis, and through other natural processes. The 99th percentile of the locally determined noise distribution was used as a threshold to separate the distribution into fire and non-fire events. Window widths were determined by selecting the smallest smoothing window possible to achieve a signal to noise index (SNI) > 3 (Brossier et al. 2014). This resulted in a window width of 150 years for core 1, 250 years for core 3, and 600 years for core 4. The statistical analysis was not attempted for core 2 because of suspect age control (see below). The CharAnalysis software is freely available at <http://CharAnalysis.googlepages.com> (Higuera et al. 2008; Higuera et al. 2009).

Traditions Shared by Coast Salish and Other Experts

In May 2017, we met with two different members of Lummi Nation, Shirley Williams and Robert Eagle Bear Lawrence. We also spoke with Todd Woodard, the Director of Natural Resources for Samish Indian Nation, who shared with us some

of the current and past land management strategies, including the use of fire. We asked each of them if they would be willing to share what they knew about the traditional ecological knowledge of the San Juan Islands and Coast Salish use of fire to manage landscapes.

Results

Radiocarbon and Macroscopic Charcoal Analysis

Radiocarbon age estimates are presented in Table 2 for Cores 1 through 4. The calibrated 2σ median age and the mid-point of the interval sampled for radiocarbon determination were used to calculate a sedimentation rate of 0.075 cm/yr for Core 1, 0.042 cm/yr for Core 3, 0.043 cm/yr for the top of Core 4 (or Zone 1, from 0 to 19.5 cm depth), and 0.011 cm/yr for the bottom of Core 4 (or Zone 2, from 19.5 to 32.5 cm depth). Core 2 was not used for sedimentation rate calculations or for fire history reconstruction because the mid-core radiocarbon sample returned a greater than modern age estimate (Table 2), confounding development of an age/depth model for that core. C-14 activity for the 23–25 cm-deep radiocarbon sample from core 2 suggests that it dates within the bomb peak period, with an estimated age of Cal 2000 to 2010 AD (92% probability).

Results of the statistical analysis of the charcoal record are presented in Figure 5. Ages are estimated using linear interpolation between dated horizons and between the most recent dated horizon and the surface sample, which was assigned an age of -67 cal. yr BP (samples were collected in 2017). Cores were interpolated to a median sample resolution of 13 years for Core 1, 24 years for Core 3, and 23 years for Core 4 for the fire history reconstruction using CharAnalysis. The

Table 2. Radiocarbon Results for Cores 1 Through 4

Core	Depth	Conventional Radiocarbon Age (yrs BP)	Calibrated 2σ Range (cal yr BP)	Calibrated 2σ Range Median (cal yr BP) ^a	Dated Material	Laboratory Number ICA-
1	33–36 cm	340±30	311 to 480	391	Organics	17OS/0507
2	23–25 cm	> Modern	n/a	n/a	Organics	17OS/0508
3	46–50 cm	1300±30	1181 to 1214 1220 to 1290	1244	Organics	17OS/0509
4	30–36 cm	800±30	675 to 766	714	Organics	17OS/0510
5	17–22 cm	340±30	311 to 480	391	Organics	17OS/0511
6	30–35 cm	1650±30	1418 to 1461 1484 to 1490 1517 to 1620 1677 to 1686	1553	Organics	17OS/0512

^a The calibrated 2σ median age (in cal yr BP, present = 1950) was used for development of the age/depth model. C-14 activity for the 23–25 cm interval from core 2 suggested a post-bomb age of either Cal 1956 to 1957 AD (3.1% probability) or Cal 2000 to 2010 AD (92.3% probability).

statistical analysis suggested 4 fire events for the 478 years represented in Core 1, 5 fire events for the 852 years represented in Core 3, 3 fire events for the 458 years represented in zone 1 of Core 4 (-67 to 391 cal. yr BP), and no fire events for the 1,564 years represented in zone 2 of Core 4 (391 to 1955 cal. yr BP). Zone 1 of Core 4 represents the sample interval between the surface and the mid-core radiocarbon age determination and zone 2 represents the sample interval between the mid-core and the basal radiocarbon age determination. Charcoal concentration data are presented for Core 2 vs. depth (Figure 6), although no statistical analysis was attempted because of the difficulties encountered in constructing an age/depth model. The mean fire return interval (MFI), defined here as the total years of record in each core or zone divided by the number of identified fire events, was calculated at 120 years for Core 1, 170 years for Core 3, and 153 years for zone 1 of Core 4. Core 1 was collected approximately 200 m from the current northern edge of the grasslands on Iceberg Point (Table 1). Core 3 was collected 700 m from the Cattle Point and American Camp grasslands. Core 4 was collected 800 m away from the grasslands at Cattle Point. We observed that Core 1, which was the core collected closest to the grasslands, had the lowest MFI.

These apparently high fire return intervals do not provide enough data to sufficiently evaluate the hypothesis that the fire frequency would be greater before the Euro-American settlement compared to after. With intervals ranging from 120–170 years, only one or two post settlement fires are recorded in the cores, and the number of usable cores is not sufficient for statistical analysis of differences in intervals before vs. after settlement (Table 1).

Summaries of Traditions Shared by Coast Salish and Other Experts

Robert Eagle Bear Lawrence (2017), a direct descendant of Chief Seattle, recounted that the Lummi used fire for cooking, comfort, grieving, and memory. Fire is considered to be a doorway to the other world. After farming an area for a year, the Lummi would burn the land, which allowed for the land “to heal.” In other words, the use of fire was a crucial step for regeneration of the land. According to Lawrence (2017), they burned the land using special herbs for the summer solstice and moved on to planting in another patch of the islands (Lawrence, personal communication, 2017). His account of the phenology of burning differs slightly from that of the literature, which state that burns by the Coast Salish occurred in early autumn (Boyd 1999).

Todd Woodard (2017), employee of Samish Indian Nation, confirmed that the Samish used fire in the San Juan Islands to manage camas. The Samish lived alongside the Lummi and other Coast Salish tribes. They had family camps in the summer, and the main village sites for the Samish are in present day Anacortes, Washington, as well as Lopez Island, Guemes Island, and Samish Island. The great camas flourished through the use of regular fire, but they had to be careful to distinguish between great camas and death camas, which is poisonous. They dug up the death camas, which has a white inflorescence, after it bloomed to avoid confusion between the two (Woodard, personal communication, 2017).

Shirley Williams (2017), member of Lummi Nation, explained that it has been the mission of the Lummi “to support the natural, cultural, and historical

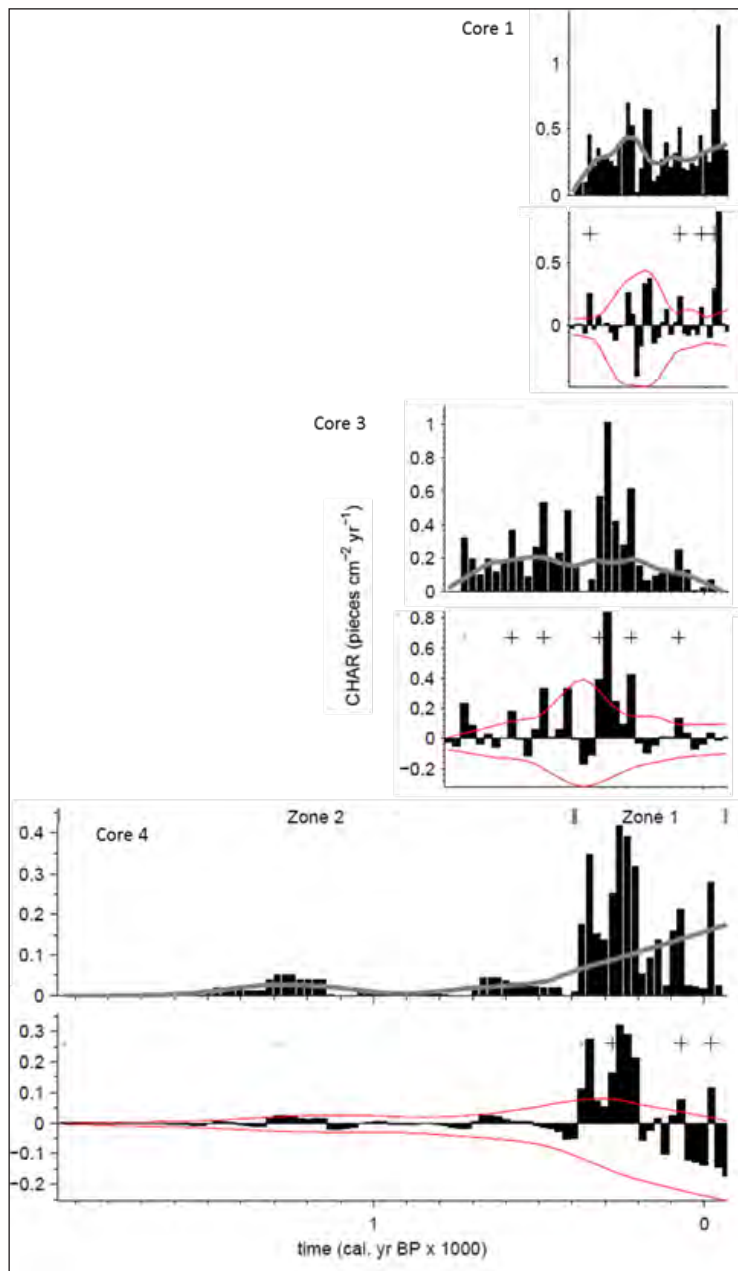


Figure 5. Results from the CharAnalysis statistical model including interpolated CHAR (bars in the upper graphs for cores 1, 3, and 4) and background CHAR (gray lines in upper graphs). CHAR is plotted on the bottom graphs (bars in lower graphs) as background CHAR subtracted from interpolated CHAR, with thresholds identifying peaks also shown (upper and lower gray lines in the bottom graphs). Identified peaks are indicated with “+” symbols. Peaks that did not pass the Poisson minimum-count criterion are displayed with gray dots. Graphs from all 3 cores are plotted along the same x-axis, with 0 cal. yr BP displayed on the right side of the graphs, with sample age increasing to the left. Note that y-axis scaling varies between the 3 cores, although all are plotted using the same units.

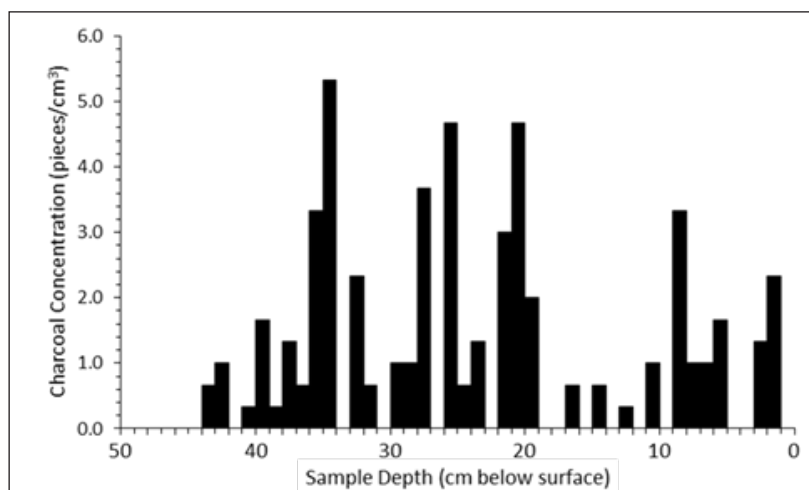


Figure 6. Charcoal concentration vs. sample depth plotted for Core 2, where an age/depth model was not attempted.

restoration of the Salish Sea region for the next seven generations.” She acknowledged President Obama’s recognition of the profound cultural history of the Coast Salish People as being beneficial for the restoration of their culture. In Obama’s Proclamation 8947, he established the San Juan Islands National Monument using his authority from the American Antiquities Act of 1906 (16 USC 431–433) to preserve sites with particular historical or cultural significance. Williams believes that fire management for agricultural reasons has an important place in educational programs like the 13 Moons Community Garden and that this kind of field work should be taught in schools (Williams, personal communication, 2017).

Discussion

The mean fire return intervals (MFIs) vary across three sites, and the hypothesis that the fire frequency declined after Euro-American settlement could not be evaluated because of the limited number of fire events identified in each core (Figure 5). The MFIs calculated for cores 1, 3, and zone 1 of Core 4, which all represent the most recent ~400 to 800 years, are relatively similar to each other, ranging from 120 to 170 years. The modern radiocarbon age estimate returned for Core 2 suggests that there may be significant sediment mixing for at least the top half of the core, perhaps due to recent disturbance at the site. Given that it is not possible to know the total depth of disturbance, further interpretation of Core 2 sediments is not attempted. No fire events were identified in zone 2 of Core 4 and it is difficult to interpret why there are no identified peaks over this >1500 year interval (from 391 to 1955 cal. yr BP), especially given that this was known to be a time of high fire frequency in the Pacific Northwest (Walsh et al. 2015; Hoffman et al. 2016). Our MFIs from our study sites on the San Juan Islands suggest a slightly higher late Holocene fire frequency than an estimate for the entire Holocene of 2.97 fires per 1,000 years per site for 17 Pacific Northwest charcoal records summarized in Walsh et al. (2015). Our MFIs agree well with a mean individual tree fire return interval of 104 years estimated from a tree ring record from Waldron Island, Washington, for the settlement/modern period (1880 to 2004 AD) but are much higher than those estimated for the historic period (1700 to 1879 AD) in that same record (Sprengr and Dunwiddie 2011). Our MFIs are also higher than those determined for tree ring studies conducted near our field site discussed in more detail below (Spurbeck and Keenum 2003; Bakker et al. 2016). It is obvious that the charcoal records from cores 1, 3, and 4 are not capturing the more frequent fires, known from oral history, which occurred in the grasslands near the coring locations.

It is possible that the more fragile grassland charcoal did not survive transport to our coring locations or that the smaller size of this charcoal tended to pass through the mesh of our 120 μm sieve and would have been captured by a smaller, 60 μm sieve (see Leys et al. 2017). According to Mooney and Tinner (2011), charcoal particles greater than 100 μm typically do not travel more than 100 m from their source, but for each of the four cores, the distance from the grasslands was greater than 200 m (Table 1). It is also possible that a more detailed analysis that included separating different charcoal morphotypes (e.g., separating charcoal from herbaceous sources vs. woody sources) would have revealed some of these fires (see Walsh et al. 2008, 2018; Leys et al. 2017). We suggest that future attempts

to reconstruct MFIs for grasslands near our study sites employ these methods.

Spurbeck and Keenum (2003) reconstructed the fire history of Iceberg Point by analyzing the scars on tree rings. The benefit to this method is that the exact year a fire occurred can be determined, and if enough trees are sampled, local and regional fires can be differentiated. This is because regional fires should be detected from the scars of most trees, while local fires, being smaller and less intense, are shown in the scars of only a few trees. Using live trees, Spurbeck and Keenum (2003) dated fires back to the year 1584 but were not able to reconstruct fire history beyond this date. This is why using soil charcoal to reconstruct fire history is ideal for demonstrating trends up to several millennia if there is a sufficiently long organic sediment record. Spurbeck and Keenum (2003) document a significant reduction in fires since 1870, which they attributed to the decreasing influence of the Coast Salish and the increasing influence of Euro-American settlers on the land. They also note that the last major fire event in the grasslands of southern Lopez Island occurred in 1916. Based on the trees they sampled, fires occurred between 4 and 39 years before European settlement and between 24 and 63 years since the early twentieth century (Spurbeck and Keenum 2003).

Bakker et al. (2016) used similar methods involving tree rings to Spurbeck and Keenum (2003) to reconstruct the fire history of two locations in the San Juan Archipelago: Turn Point on Stuart Island and Kellett Bluff on Henry Island. By differentiating between historical (1780–1895) and post-settlement (1896–2011) periods, they found that the historical MFI at Kellett Bluff was 6 years, while the post-settlement MFI was 27 years. At Turn Point, the historical MFI was 6 years, while the post-settlement MFI was 14 years. Individual trees were scarred on an average of every 48 years, and they found that only in 7 individual years were there fires recorded by two or more trees at each site (Bakker et al. 2016). They also found that trees survived an average of four fires, which supports that fires in the grasslands were human-ignited because of their low intensity. Like Spurbeck and Keenum (2003), their analysis of fire history in the San Juan Islands was limited by the age of the trees in their study. However, the advantage to both of these studies is that they could sample trees on or near the grasslands and, thus, were not limited by the proximity of wetlands to the grasslands.

Our second hypothesis that the cores would demonstrate a fire regime similar to that known from Coast Salish oral history was not supported. Our cores likely record the fire history of the surrounding forests and not the adjacent grasslands, and they are also more consistent with higher MFIs calculated from trees in the forests, rather than the grasslands, of tree ring studies. For example, Spurbeck and Keenum (2003) demonstrate that areas nearby but not directly adjacent to the grasslands at Iceberg Point had an MFI of 44.5 years, while the MFI was 14.8 years for the grasslands (Spurbeck and Keenum 2003).

According to our results, fires occurred more frequently in the San Juan Islands than they did in some surrounding areas, including Vancouver Island and mainland British Columbia. Lertzman et al. (2002) found that the MFIs in Fraser Valley and Clayquot Valley were 1,299 years and 2,380 years, respectively. In some locations, almost no fires occurred throughout the entire Holocene, indicating that fire does not play a large role in these forest ecosystems (Lertzman et al. 2002). Agee

(1985) also explains that fire exclusion has not significantly affected the Olympic Mountains, Washington, because the MFIs are naturally centuries-long. This is not the case for the drier San Juan and Lopez Islands. These plant communities—in grasslands and forests alike—have adapted to low intensity, frequent fires. While the fire frequency is lower in the forests than in the grasslands (Spurbeck and Keenum 2003), our results indicate that fire, whether lightning-ignited, human-ignited, or a combination thereof, also shaped the forests of the archipelago.

It is also clear, however, that this conventional scientific analysis of wetland sediments does not document anthropogenic, annual, patchy grassland fires that we know occurred in the San Juan Islands through Coast Salish oral history. Both tree ring studies and CHAR analysis of wetland sediment cores may capture either more localized fires within a forest or more regional fires, but likely do not record the small patchy fires that are clearly recorded in traditional ecological knowledge. Thus, intergenerational Indigenous knowledge should be used together with paleoecological and archaeological data to inform management solutions (Turner and Clifton 2009). The grasslands of the San Juan Islands are important cultural as well as ecological landscapes (Thomas 2006), which should be preserved as part of the global cultural and natural heritage. Thus, considering Coast Salish traditional knowledge, values, and goals should be central to the process of resource management planning.

We also recognize that the southern grasslands of the San Juan Islands are not isolated from adjacent landscapes, including private residences. Aside from potential concern that fires could spread into the backyards of San Juan and Lopez residents, Agee (1993) explains that fire-absent landscapes may not respond in the same way they did when regular fire was included in land management or occurred naturally. Potential losses and gains of habitat for wildlife, as well as shifts in nutrient cycling and primary disturbance agents (insects, disease, etc.) in these ecosystems may occur when fire is reintroduced after periods of suppression (Agee 1993). Since Coast Salish oral traditions may provide insight about the period during which social complexity and use of fire to manage grassland species increased (Lepofsky et al. 2005), they might also help us understand and predict what happens when fire is reintroduced into areas previously experiencing fire suppression. Land managers and other stakeholders based in the San Juan Islands should maintain and strengthen their relationships with local tribal representatives and build foundations of trust and respect needed to share knowledge and collaborate on future management decision-making.

In summary, the information that was shared by Coast Salish people affirms that Native peoples had burned small patches of grasslands annually. This frequency is not reflected in the current and previous reconstructions of fire history from wetland cores or tree rings across the southern ends of Lopez and San Juan Islands, as the fires recorded in trees and wetland soils may be more representative of larger fires that were either lightning-ignited, accidental spreads of grassland fires into forests, or fires used for land-clearing in post-settlement eras. Acknowledging that our scientific methodologies may fail to document fully known histories, we must seek, listen to, and incorporate the traditional ecological knowledge of present day Native peoples about how to live on and with the land.

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UNDERSTANDING THE FIRE HISTORY OF THE SAN JUAN ISLANDS

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The Influence of Coastal Geomorphic Processes on Terrestrial Archaeological Site Distributions: A Puget Sound Example

J. Tait Elder, Melissa Cascella, and M. Shane Sparks

Abstract *In this study, we consider archaeological site distributions through the lens of shoreline geomorphology. Using publically available shoreform data, we categorized the shoreline in our study area into three geomorphic types: depositional, erosional, and stable. Following this, we grouped all documented precontact archaeological sites located adjacent to the shoreline by geomorphic shoreline type. This analysis revealed that the distribution of nearshore precontact archaeological sites is strongly related to geomorphic shoreline type, with precontact archaeological sites disproportionately distributed along depositional and stable shoreforms.*

Introduction

Archaeologists commonly consider how a range of environmental attributes and patterns of historical landscape use co-occur with archaeological sites in order to efficiently locate and study them. With the widespread adoption, and ever-increasing mastery, of statistical analyses and geographic information system (GIS) modeling in archaeology, efforts to predict the distribution of archaeological sites has become increasingly refined and complex in the Pacific Northwest (e.g., Maschner and Stein 1995; Mackie 2001, 2003). Despite this, the extent to which the location of as-yet undocumented archaeological sites can be reliably predicted is often highly variable by region and environment. Although there are likely many reasons for this, we suspect that at least one is the limited consideration for geomorphic forces and their effects on archaeological site preservation and visibility.

A handful of studies have considered geomorphic forces effects on archaeological site visibility and preservation and how these forces can serve as a disproportionate or selective filter for the types and conditions in which archaeological sites preserve (Ferring 1986; Guccione et al. 1998; Rosenthal and Meyer 2004; Clevis et al. 2006; Taylor et al. 2011; Elder et al. 2014). While, in some environments, the influence of these processes may be too minor to substantively affect the archaeological record, they should at least be considered in order to attempt to increase the accuracy and/or precision of a given predictive model—particularly in active and high energy geomorphic environments like fluvial and coastal environments.

The coastal margin of Washington State is a useful case study for examining the extent to which geomorphic processes play a role in accounting for archaeological site distribution. Much of the ethnographic and archaeological literature indicates that the precontact peoples of the region used the riverine and coastal margins extensively (e.g., Haeberlin and Gunther 1930; Smith 1940; Tweddell 1974; Ames and Maschner 1999; Hilbert et al. 2001). Highlighting this pattern of regional precontact land use, the Washington Department of Archaeology and Historic

Preservation's (DAHP) archaeological site predictive model depicts nearly the entire coastline as having high sensitivity to contain archaeological sites. This model considers variables such as slope, distance to water, and other factors. Despite the apparent widespread conditions that are favorable for human use, the authors' previous review of a sample of 43 coastal archaeological sites from the Puget Sound revealed that these sites tend to be distributed across depositional and stable landforms such as barrier beaches, barrier estuaries, and open coastal inlets (Elder et al. 2015). A similar pattern was also observed for a unique subset of archaeological sites (i.e., fish weirs) along the coastline of Washington State (Elder et al. 2014) where the majority of these resources appear to be located in embayments that are subjected to very slow depositional forces—the same forces that comprise a very small percentage of the overall coastline.

In this study, we consider the distribution of coastal archaeological sites through the lens of coastal geomorphology on San Juan Island, one of several islands in the San Juan archipelago, located in the northern Puget Sound and Strait of Juan de Fuca (Figure 1). Our study demonstrates that coastal archaeological

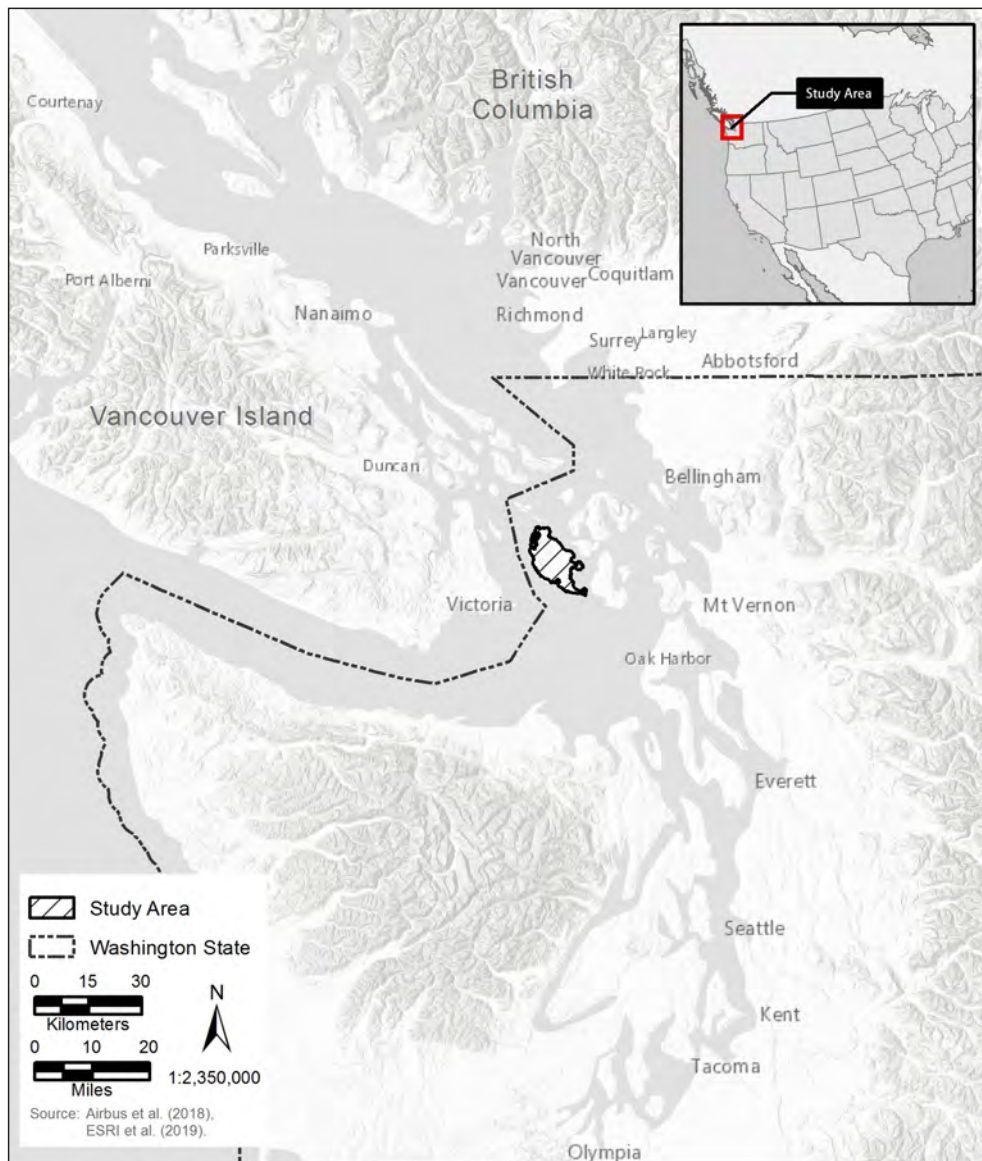


Figure 1. Study area vicinity.

sites are overwhelmingly associated with depositional and stable landforms, and are rarely present on erosional landforms—which are widespread in the Puget Sound shoreline (Downing 1983; Shipman 2008). Our study reinforces the idea that, especially in highly active geomorphic environments, post-depositional processes play a significant role in accounting for archaeological site distribution across the landscape. Knowledge of such post-depositional processes can help us to better understand past human use of landscapes, address potential bias associated with post-depositional processes and their effects on archaeological resources, and to improve the reliability of archaeological predictive models for the purposes of managing the archaeological record.

Our project set out to evaluate a simple proposition. We expected to find that archaeological sites are more likely to preserve on shorelines primarily subject to depositional or stable geomorphic forces than on erosional shorelines. To evaluate this expectation, we developed statistical tests to compare the relative frequency of archaeological sites along depositional/stable shorelines and erosional shorelines.

Study Area

San Juan Island is the second largest of 128 named islands that make up the San Juan archipelago in the central Salish Sea. Located approximately 72 miles northwest of Seattle, Washington, and 45 miles south of Vancouver, British Columbia, San Juan Island was traditionally used by six groups that spoke the Northern Straits dialects of the Salish language (Suttles 1951, 1990). Of these, four groups—including the Lummi, Saanich, Samish, and Songhees—are known to have had winter villages throughout the islands (Suttles 1951). Between late winter and spring, salmon returning seasonally from the Pacific Ocean to the rivers of the northeastern Puget Sound and the Fraser River through the narrow channels between the San Juan and Gulf Islands were caught off the shores of the San Juan Islands via trolling. The shores of the San Juan Islands were also productive shellfish gathering grounds (Suttles 1990). The island has approximately 87 miles of shoreline, which range from Mesozoic-aged bedrock platforms and plunging shorelines, to bluffs comprised of Pleistocene-aged glacial and non-glacial deposits, to pocket beaches, tide flats, and barrier beaches comprised of Holocene-aged sediments (Washington Department of Natural Resources 2016).

Methods

A three-step process was used to test the expectation that archaeological sites are more likely to preserve on depositional or stable shorelines than on erosional shorelines. The first step was to obtain shoreform classification data for the study area from the Puget Sound Nearshore Research Group (PSNRG) (2012). This dataset relied on United States Geographic Survey topographic and light detection and ranging (LiDAR) data normalized to 10-meter resolution, and used the shoreform typology proposed by Shipman (2008). Once this data was compiled, previously collected LiDAR and in-person field visits were used to further verify and refine the distribution of shoreform types. For example, the

PSNRG data classified much of South Beach on the southern shore of San Juan Island as bluffs; however, the relatively low and flat topography, and the presence of multiple rows of landward-to-seaward berms suggests that this beach is more appropriately classified as a barrier beach. Based on this review, approximately 10% of the shoreline in the study area was reclassified for the purposes of this analysis.

Once the study area's shoreline was categorized by shoreform type, the second step was to divide shoreform types into three categories based on the primary geomorphic force that formed them (e.g., erosional, depositional, and stable) (Table 1). These categories include erosional (landward wearing of the shoreline), depositional (seaward accumulation of sediment along the shoreline), and stable (limited change in the position of the shoreline over time). Based on the findings presented in Elder et al. (2015), and the expectations presented above, erosional shoreforms were considered to have low probability for containing archaeological sites, whereas depositional and stable shoreforms were considered to have high probability for containing archaeological sites. To account for possible ambiguity associated with the boundaries of depositional and stable shoreform types, they were buffered by a 50-meter area in instances where they intersected with erosional areas.

The third step was to obtain and analyze archaeological site data distributions in relation to these shoreform types. Location and site contents data for all precontact archaeological sites located within 50 meters of the shoreline within the study area were obtained from DAHP on May 15, 2015. Based on DAHP records, each archaeological site was assigned a type based on the primary artifacts and features that they contained. While this information was not necessarily directly relevant for the specific purpose of this analysis, it is included in the results section below for reference. Site location data were then analyzed relative to whether sites were located on erosional, depositional, or stable shoreforms. With this information, a two-tailed, Chi-square goodness of fit analysis was used to determine whether the difference in the distribution of sites by geomorphic force was statistically significant. In order to perform this analysis, the frequency of archaeological sites were considered relative to the total length of two shoreform types—(1) those classified as depositional or stable and (2) those classified as erosional.

It is important to note that archaeological sites analyzed in step three were identified during a series of unrelated development, agency inventory, and academic projects rather than as part of a comprehensive shoreline survey. As a result, it is plausible that additional undocumented coastal archaeological sites are present but unaccounted for in this model. While this factor adds uncertainty to the analysis, the robust sample of previously documented archaeological sites along the shoreline appears to be sufficient to assess whether there are broad patterns in distribution of archaeological sites. Another consideration is that by selecting a sample of archaeological sites located along the present-day coastal margin, this study is likely to disproportionately reflect the distribution of precontact archaeological sites from the late Holocene. Older coastal sites are likely to have been inundated or eroded as sea levels have transgressed during the Holocene epoch.

Table 1. Shipman's (2008) Shoreform Type Sorted by Primary Geomorphic Force

Erosional	Depositional	Stable
Bluff Platform	Barrier beach Pocket beach River-dominated deltas Wave-dominated deltas Tide-dominated deltas Fan deltas	Open coastal inlet Plunging Barrier estuary Barrier lagoons Closed lagoons and marshes

Results

A total of 108 precontact archaeological sites have been documented along the shores of San Juan Island as of May 15, 2015. Of these sites, types include shell middens, lithic scatters, faunal material, burials and human bone, rock cairns, depressions, fish weirs, isolated projectile points, peeled cedars, and canoe remains. In many instances, sites were characterized as containing elements from multiple site types. Shell midden or midden were the most commonly documented site type ($n = 55$ out of 108). Of the other documented sites, 44 had contents that could be considered midden (i.e., concentrations of fire modified rock, lithics, shell and bone, and ash), but were not explicitly identified as such. In the remaining nine instances, sites did not have contents that were midden-like in composition, but rather consisted of fish weirs (one instance), isolated projectile points (one instance), peeled cedar (one instance), rock cairns (four instances), and depressions (two instances).

Approximately 35% (31 miles) of the shoreline is characterized as being either a depositional or stable shoreforms (Table 2). These areas contain 89% ($n = 96$) of the archaeological sites located along the San Juan Island shoreline, or approximately 3.1 archaeological sites per linear mile of shoreline. While a much larger proportion of the shoreline (65%, 57 miles) is characterized as being erosional shoreforms, these coastal margins contain only 11% ($n = 12$) of the archaeological sites located along the San Juan Island shoreline—approximately 0.2 archaeological sites per linear mile of shoreline (Table 2; Figure 2). When the results of the analysis were considered using the Chi-squared test of statistical significance (two-tailed confidence interval of 99%), a disproportionate frequency of archaeological sites were found in the depositional/neural shoreform type ($\chi^2 = 125.59$) (Table 3).

Of the 96 archaeological sites located along depositional or stable shoreforms, 93 are defined as middens or have midden-like constituents (shell, bone, ash, fire modified rock). The remainder include one rock cairn and two depressions. Of the 12 sites located along erosional shoreforms, six are middens or have midden-like constituents, three are rock cairns, one is a possible fish weir, one is a peeled cedar, and one is an isolated projectile point. Middens make up a higher proportion of sites on depositional or stable shoreforms compared to erosional landforms (97% versus 50%), while the frequency of each of the remainder of the archaeological site types is too small to meaningfully analyze their distribution by shoreform type. None of the resource types located along erosional shoreforms appear to be particularly erosion-resistant, unlike a study of the distribution of fish weirs along the Washington coast, which observed that fish weirs along erosional shorelines primarily consisted of large and erosion-resistant stone weirs (Elder et al. 2014).

Table 2. Frequency of Archaeological Sites by Geomorphic Shoreform Analysis

Geomorphic Shoreform	Length (Miles)	Percent Shoreline	Number of Sites	Sites/Mile
Depositional or Stable	31	35%	96	3.1
Erosional	56	65%	12	0.2
Total	87	100%	118	.8

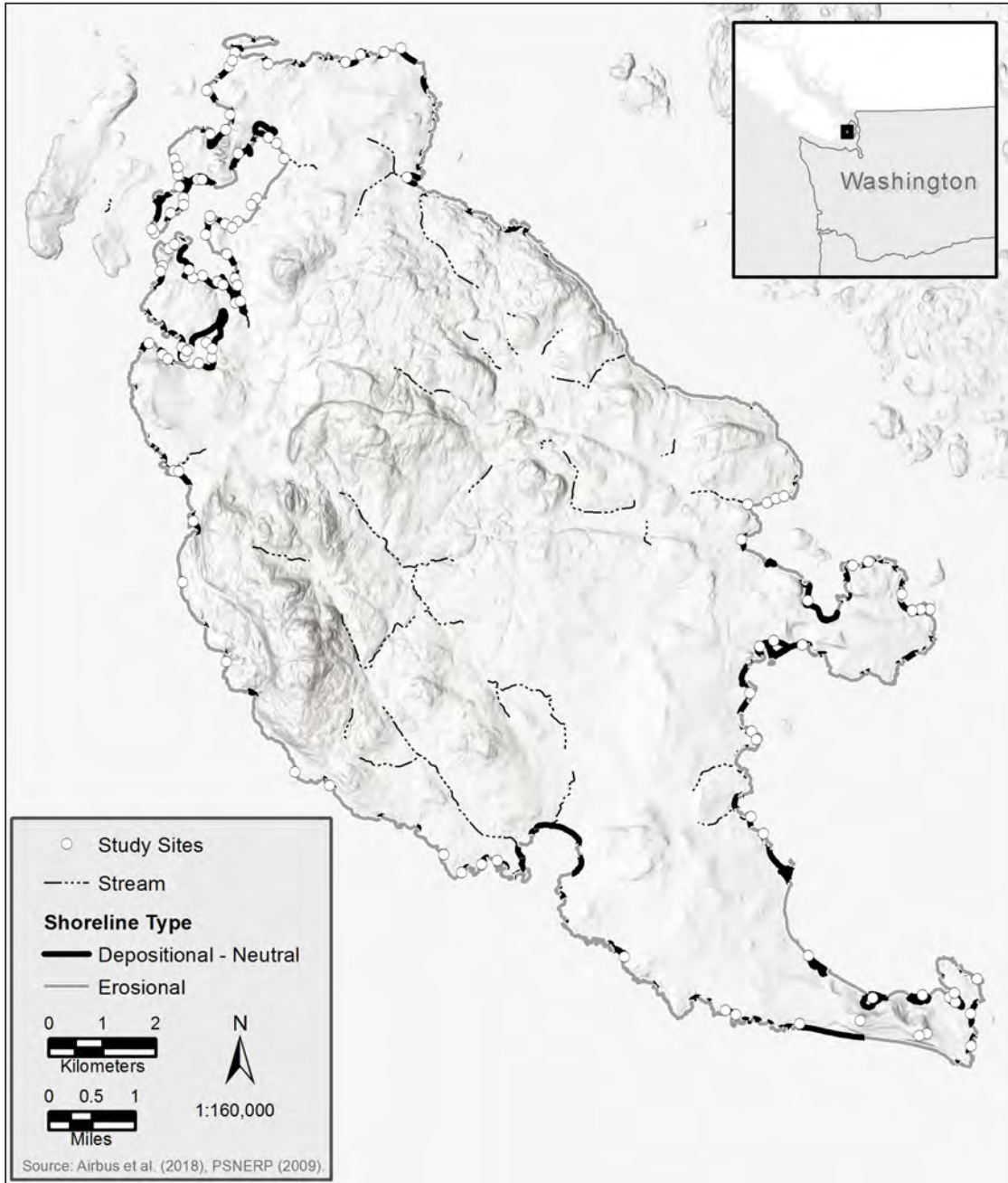


Figure 2. Map of San Juan Island showing depositional/neutral and erosional shoreline types and known archaeological site locations, illustrating the correlation of archaeological deposits with depositional/neutral shoreforms.

Table 3. Chi-Square Analysis of the Distribution of Archaeological Sites by Geomorphic Shoreform Type

Total Number of Sites in Study Area	108		
Shoreline Length (Miles)	87		
Critical Value at 0.01 (Two-Tailed)	$\chi^2 = 6.63$		
Null ($\chi^2 < 6.63$)	Archaeological sites are randomly distributed by geomorphic type		
Alternative ($\chi^2 > 6.63$)	Archaeological sites are disproportionately distributed by geomorphic type		
Geomorphic Type	Depositional	Expected Erosional	Total
Number Observed	96	12	108
Number Expected	38	70	108
(O-E) ² /E	83.31	48.06	131.36
		p-value	<0.00001

Conclusions

As this analysis demonstrates, the preservation of coastal archaeological sites in the study area disproportionately favors depositional and stable shoreforms. While these shoreforms are likely to have been preferentially used by precontact peoples because they tend to be relatively flat and associated with resource-rich areas, areas along erosional shoreforms would also contain a range of useful resources (e.g., shellfish and lithic raw materials) and were accessible for short-term habitation. Therefore, the paucity of archaeological sites on erosional landforms could be largely related to post-depositional factors rather than actual patterns in precontact land use.

This study did not consider the associations between specific archaeological site types and shoreform types (e.g., barrier estuaries, lagoons, pocket beaches), nor did it consider archaeological site types that are not located along the present-day shoreline. Consideration of the former could help predict the distribution of specific archaeological site types across the landscape. Consideration of the latter could provide help to predict the potential distribution of archaeological sites that predate the late Holocene, when sea levels were lower. Further studies using these considerations may also help to explore the extent to which geomorphic processes have resulted in the disproportionate representation of particular archaeological site types. For example, it is plausible that post-depositional geomorphic processes result in the archaeological record underrepresenting specific classes of temporary resource collection and processing activities. Both of these research avenues could help to better frame the strengths and limitations of the preservation of the archaeological record and, as a result, create better predictive tools for identifying intact resources.

While these findings will come as no surprise to many archaeologists, considering that few—if any—predictive models and regional studies explicitly consider coastal geomorphology as a central factor for the distribution of archaeological site, this study suggests that the consideration of coastal geomorphology

should play a greater role in such studies. This is especially true in coastal regions characterized by widespread and extensive erosion zones along shores; including much of the Oregon and mainland Washington State coasts.

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Why Are There No Pre-Clovis Mammoth Sites in the Columbia Plateau?

Robert Lee Sappington

Abstract *The remains of extinct elephants have been encountered in the Columbia Plateau since 1876. Since the 1930s the earliest accepted evidence for the First Americans has been Clovis culture, which has long been characterized by an association with mammoths. Recent evidence from the Manis site near Sequim, Washington, and at Paisley Caves, Oregon, demonstrates that pre-Clovis populations were hunting and processing elephants in the Pacific Northwest by 14,000–13,000 BP. Clovis culture is minimal in the Columbia Plateau and it appears to have arrived after Western Stemmed Tradition technology had become widespread. The best means for demonstrating a pre-Clovis presence in the Columbia Plateau is to treat the next discovery of a mammoth as an archaeological site and to follow explicit criteria during excavation and subsequent analyses.*

Introduction

The southern Columbia Plateau Culture Area includes the interior of Washington, northern Idaho, western Montana, and parts of central and northeastern Oregon. The remains of more than 100 mammoths have been found across this area since 1876 and another one is reported nearly every year. Most mammoth discoveries have been treated as paleontological sites so potential evidence of human involvement may have been overlooked. Since the 1930s mammoths have been closely associated with Clovis culture especially across western North America. Thus it seems that Clovis culture would be well-represented in the Columbia Plateau, but in fact it is virtually nonexistent. Since the 1980s there has been a growing awareness that there is an antecedent to Clovis culture. Pre-Clovis sites have been reported across North America and many of them are associated with the remains of mammoths or mastodons. Many pre-Clovis sites also have limited cultural material including lithic and bone tools, but there are no known distinctive pre-Clovis artifacts. The earliest occupations in the Columbia Plateau are associated with the Windust phase which is characterized by projectile points belonging to the Western Stemmed Tradition (WST). Recent dating of the WST indicates that it is coeval to, and may even pre-date, Clovis culture. This article reviews mammoth sites in the Columbia Plateau, suggests that this area possesses an excellent possibility of having pre-Clovis sites, and recommends that future mammoth discoveries be investigated as archaeological sites.

History

Among the many topics that he addressed in *Notes on the State of Virginia* in 1787, Thomas Jefferson discussed mammoths. Based on the fossil evidence and

the “traditional testimony of the Indians” Jefferson considered it quite likely that in unexplored and undisturbed parts of northern and western America that the mammoth “may as well exist there now, as he did formerly where we find his bones” (Peden 1955:54). After he became president, Jefferson gave explicit instructions to Meriwether Lewis, prior to his leading the Corps of Discovery across the newly acquired Louisiana Purchase, on many topics including the need to gather the remains or accounts of any animals deemed to be rare or extinct (Hawke 1980:28). Lewis reported on a mammoth site in Kentucky in a letter to Jefferson in 1803 and his party was on the lookout for mammoths when they traversed the Columbia Plateau in 1805–1806.

The first discovery of mammoths in the Columbia Plateau occurred in eastern Washington in 1876 (Luttrell 2001; Nisbet 2003). In May of that year members of the Coplen family began probing a bog in their property located along Hangman Creek in Whitman County. They used an iron hook and pulled up a large vertebra and soon found a variety of bones, all far larger than those from any known animal in the area. Using their previous experience with mining, the Coplen brothers devised a plan to drain the bog; they began with a ditch and gradually worked their way upstream.

When my brothers had dug the ditch in to a point about 125 feet from the creek, they found in the gravel below the clay at the depth of some eight feet from the surface a large stone spear head, several stone arrow heads and a small human skull. Nearby they dug through a place where the sand and gravel were blackened and discolored, as if by fire and somewhat congealed and cemented by what looked like the ashes and carbon from some prehistoric camp fire. (Lewis 1926:22–23, cited by Luttrell 2001:39)

The excavation continued at the Coplen Spring site into June and more than 100 bones from two types of animals were accumulated. The Coplen brothers took some of their collection to Colfax for weighing and then they continued on to Dayton and Walla Walla. When they arrived in Portland, they sold tickets at 25 cents each. The fossils were identified and described as mammoths by leading scientists including James Dana and Thomas Condon in 1876. Eventually the Chicago Academy of Science bought the collection, which became the first full mount of a mammoth in America in September 1886 (Luttrell 2001:71). At that time the Coplens’ mammoth was considered to be the largest known elephant in the world (Nisbet 2003:89). The Coplens’ mammoth was the centerpiece of the State of Washington exhibit at the Columbian Exposition in Chicago in 1893. Twenty years later it was sold to the Field Museum of Natural History in Chicago where it is still a mainstay attraction (Luttrell 2001:75).

When the Coplens’ discovery was reported, another family that lived 12 miles away thought of a spring on their property and started their own excavation. By August 1876 the Donahoe brothers had found an enormous skull and soon another amazing assortment of bones had been piled up (Luttrell 2001:41; Nisbet 2003:78–79). Multiple species were recovered and the first knowledgeable account was provided by fossil hunter and entrepreneur Charles H. Sternberg (Sternberg 1903:512). The Donahoe Spring find was later identified as a Columbian mammoth

(Luttrell 2001:43). Sternberg's notes also indicated the recovery of bison bones that were associated with a "flint arrow-point" (Sternberg 1903:512; Hay 1927:35; Luttrell 2001:43). The Donahoe mammoth was sold to the American Museum of Natural History in New York City in 1897 and it remains there today (Luttrell 2001:77; Nisbet 2003:91).

Paleontologist Oliver P. Hay produced a series of volumes that discussed three species of mammoths, mastodons, and unspecified finds of elephants, in Idaho, Washington, and Oregon (Hay 1927). Mammoths were clearly widespread in the Pacific Northwest including Oregon (20 sites), Washington (22 sites), and Idaho (9 sites) (Hay 1927:24, 29–40, 51–53, Maps 4–7). Mastodons were present at multiple locations in Oregon (10 sites), Washington (3 sites), and Idaho (4 sites) (Hay 1927:18–21, Map 2). The study clearly indicated the potential for finding additional fossil elephants in the Columbia Plateau. When Hay provided his overview there was no acceptable evidence of any association between Pleistocene megafauna and humans in North America. That situation would change soon.

Paleontology

All fossil and living elephants belong to the taxonomic order Proboscidea. Ancestral proboscideans appeared in Africa during the late Eocene and mammoths appeared in Europe 3 million years ago; they rapidly spread across Eurasia during the Pleistocene (Kurten and Anderson 1980:350). The imperial mammoths (*Mammuthus imperator*) eventually evolved into Columbian mammoths (*M. columbi*), which have been found across most of North America. Woolly mammoths (*M. primigenius*) represent a separate and much later migration from Asia and they were restricted to the northern parts of North America. The genus *Mammuth* ranged from the early Pleistocene to the early Holocene in North America and it is represented by a single species, the American mastodon (*Mammuth americanum*).

While they are commonly mixed by the general public, mammoths and mastodons had very different evolutionary history and the two groups have very distinct skeletons and teeth (Figure 1) (Olsen 1979). They also differed greatly in terms of habitat, diet, and behavior. Mastodons are considered to be more primitive and are solitary browsers, while mammoths are herd grazers. While American mastodons remained virtually unchanged, mammoths exhibit considerable evolution over time and space. The taxonomic classification of mammoths has changed over the years and multiple species, as well as some individuals considered to be hybrids, have recently been reclassified on the basis of mitochondrial DNA (MtDNA) (Enk et al. 2016). Formerly distinct species are now considered to be within the range of intraspecies variation. There are only two species of mammoths that are relevant to this study, the Columbian mammoth (*M. columbi*) and the woolly mammoth (*M. primigenius*).

Archaeology

Clovis Culture. The discovery of distinctive fluted stone projectile points in direct association with the bones of an extinct Pleistocene bison (*Bison antiquus*) near Folsom, New Mexico, in 1926 revolutionized American archaeology (Figgins 1927). Six years later a different form of fluted projectile point was found in association with

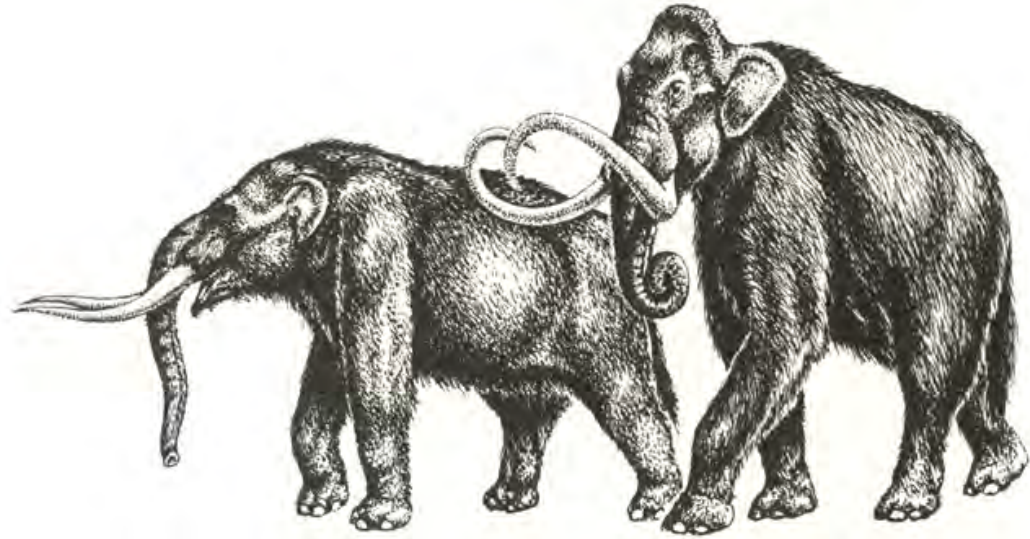


Figure 1. Artist's conception of an American mastodon (*Mammuthus americanum*, left) and a Columbian mammoth (*Mammuthus columbi*, right) drawn at the same scale (adapted from Kurten and Anderson 1980: Figure 17.1).

mammoth remains near Dent, Colorado, and soon at other sites. Clovis projectile points were a key part of the Llano Complex when it was outlined in 1952 (Sellards 1952:17–18). The Llano Complex gradually became known as the Clovis Culture, the Clovis Complex, the Clovis Pattern, the Clovis Horizon, and more recently as the Clovis manifestation (Collins et al. 2014:522).

The definition of Clovis Culture was fairly straightforward by the 1970s. Clovis sites usually consisted of a single find of a distinctive fluted projectile point at an open site located near a former water source. There was a clear and long-term association with mammoths, especially in the western United States. A 1988 review noted that while there were 8 sites with Clovis artifacts associated with mammoths in 1957, the number of sites had more than doubled by then with at least 15 such occurrences, as well as three sites with Clovis tools associated with mastodons (Agenbroad 1988:66). A recent examination of megafaunal extinctions tried to estimate mammoth and mastodon populations in North America at the end of the Pleistocene and a total of 185 sites with faunal remains had been proven to be, or were likely from, the Clovis era (Haynes 2009: Table 3.2) with mammoth sites ($n = 80$) being less common than those with mastodons ($n = 105$). As many as 27 of those settings might have been kill sites which means that humans could have been associated with as many as 15% of all known mammoth and mastodon sites dating from the Clovis era (Haynes 2009:43). For well over 50 years Clovis was considered to be the oldest culture in the New World and any site that was reported as being older was dismissed. Similarly, any find of a mammoth or mastodon that dated beyond 13,000 years ago was considered to be too old to represent any association with humans (Adovasio and Pedler 2014). While Clovis subsistence has long been characterized by mammoths it should be noted that other foods were also foraged including birds, reptiles, fish, and additional resources although the evidence is “extremely slim” (Haynes and Hutson 2014:293).

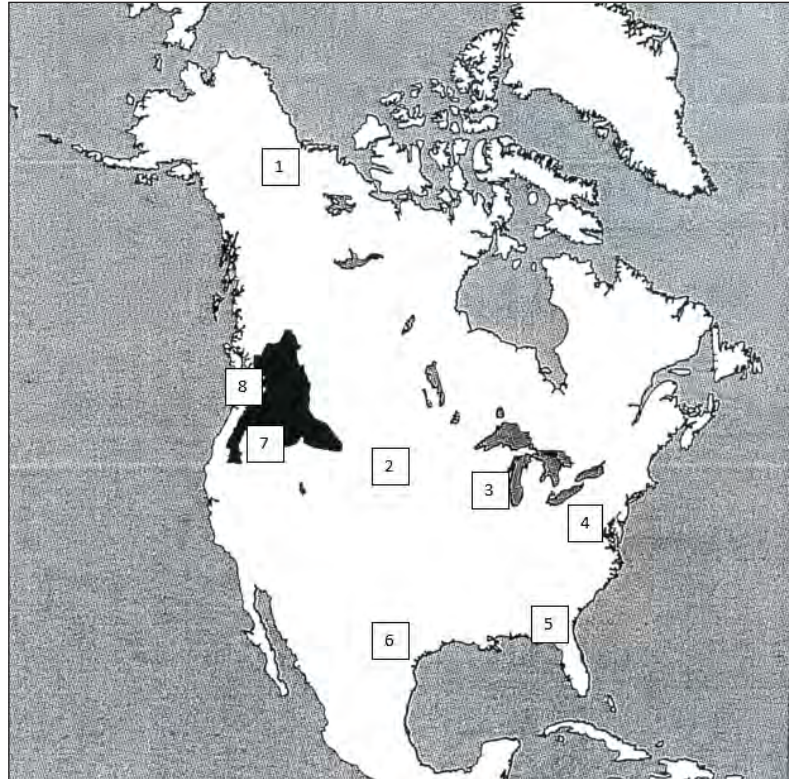
Following the advent of radiocarbon dating in the 1950s, the Clovis horizon was determined to be about 11,000 years ago but with modern calibration programs the “real” age is now often expressed at about 13,500 to 13,000 calendar years ago (Fiedel 2004:73). Another way of stating the time range is approximately (ca.) 11,500–11,000 14C yr BP or ca. 13,000 cal yr BP (Adovasio and Pedler 2014:512). The range is becoming progressively more specific and may now be as narrow as 200 calendar years (Waters and Stafford 2007:1124). The age for Clovis Culture is now approximately 13,000 to 12,700 years ago (Waters et al. 2018:9). Different nomenclature is used by various researchers but the use of “years ago” is the simplest and it refers to radiocarbon years before the present (BP). Specific conventional radiocarbon dates are indicated as radiocarbon years (YR, Y, or yr) BP or as 14C yr BP (RCYBP or RYBP) while calibrated or calendar (CAL or cal) years are indicated as 14C cal BP (CALYBP, CALBP, or cal BP).

The concept that the First Americans travelled overland from Siberia to Alaska and then through an ice-free corridor between the Laurentian and Cordilleran ice sheets into the interior of North America was proposed in the 1930s and it is generally known as the Midcontinental or Interior migration route (Dixon 1999:29–31). Advocates for an early arrival hypothesize that between 40,000 and 30,000 BP, and prior to 22,000 BP, humans could have followed the eastern slope of the Rocky Mountains when there was an opening between the ice sheets (Holen and Holen 2014). The ice sheets periodically blocked access to the interior until 13,400 BP when the ice-free corridor opened again (Menounos et al. 2017:358). Archaeologists have traditionally tied the colonization of the interior of North America to the last opening of the ice-free corridor; the details from 13,000 to 11,000 BP have been described and mapped (Haynes 2005: Figures 2–4).

A more recent theory for the arrival of the First Americans is tied to the glacial maximums during which large expanses of the continental shelf were exposed due to the lower sea levels (Fladmark 1979). Populations adapted to coastlines in northeast Asia could have followed the shore of Beringia to the western hemisphere and continued south along the continental shelf as well as up the river corridors into the interiors of North and South America. This model has been referred to as the Northwest Coast route, the coastal route, and/or as the Paleocoastal route. Based on evidence from terrestrial mammals, the Northwest Coast was largely free of ice by 16,000 BP (Dixon 1999:32) or between about 18,000 and 15,000 BP (Erlandson 2014:127). This notion is now generally accepted and known as the Coastal Migration Theory, or the Kelp Highway Hypothesis (Erlandson 2014:127). This concept accounts for the presence of early sites along the Pacific coast, as discussed below.

The Columbia Plateau. The Columbia Plateau Culture Area (Figure 2) is located in the interior of the Pacific Northwest with the southern Columbia Plateau encompassing eastern Washington, northern Idaho, western Montana, and parts of central and northeastern Oregon (Walker 1998). By the 1940s there were scores of known Paleoindian sites across North America but the first one to be reported in the Plateau was at Lind Coulee, which was excavated in 1951–1952 (Daugherty 1956). The Lind Coulee site contained distinct stemmed Lind Coulee projectile points that were associated with extinct bison (*Bison antiquus*) and other resources.

Figure 2. Location of selected pre-Clovis sites in North America: (1) Bluefish Caves, Yukon; (2) Lindsay, Montana; (3) southeastern Wisconsin mammoth sites; (4) Meadowcroft, Pennsylvania; (5) Page-Ladson, Florida; (6) Gault and Debra L. Friedkin sites, Texas; (7) Paisley Caves, Oregon; and, (8) Manis, Washington. The Columbia Plateau is indicated by the black polygon. Adapted from Plateau, *Handbook of North American Indians*, Volume 12 (Walker 1998: iii).



The first cultural chronology proposed for the Columbia Plateau was an outline for the lower Snake River region in 1959 (Daugherty 1962). Following more extensive fieldwork a landmark six-phase cultural typology was proposed for the lower Snake River region in 1970 (Leonhardy and Rice 1970). That sequence became the basis for the precontact cultural history of the entire southern Columbia Plateau; it is still in use and has been adapted to other regions (Sappington 1994, 1996). The potential for Clovis culture in the Columbia Plateau was not mentioned by Daugherty, Leonhardy, or Rice.

The word Clovis appears exactly once in the index of the Plateau volume in the *Handbook of North American Indians* (Walker 1998:764). Prehistory is covered in four chapters, the first of which provides the context for the three geographic divisions that follow with early human activity represented only by a scattering of diverse styles of projectile points (Chatters and Pokotylo 1998:74). The chapter on the northern Plateau mentions “surface finds of fluted, stemmed, leaf-shaped and Plano-like points” that may reflect regional variants of several widespread early cultural traditions for the Pacific Northwest (Pokotylo and Mitchell 1998:81–82).

The prehistory of the southern Plateau begins with Period I and the Richey-Roberts site is the only one with intact deposits between 11,500 and 11,000 BP; other early sites are only surface finds of Clovis points (Ames et al. 1998:103). Richey-Roberts is one of the better known Clovis cache sites due to its oversized projectile points, numerous bifaces, bone rods, and specific dating based on Glacier Peak tephra at approximately 11,250 BP (Mehring and Foit 1990; Gramly 1993; Kilby and Huckell 2014:261). However, the fact that it is a cache suggests that it may be due to new arrivals in the area who were unfamiliar with the available resources (Beck and Jones 2014:287) and it appears to be an anomaly in the Plateau.

The chronology of the eastern Plateau was divided along regional drainages with the early prehistoric period dating before approximately 10,000–7000 BP (Roll and Hackenberger 1998:123). Large lanceolate and stemmed projectile points characterize the early period while Clovis and Folsom points occur infrequently, if at all (Roll and Hackenberger 1998:123). Clovis Culture is clearly not significant in the Columbia Plateau and, with the exception of the Richey-Roberts site, it is essentially non-existent. However, based on the growing evidence from nearly all other culture areas in North America it seems likely that contemporaneous or older-than-Clovis sites may not have been recognized.

A key factor affecting the presence of early sites in the Columbia Plateau are the Missoula floods (Bryan 1980:86), which occurred at the end of the Pleistocene between approximately 15,000 and 13,000 BP. Approximately 40 separate flood events have been identified in the Columbia Basin in south-central Washington (Waitt 1980). The massive volumes of water exceeded the drainage capacity of the Columbia River which led to ponding in the Pasco Basin that created slackwater that temporarily backed up the Snake, Clearwater, and Yakima River canyons. The height of the water has been calculated for various locations, such as 550 feet at Spokane and 1,250 feet at Pasco (Allen et al. 1986: Appendix B; Last and Bjornstad 2009). While the Cordilleran ice sheet impacted the northern Columbia Plateau the Missoula floods impacted the archaeological record for early sites across large portions of the southern Columbia Plateau.

Discussion

The Case for Pre-Clovis Sites in the Americas

Since the 1980s there has been a growing awareness that Clovis Culture must have developed from something that existed earlier and that fore-runner has generally become referred to as pre-Clovis (Bonnichsen 1991). Sites dating prior to the Clovis era have also been referred to as proto-Clovis, older-than-Clovis, and most recently as the Exploratory Period (Waters and Stafford 2014:555). The use of terms involving “Clovis” imply a relationship or affinity with that culture while the use of the Exploratory Period is preferably neutral. However, since “pre-Clovis” is in common use, those sites with evidence of being older than 13,000 BP will be referred to either by that term or as “older-than-Clovis,” with the understanding that they may not have any relationship to Clovis Culture.

Since the 1930s more than 500 potential pre-Clovis sites have been reported across the western hemisphere that may date as much as 20,000 or even 300,000 years old (Adovasio and Pedler 2014:511). However, until the past few years any and all sites reported as being older than 13,000 BP were routinely dismissed due to one or more of the following reasons: (1) the potential sites did not contain valid human artifacts; (2) the potential sites had disturbed contexts containing valid, but younger artifacts; (3) the potential sites yielded contaminated, disturbed, or incorrect radiocarbon dates; and/or (4) the potential sites were the products of natural agencies (Dillehay 1997:3).

Numerous criteria for the acceptance of early sites have been proposed since 1964 (Haynes 1964; Stanford 1983:65; Dixon 1999:48; Adovasio and Pedler

2014:512; Jenkins in Smith 2014:14–15). One criticism of pre-Clovis sites was that that they “tend to be unique occurrences” so that “Seldom do we see the material culture claims from one candidate site paralleled in another, nearby site” (Agenbroad 1988:64). Recent criteria have been developed specifically for dating archaeological events (Goebel and Keene 2013:39–40; Beck and Jones 2014:278). Many of these criteria deal with careful dating and some stress “contextual and chronological hygiene” meaning great care in selecting specific and uncontaminated samples (Goebel and Keene 2013:39–40). Only with evidence that meets most, if not all, of these criteria (Table 1) will it be possible for an early site to gain acceptance. Even then, there are scholars who will find problems with many, or perhaps all, claims for Clovis and older-than-Clovis sites (Grayson 1988; Grayson and Metzler 2002, 2015). In addition, in some cases the evidence for early human activities may not come from conventional archaeological sites (Stanford 1983:65).

Most potential pre-Clovis sites have had a short “shelf life” with some enjoying a brief bit of fame or infamy and then forgotten. However, a very few sites have managed to survive the critics. A survey of selected researchers was conducted in 2012 and 132 respondents answered some or all of 19 questions concerning pre-Clovis issues, migration routes, acceptable sites, and related topics (Wheat 2012). Most researchers accepted a date of prior to 15,000 BP for the colonization

Table 1. Compilation of Criteria for Acceptable Evidence of a Pre-Clovis Site or Any Site Older than 11,500 Years BP

Criterion Number	Description
1	Consonance of data from relevant interdisciplinary studies
2	The presence of unquestionable artifacts in an indisputable primary context
3	The presence of artifacts that are clearly the products of human manufacture
4	Recovered materials that are within a clear stratigraphic context
5	There are reliable, concordant, and stratigraphically consistent radiocarbon dates from the deposit
6	Paleoenvironmental studies are consistent with the ages assigned to the site
7	Human remains are present that are reliably dated at older than 11,500 BP
8	Consistent and accurate radiocarbon dates
9	Precise radiocarbon dates with a standard error of 300 years or less
10	Radiocarbon dates that are obtained from single items
11	Radiocarbon dated items are identified with cultural carbon of adequate quality
12	Dated items are derived from recorded stratigraphy
13	Dated items are found in primary association with artifacts
14	The evidence can be reviewed in situ by peers
15	The evidence is available in peer-reviewed published accounts

of the New World and the most commonly accepted pre-Clovis site was Monte Verde (Wheat 2012:11) so that a brief review of that site is relevant here due to the presence of mastodons.

Monte Verde, Chile. The Monte Verde site was discovered in a creek cutbank in 1977 and investigations soon led to the discovery of structures, mastodon bones, lithic and wooden artifacts, diverse plant remains, and even human footprints. The mastodon bones and the initial radiocarbon dates indicated great antiquity and eventually 70 scientists from 20 disciplines were involved. Skeptics could easily note that Monte Verde had no Clovis points or any distinctive lithic technology, that the radiocarbon dates were too old, and that the site was obviously at the wrong end of the western hemisphere (Dillehay 1989, 1997).

The site contained two occupations with the older Monte Verde I (MV-I) dated to 33,000 BP; the results were considered inconclusive (Dillehay 1997:2). The upper occupation (MV-II) was dated 12,800 to 12,400 BP on the basis of 11 radiocarbon assays obtained from hearths, mastodon bones, and wooden artifacts; there were 13 structures, hearths and other features and the evidence was considered “unassailable” (Dillehay 1997:787). The faunal assemblage was dominated by the bones of South American mastodons and seven individuals were represented; some elements exhibited evidence of cultural processing including cut marks, burning, and polishing. The specific faunal elements and their arrangement indicated that portions of mastodons had been selectively scavenged nearby and transported to the site. Lithic materials included both local and exotic stone with evidence of both percussion and pressure flaking but there were no stylistically distinct projectile points and much of the technology was oriented toward the manufacture of grinding stones (Dillehay 1997:769).

Subsequent investigations in 2013 revealed greater complexity including additional cultural horizons with radiocarbon and luminescence dates between at least 18,500 and 14,500 radiocarbon BP (Dillehay et al. 2015). Without the early discovery of the mastodon remains it is likely that the antiquity of the site would not have been suspected and that it would not have been so thoroughly investigated and dated.

Paisley Caves, Oregon. Paisley Caves in south-central Oregon was generally accepted as a pre-Clovis site in 2012 (Wheat 2012). The site consists of a series of eight caves in the northern Great Basin (Figure 2) that were first investigated in 1938 (Cressman et al. 1940). One shelter produced a hearth, artifacts, and the remains of *Equus*, camel, and other bones well beneath Mazama tephra which indicated considerable antiquity (Cressman 1977:53). The site was re-examined in 2009–2011 and those excavations focused on the lower deposits. DNA from 65 human coprolites provided the oldest directly dated human remains in the western hemisphere (Jenkins et al. 2012:223). A series of more than 200 radiocarbon dates showed that the deposits containing coprolites and artifacts dated from 12,450 to 2295 BP. Four Western Stemmed points were associated with dates between 11,340 and 11,070 radiocarbon years before the present, clearly predating Clovis Culture (Jenkins et al. 2012:224; Stewart 2012). Although there are no faunal remains of mammoths or mastodons, another study identified protein residue from proboscideans on

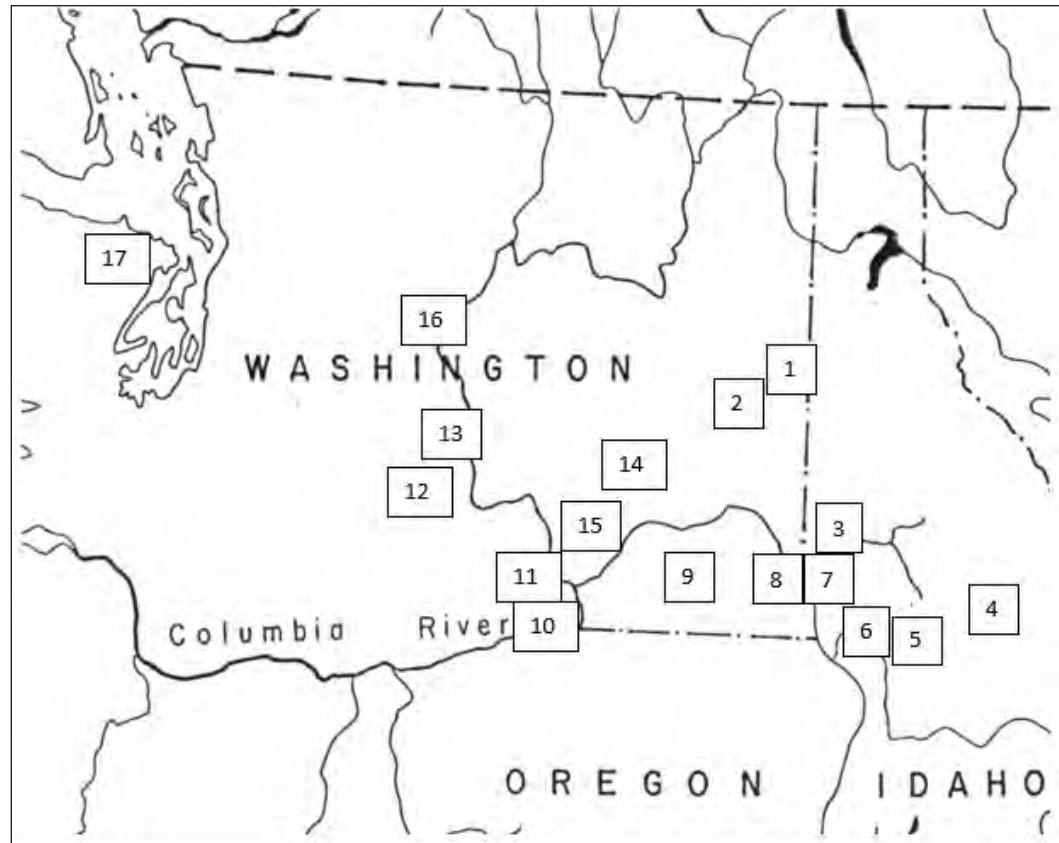


Figure 3. Location of sites mentioned in the text: 1) Coplen Spring; 2) Donahoe Spring; 3) Hatwai; 4) Grove; 5) Tolo Lake; 6) Coopers Ferry; 7) Hells Gate State Park; 8) Port of Clarkston; 9) Ledgerwood; 10) Umatilla; 11) Coyote Canyon/Fourmile Canyon/Webber Canyon—Jones; 12) Wenas Creek; 13) Sentinel Gap; 14) Lind Coulee; 15) Frenchman Hills—Tonnemaker; 16) Richey-Roberts; and 17) Manis.

two lithic tools including a hand stone and an edge-modified flake (Jenkins et al. 2014:494, Figure 28.5B).

The Western Stemmed Tradition. The first extensive study of lanceolate points across western North America was done by Alan Bryan who recognized and probably coined the term “Stemmed Point Tradition” (Bryan 1980). Bryan reviewed all the named types from California to British Columbia. Sites in the southern Columbia Plateau with stemmed points were generally considered to be part of the Windust phase (Bryan 1980:86–89) which is the oldest recognized culture in the region and it was initially dated between 11,000 and 9000 BP (Leonhardy and Rice 1970; Rice 1972). Some researchers see a sequence of lanceolate points within the Columbia Plateau that comprise the Western Stemmed Point Tradition (Lohse and Moser 2014). A recent thesis also sought to differentiate Western Stemmed projectile point forms from the Columbia Plateau and elsewhere into temporal intervals that showed increasing diversity over time (Rosencrance 2019).

For decades the “orthodox view” was that the Western Stemmed Tradition (WST) was derived from a fluted point industry (Beck and Jones 2010:101), but recent studies indicates that Western Stemmed technology in the Intermountain

West (the Columbia Plateau and the Great Basin) is actually older than Clovis. In fact “people were in the Intermountain West before Clovis was present *anywhere*” (Beck and Jones 2010:106, emphasis in original). An update of that study showed that, on the basis of radiocarbon dates and lithic technology, WST was not related to Clovis (Beck and Jones 2014). While radiocarbon-dated Clovis sites are rare in the Intermountain West, there are multiple early sites in the Columbia Plateau with large stemmed points, including Coopers Ferry and Hatwai in Idaho, as well as Marmes and Sentinel Gap in Washington (Figure 3), that are older than Clovis (Beck and Jones 2014:Tables 16.1, 16.2). A review of lithic technology shows that Clovis was more standardized with a focus on blades and biface manufacture that included the controlled use of overshot flaking for thinning while WST employed multiple reduction patterns that were adapted to the type of toolstone material and the morphology of the bifaces (Beck and Jones 2014:280–282). WST was used for a span of 3,000 years (Beck and Jones 2014:279) or perhaps even 5,000 years (Collins et al. 2014:529).

Some researchers in other cultural areas have extended the range of WST even farther back into the past. Excavations below the Clovis levels at the Gault and Debra L. Friedkin sites in central Texas (Figure 2) encountered a variety of lithic tools including lanceolate and Western Stemmed projectile points that have been associated with radiocarbon dates back to 16,000 BP (Waters et al. 2018; Williams et al. 2018). Secure dating shows a lack of continuity between the pre-Clovis and Clovis complexes (Williams et al. 2018:5).

A recent investigation focused on radiocarbon dating the WST on the southern Columbia Plateau and 16 previously excavated sites with a total of 65 assays were reviewed (Brown et al. 2019). Following a series of six chronological models, WST was determined to conservatively date between 13,000 and 11,000 cal BP and it likely extended to ~13,500 cal BP (Brown et al. 2019:490). An even more recent study dates the Cooper’s Ferry site on the lower Salmon River to ~16,000 BP on the basis of WST points, debitage, and 21 radiocarbon ages from charcoal and bone samples recovered from within and outside cultural pit features (Davis et al. 2019:892).

In summary, “There now appear to be seven early cultural patterns, distinct from Clovis, that were present across North America during the interval 27,000–13,000 cal yr BP” (Collins et al. 2014:522). Pattern 6 represents numerous sites and complexes distributed near the Pacific margin from Beringia to southern South America that share the presence of thick, narrow projectile points and bifaces, with sites including Coopers Ferry, Marmes, and Hatwai in the Columbia Plateau (Collins et al. 2014:523, 529–531, Table 30.1). Western Stemmed points are not a type but a general morphological theme and more than one production technology was employed in their manufacture. Dated sites fall in the range from 14,500 to 13,200 cal yr BP and are contemporary with, and older than, Clovis (Collins et al. 2014:529). Furthermore, new approaches are tying Monte Verde to Paisley Caves with the Pacific Coast having been colonized by 15,000 BP based on a new model that “proposes that the Paleocoastal and Western Stemmed traditions are both linked to a coastal migration from northeast Asia to the Americas” (Erlandson 2014:129–130).

Another Look at Some North American Mammoth and Mastodon Sites

The current interest in pre-Clovis sites has led to a renewed look at certain locations where mammoths or mastodons were found in the 1960s–1980s. These sites were initially reported as being associated with early human occupations but due to a number of factors they were all either ignored or rejected by most of the scientific community at that time. For the record, some of these sites are still being rejected (Grayson and Meltzer 2015).

Bluefish Caves, Yukon. A series of excavations were conducted at the Bluefish Caves site located at the eastern edge of Beringia in northern Yukon Territory between 1977 and 1987 (Figure 2). Fragments of mammoth, horse, caribou, and other mammals were recovered along with approximately 100 small lithic artifacts including a microblade core, a core tablet, microblades, burins and burin spalls, and other lithic debris. There were no hearths but a series of 21 radiocarbon dates ranging from 25,000 to 10,000 BP were obtained from bone and wood and the site was reported to be one of the earliest in North America (Cinq-Mars 1979; Morlan 1988; Cinq-Mars and Morlan 1999). Of particular interest to this study is a mammoth bone core and retrofitted flake (Cinq-Mars and Morlan 1999:204–206). However, the proposed evidence of ancient human processing was generally dismissed as having been done recently on older fossilized elements, or it was attributed to subsequent trampling by later occupants at the site, or it was due to trampling by other animals, or by rockfall, and the site was ignored for years.

Due to the potential significance of the site, a reanalysis was recently conducted on all 36,000 bones with six criteria selected as evidence of human activity (Bourgeon 2015; Bourgeon et al. 2017:3). A total of 15 elements passed all criteria and these included the bones of horse, caribou, and wapiti, as well as possibly Dall sheep and bison. A specific sample of those bones with acceptable evidence of butchering were selected for radiocarbon dating and six new dates were obtained ranging from 24,000 to 12,000 BP (Bourgeon 2015; Bourgeon et al. 2017: Figure 3). A horse mandible with distinct human-made cut marks that dated at 24,000 BP has again made Bluefish Caves potentially the earliest known archaeological site in North America (Bourgeon 2015; Bourgeon et al. 2017:6; Neely 2017:7).

The Schaefer, Hebior, Mud Lake, and Fenske Sites, Wisconsin. An excavator jolted to a halt while draining a marshy field near the Schaefer farm in southeastern Wisconsin in 1964. The operator had hit a woolly mammoth femur and the remains ended up in the local Kenosha Public Museum. Twenty years later an amateur archaeologist noticed cut marks on another set of bones in the museum's collection which prompted the museum director to reinvestigate the Schaefer site. While the Schaefer site was being excavated a local farmer named John Hebior approached the team with a large bone that he had found in 1979 on his property located 3/4 mile away. Two other mammoths had been found previously nearby so that there were a total of four woolly mammoth sites within a small area (Figure 2); the Mud Lake and Fenske mammoths were examined but not fully excavated (Overstreet and Kolb 2003).

Excavations resulted in the recovery of an approximately 75% complete mammoth at the Schaefer site. A broken chert biface edge and a chert waste flake

were found in association. The Hebior mammoth was approximately 85–90% complete. Two bifacial chert implements, a chert waste flake, and a flaked fragment of dolerite were found within, and adjacent to, the bones. The artifacts were subjected to microwear analyses; no wear was identified on the tools from the Schaefer site but the bifaces from the Hebior site showed both meat and hide polish (Overstreet and Kolb 2003:95). All four mammoths were reported as having unambiguous evidence of butchering in the form of cut marks although it was not possible to determine whether they had been actively hunted or scavenged (Overstreet and Kolb 2003:111).

Radiocarbon ages were obtained from purified mammoth bone collagen ranging between 12,600 and 12,200 years BP for the Schaefer and Hebior mammoths and between 13,510 and 13,440 years BP for the Mud Lake and Fenske mammoths. Radiocarbon ages, stratigraphic/geomorphic contexts, and taphonomic studies from the Schaefer and Hebior mammoths provided in situ evidence for human interaction with megafauna very near the active glacial ice margin in the mid-continent by 12,500 BP and perhaps as early as 13,500 BP (Overstreet and Kolb 2003:98).

More recent research has indicated that the Fenske proboscidean is actually a mastodon (Joyce 2014:468). The Mud Lake mammoth had the “highest frequency of cultural cutmarks” with “wedge marks (that) are directly related to *deliberate disarticulation* of the foreleg and were not caused by metal tools or by improper curation” (Joyce 2014:469, emphasis in original). However, examination of some of the cut marks led another researcher to consider the evidence from the Mud Lake mammoth to be non-cultural (Krasinski 2010, 2016:146).

The Page-Ladson Site, Florida. The Page-Ladson site is in a deep sinkhole in the bed of the Aucilla River in northwestern Florida (Figure 2). During the late Pleistocene the site was located within a small pond in bedrock but subsequently sea levels rose and it is now under 4 m of sediment and 9 m of water. Recreational SCUBA divers discovered mastodon bones at the site and it was investigated from 1983 to 1997. A mastodon tusk had perpendicular grooves that were attributed to its having been removed from the skull by stone tools (Webb 2006). A number of Paleoindian lithic artifacts were recovered from both in situ and displaced contexts (Dunbar 2006:412–423). The early Paleoindian occupation from the oldest stratigraphic Unit 3 was regarded as pre-Clovis with nine lithic artifacts, butchered bone and tusk fragments, and seven radiocarbon dates that averaged 12,400 years BP (Dunbar 2006:417, Tables 14.1 and 14.2). None of the lithic artifacts, which included a utilized flake plus a hammerstone and debitage, were temporally diagnostic. However, the findings were challenged and the site was relegated to an ambiguous status (Halligan et al. 2016:1).

A new team investigated the Page-Ladson site in 2012–2014 to evaluate its archaeological and geological context and to gather proxy evidence to assess the timing of megafaunal extinctions (Halligan et al. 2016). Faunal remains included mastodon, camelid, bison, and possibly domesticated dog (Halligan et al. 2016:5). Additional artifacts made from local chert were recovered, including a reworked bifacial knife fragment and five flakes (Halligan et al. 2016: Figure 2). Seven radiocarbon assays collected immediately next to the biface dated approximately 14,550

calendar years BP (Halligan et al. 2016:4). There are now a total of 71 radiocarbon dates showing the development of the strata at the site. The data show that humans butchered or scavenged a mastodon carcass approximately 14,500 BP and that humans interacted with megafauna in the southeastern United States for 2,000 years until those animals went extinct approximately 12,600 BP (Halligan et al. 2016:5).

The Lindsay Site, Montana. The Lindsay site consists of the skeleton, mandible, and tusks of a single mammoth that was found in eastern Montana in 1966 (Figure 2). Les Davis investigated the site in 1967 with the possibility that it was associated with humans and he excavated 147 m² to a depth of 3.5 m into Paleocene sediments (Davis and Wilson 1985:87). No tools were recovered but some possible cut marks were noted. Directly associated with the mammoth were eight blocks of sandstone that had probably been obtained 0.3 km north of the site. The blocks occurred beneath the mandible, vertebrae, and articulated ribs, as well as beside and beneath one modified humerus, “a co-occurrence suggestive of contemporaneity with the skeleton....Presence in the deathbed of these transported sandstone blocks is indirect evidence of post-mortem scavenging by humans” (Davis and Wilson 1985:98). The arrangement of some elements, such as the stacking of the femora atop each other and across the ribs, and the separation and reorientation of the mandible from the cranium, indicated human involvement. The absence of flaked stone artifacts and bone tools did not disallow the possibility that the carcass had been scavenged by humans. Non-perishable projectiles would not have been needed and butchering, dismemberment, and bashing tools could have been carried away (Davis and Wilson 1985:98). Five radiocarbon dates were obtained (Hill and Davis 1998; Huber and Hill 2003). The skeleton was originally identified as an imperial mammoth but reanalysis indicated that it was a Columbian mammoth (Hill and Davis 1998:109).

A recent analysis of the Lindsay mammoth bones identified 15 “unequivocal” butchery marks made by stone tools on four different elements (Waters and Stafford 2014:552). There are now a total of 14 radiocarbon dates with the six most recent being obtained from a femur and humerus; using several different methods they ranged from 12,220 ± 35 to 12,300 ± 35 ¹⁴C yr BP (Waters and Stafford 2014:Table 31.1). One key aspect of the Lindsay mammoth is that the study was based on taphonomic evidence rather than on artifacts. “The pivotal importance of this site is that it provides solid evidence for older-than-Clovis occupation of the Americas, even though no stone tools were found” (Waters and Stafford 2014:551). However, the cut marks have been questioned (Grayson and Meltzer 2015; Krasinski 2016).

The Manis Mastodon Site, Washington. Emanuel Manis was excavating a small pond near Sequim on the Olympic Peninsula (Figures 2, 3) when he unearthed two tusks and other faunal remains in August 1977. Mr. Manis contacted Carl Gustafson at Washington State University who visited the site with graduate student Delbert Gilbow; on the basis of a molar they determined that the remains were those of a mastodon (*Mammot americanum*). Gustafson screened the disturbed backdirt and developed a wet site excavation technique to recover the rest of the skeleton between 1977 and 1979. The results were published in two articles (Gustafson et al. 1979; Peterson et al. 1983) and a master’s thesis (Gilbow 1981). Some of the bones were spirally fractured, flakes had been removed from one long bone fragment,

other bones showed cut marks, and in addition, the bones showed an upslope dispersal, all of which indicated human activity (Gilbow 1981). The most intriguing discovery was a rib with an embedded bone point (Gustafson et al. 1979: Figure 2). Two radiocarbon assays from associated vegetal material dated the site to approximately 12,000 BP. The Manis site was the first evidence of humans in direct contact with a mastodon in North America and it was also the oldest archaeological site in Washington (Gustafson et al. 1979:157).

The age and evidence for human involvement was challenged for more than 30 years (Waters et al. 2011:352). Some critics thought that the bone point was a result of an altercation with another mastodon while others thought that stratigraphy was disturbed, or that the dates were not associated with the mastodon, or that the dates were simply incorrect. The assemblage was recently reexamined and a total of 13 AMS radiocarbon dates were obtained from purified bone collagen extracted directly from the rib that held the bone point; all dates were statistically identical at approximately 12,000 BP or 13,800 BP (Waters et al. 2011:352). DNA and protein sequencing indicated that both the rib and the point were identical to other mastodons. The new evidence from the Manis site demonstrated that humans were hunting mastodons with weapons manufactured from mastodon bones 800 years prior to the appearance of Clovis Culture (Waters et al. 2011:352). However, criticism continues and an alternative explanation for the point is that it was caused by the initial backhoe disturbance; DNA testing has been recommended to determine whether the point and rib were from the same individual or not (Haynes and Huckell 2016:191).

A Review of Mammoth Sites in the Columbia Plateau

The discovery of a mammoth is a relatively common occurrence in the Pacific Northwest. "Several hundred" finds have been reported across the state of Washington although most are single skeletal elements, especially molars and tusks. When enough of the skeleton is present, most have been identified as Columbian mammoths, which became the state fossil in 1998 (Barton 1999:23). Some of the better preserved and stratigraphically dated examples are in the Columbia Plateau and were described by Sternberg (1903), Freeman (1926), Bryan (1927), Hay (1927), Fryxell (1963), Scott and Clem (1967), Newcomb and Repenning (1970), and Martin et al. (1982). More recently 24 mammoth sites were noted in southeastern Washington and tied to the volume of particular Missoula floods with a median at 607 feet above sea level (ASL) and a maximum of 1190 feet ASL (Last and Bjornstad 2009:169). Another study identified 45 mammoth sites plus another 10 proboscidean sites (on the basis of tusks or non-diagnostic bones) in Benton County, Washington (Barton and Last 2010:250–251). A number of other, generally more recent, finds in Washington and Idaho have been studied as potential archaeological sites, as discussed below.

The Umatilla Mammoth, Washington. The Umatilla mammoth site (Figure 3) was discovered by Carl Gustafson in May 1977 during an archaeological survey prior to the construction of a weigh station (Gilbow 1981). A surface scatter of extensively fractured and extremely weathered bone fragments was observed in a blow-out and tooth fragments indicated that it was a mammoth. The bones represented more

skeletal material than had been previously discovered at one location in Washington and they appeared to be lying in contact with lacustrine deposits (Gilbow 1981:26). Excavations began in May 1979 and it was soon apparent that the larger bones were intact and that the mammoth was lying on its right side. Associated with it were the remains of musk ox, pronghorn, deer, and one unidentified mammal. The site was compared with the Manis mastodon and based on the arrangement of the remains, as well as the absence of spiral fractures, there was no obvious evidence of human involvement (Gilbow 1981).

The Ledgerwood Mammoth, Washington. The Ledgerwood mammoth was discovered by construction workers who noticed a piece of tusk protruding from a roadcut near Pomeroy in 1990 (Figure 3). The tusk had been recently exposed since there was no evidence of it during an archaeological survey that had been conducted there the previous year. The site consisted of a small semicircular concentration of bones, tusks, and teeth. More than 9000 bone fragments were recovered, the majority of which were mammoth skull fragments but at least 11 other species of animals were associated including rodents, rabbits, one canid, bison, and birds. It was considered to be problematical that so many kinds of animals were concentrated in such a small area unless humans were responsible (Gustafson et al. 1991). A radiocarbon date obtained from mammoth bone and another date from organic material in the sediment on which bones were resting dated the site between 19,000 and 17,000 BP (Gustafson et al. 1991:41). St. Helens set M ash dated at 20,400 to 19,200 BP was identified below the mammoth bones. A few bone fragments appeared to have been modified in a manner compatible with human activities but no stone artifacts were found in direct association with the bone mass although a small chert flake was found in sediment that had slumped from the bank and an angular basalt core-like object was found in the matrix during the laboratory analysis (Gustafson et al. 2001:21, Figures 5–6).

The Grove Mammoth, Idaho. Sigurd Grove was excavating his rock pit near Kamiah in 1957 when he discovered the remains of a mammoth (Figure 3). After some initial excitement he left most of the remains in place, covered them with soil and rocks, and continued to work elsewhere. Eventually the former bottom of the pit became a pedestal within it. The mammoth remains became the focus of a University of Idaho (UI) archaeological field school in 1995. Students gradually cleared the overburden and exposed the skeleton, which was identified as a Columbian mammoth (Plastino 1997). The remains were concentrated but they were very disarticulated and sorted into piles or lodged among boulders. Rib fragments were radiocarbon dated at approximately 14,700 BP. A chalcedony cobble with battered lateral edges was found during the excavation but historic disturbance could have accounted for its possible association with the mammoth. The arrangement of the bones suggested deposition by natural processes; no incontrovertible cut marks were identified, no lithic tools or debitage were found, and there was no conclusive evidence of human processing (Plastino et al. 1996; Plastino 1997).

Tolo Lake, Idaho. Tolo Lake is a 35-acre natural lake located five miles west of Grangeville near the southern margin of Camas Prairie (Figure 3). In the fall of

1994 heavy equipment operators encountered fossil bone and tusk fragments on the floor of the drained lake bed. The find was reported to the local Forest Service archaeologist and a quick response team was put together from various agencies and universities to determine the nature and extent of the discovery. The late season excavation focused on a concentration of fossil mammoth elements at the northeastern part of the lake and confirmed the potential for further investigations (Breckenridge et al. 1994).

An intensive field effort was conducted by the UI, Idaho State University, and others in 1995. Over 400 mammoth (*Mammuthus* sp. *M. columbi*) fossils were recovered with a minimum number of 10 individuals present. Bison remains were also recovered during the 3-month field season. Fossils were well preserved and retained small- and large-scale anatomical and post-mortem detail. In order to obtain smaller species and/or stone tools, fine-mesh flotation was conducted; only one small rodent vertebra was recovered. Two radiocarbon dates, one from bone collagen and the other from associated carbonate, ranged from approximately 5100 to 4300 BP but these were considered to be anomalously young. Two taphonomic settings were proposed with most evidence suggesting carcass or element deposition in shallow water, with two mammoths involving death at, or transport to, slightly deeper offshore locations. There was no evidence of a cultural association; lithic artifacts found in the construction back dirt were attributed to the ethnohistoric Nez Perce site that had existed around the shore of the lake (Miller et al. 2006:107).

Hells Gate State Park, Idaho. Hells Gate State Park is located three miles up the Snake River from Lewiston (Figure 3). Earth-moving equipment in 1974 exposed fossil bison that stratigraphically pre-dated 18,000 BP (Gustafson 1974). Monitoring during construction of a settling pond elsewhere in the park in 1999 encountered elk and grizzly bear remains, as well as two Western Stemmed projectile points and other lithic tools at *Wewukiyepuh* (Schuknecht 2000; Sappington and Schuknecht-McDaniel 2001). Two radiocarbon assays from associated charcoal dated 10,300 BP. Fossil bison and mammoth tusk fragments were found in the underlying Bonneville flood gravel deposits but they were not associated with humans (Schuknecht 2000:7; Sappington and Schuknecht-McDaniel 2001).

The Wenas Creek Mammoth, Washington. The Wenas Creek mammoth site is located in south-central Washington (Figure 3). The site was discovered in 2005 during road construction and it was the subject of a series of field schools by Central Washington University from 2005 to 2010. Mammoth and bison remains were discovered in a 20–50 cm thick stratum of gravelly silt loam interpreted as colluvium (Stratum II); it was overlain by a 60–80 cm layer of silty loam that was interpreted as loess (Stratum I) and underlain by a more than a 180-cm layer of bedded sands and gravels (Stratum III) that was interpreted as side stream alluvium (Lubinski et al. 2007; Lubinski et al. 2009; Lubinski et al. 2014:17). The age of the bones recovered from Stratum II was estimated on the basis of eight bone collagen AMS dates. The calibrated dates provided a mean pooled age of approximately 14,000 years BP and it was estimated that the mammoth (*Mammuthus* sp.) and bison (*Bison* sp.) died about 17,000 BP (Lubinski et al. 2014:17).

Two possible lithic artifacts were recovered during the excavations with one (FS 261) found in place and the other in the screen. Artifact FS 261 was in the same stratum as the mammoth remains but about 15 cm above the nearest bone. Two sediment dates bracketed the Stratum II/Stratum III contact in the central part of the excavation. The sample near the base of Stratum II returned a date of approximately 14,000 BP while the sample from the top of Stratum III returned a date of approximately 18,000 BP (Lubinski et al. 2014:17). Twelve samples for infrared stimulated luminescence (IRSL) dating were collected in 2008 and sent to the University of Washington with eight samples from all three strata and four samples surrounding the flake. There were two interpretations for the age of FS 261; it was best estimated by comparison to the four IRSL samples and one radiocarbon date taken in close proximity to it as well as with other samples from Stratum II (Lubinski et al. 2014:29). A pre-Clovis age for the artifact was considered probable although it is possible that the flake is 5,000 years old (Lubinski et al. 2014:31). Another study has supported the likelihood that the flakes are indeed debitage rather than geofacts (Lubinski et al. 2014). However, the bison remains from the site show no evidence of human actions, which argues against human involvement at the site (Lubinski 2016).

The Port of Clarkston Mammoth, Washington. The Port of Clarkston Industrial Park is located several miles west of Clarkston (Figure 3). The area was surveyed and tested in 2010 and no evidence of cultural resources were found so construction of the infrastructure began in spring 2014. In March the author was called by personnel from the Port who said that they had found a mammoth. That afternoon the construction crew showed the author fragments of a large limb bone and a divot in the wall of the utility trench where the bone had been found at a depth of approximately 12 feet below the surface. We returned with a UI crew to examine the surrounding area. Construction equipment was used in order to clear an extensive area on both sides of the trench down to a point just above the depth of the find. The location was skim shoveled to near the depth of the divot and then the area was troweled in 10-cm increments for approximately 50 cm until we were well below the divot.

A sample of the construction back dirt and all manually excavated sediment was dry screened through 1/8-in. hardware cloth. No other bones, lithic tools, or debitage was found and after a week construction resumed. Sediment attached to the bone was analyzed by UI soil scientists and described as being silt typical of Missoula flood slackwater deposits dated at approximately 12,000 years BP. Bone fragments were sent to Beta Analytic for radiocarbon dating but they were too degraded to provide a date. A bone fragment was sent to the Ancient DNA Centre at McMaster University; it was compared to a suite of fossil proboscideans and identified as a probable Columbian mammoth (Karpinski 2014). Despite considerable effort the site showed no evidence of any association with humans (*Lewiston Morning Tribune*, March 20, 2014).

Coyote Canyon Mammoth, Kennewick, Washington. A mammoth was discovered during quarrying operations south of Kennewick in 2000 (Figure 3). Excavation was halted and the land was purchased by a local family in 2008 who preserved the

site as a research center through the Mid-Columbia Basin Old Natural Education Sciences (MCBONES). Scientific excavations have been ongoing since 2012. The skeleton appears largely intact with recovered elements including a mandible, teeth, a scapula, two humeri, vertebrae, ribs, and feet. The find was identified as an adult Columbian mammoth and it has been radiocarbon dated at 17,450 BP (*Tri-City Herald* April 30, 2012). The mammoth is associated with glacial erratics that indicate natural deposition by one of the Missoula floods. The project is currently ongoing and new information, including the discovery of a molar, appeared in July 2019 (www.coyotecanyonmammothsite.org).

Fourmile Canyon, Washington. Bill and Kim Mauldin discovered a mammoth tusk on private land southwest of Finley in June 2011. The MCBONES research center conducted excavations and additional tusk fragments were found in spring 2012. Optically stimulated luminescence (OSL) studies suggests that the age of the site is between 60,000 and 35,000 BP (Kleinknecht et al. 2013). The tusk was transported to the MCBONES lab and no additional elements or excavations have been conducted (www.mcbones.org/ResearchSites/FourmileCanyon).

Webber Canyon–Jones Mammoth, Washington. A partial humerus was discovered on private property east of Kiona in December 2013. The humerus was presumed to be from a Columbian mammoth. The MCBONES research center conducted excavations in December 2013 and January 2014 and found additional fragments but the clearly disturbed context led to the termination of excavations (www.mcbones.org/ResearchSites/WebberCanyon).

Frenchman Hills–Tonnemaker Mammoth Site, Washington. Luke Tonnemaker unearthed large bone fragments while preparing an alfalfa field near Royal City in March 2015. Additional bones were recovered and over 150 specimens have been found during farming operations. Radiocarbon dating was unsuccessful but volcanic tephra dates the bones between 13,600 ¹⁴C years BP and 10,740 ¹⁴C years BP (Dodd et al. 2016). The MCBONES research center oversees research and education at the site ([www.mcbones.org/ResearchSites/Frenchman Hills](http://www.mcbones.org/ResearchSites/Frenchman_Hills)).

Umatilla Indian Reservation, Oregon. The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) conducted a survey across the proposed 640-acre Wildhorse Golf Course near Pendleton, Oregon, in 1997 and encountered several isolated precontact and historic artifacts of the surface of the project area (Longenecker et al. 2002:93). Monitoring was recommended and after a week of construction excavation a CTUIR cultural resource technician discovered animal bone fragments and a giant tooth. The tooth was identified as being from a mammoth and it was radiocarbon dated at approximately 11,280 BP (Longenecker et al. 2002:93). The tooth is on exhibit at the Tamastlikt Museum in Pendleton. The site would never have been discovered if archaeological monitoring had not been conducted.

Return to the Coplen Spring Site. A series of subsequent investigations were launched at the Coplen Spring site (Figure 3) in 1919, 1983, and 2001 (Luttrell 2001). The 2001 field work included efforts to obtain volcanic ash samples, the uppermost of which

was from Mt. Mazama dated approximately 6850 BP (Luttrell 2001; Gough et al. 2017). More recent research resulted in the discovery of a mammoth rib from the site that had been given to the Conner Museum at Washington State University some time prior to 1922. The rib provided an AMS radiocarbon date of approximately 12,000 BP with a calibrated date of approximately 14,000 BP, as well as mtDNA evidence consistent with Columbian mammoths and possible hybrids (Gough et al. 2017). In combination with the reports of artifacts and other potential cultural evidence in 1876, the Coplen Spring site is, or more likely would have been, an excellent candidate for the first pre-Clovis site in the Columbia Plateau.

Other Mammoth Sites in the Pacific Northwest. A number of the Washington finds are curated at the Burke Museum in Seattle (Barton 1999). In addition to the Umatilla and Ledgerwood sites there are also mammoths from at least three other locations that are curated at Washington State University (Diane Curewitz 2019: personal communication). Accidental discoveries of additional mammoths have recently been reported near Seattle (*Lewiston Morning Tribune*, February 13, 2014), Corvallis, Oregon (Oregon State University *News and Research Communications*, January 26, 2016), and Langley, Washington (*Lewiston Morning Tribune*, December 4, 2018).

Summary and Conclusions

Mammoths have been found at sites across North America since the 1930s and that relationship has long been a key aspect of Clovis Culture. Since the 1970s several mastodons have also been found in association with humans in even older contexts. Clovis Culture is currently dated at approximately 13,000 to 12,700 BP. However, there is little evidence of Clovis culture in the Pacific Northwest and there has been no confirmed association between humans and mammoths or mastodons in the Columbia Plateau. While Clovis sites can be identified by the discovery of a Clovis point, there is no known way to recognize a pre-Clovis site. In some cases excavations below Clovis-era levels have provided evidence of older occupations, such as at the sites along Buttermilk Creek or at Paisley Caves, which have been identified on the basis of radiocarbon dates. But there are no known Clovis-era occupation sites to investigate in the Columbia Plateau. While surface finds of Clovis points are extremely rare, there are dozens of sites with varieties of WST points and it is possible that some of those locations represent older-than-Clovis sites (Beck and Jones 2010, 2014). However, WST points are widespread temporally, spanning between 5,000 and 3,000 years of use, and they cannot be used individually as pre-Clovis time markers.

A number of pre-Clovis archaeological sites have been recently identified in North America including two in the Pacific Northwest, both of which have evidence of elephants. The Paisley Caves site demonstrates a human presence in south-central Oregon 14,000 BP with protein residue from proboscideans on two lithic tools. The Manis site shows evidence of mastodon hunting on the Olympic peninsula 800 years prior to Clovis Culture. Recent reexamination of sites in Wisconsin and Florida further supports the evidence that the processing of mammoths and mastodons pre-dates Clovis Culture.

The most likely way to find a pre-Clovis site in the Columbia Plateau is by encountering a mammoth or mastodon and treating it as an archaeological site. With the exception of the Umatilla mammoth, all mammoths and mastodons have been found by members of the public, usually through construction, so it is extremely likely that the next discovery of a mammoth or mastodon will be an accidental event. The site will need to be secured quickly to preserve its integrity and context. It will also be imperative to include a geologist or someone who is extremely well-qualified to interpret the stratigraphy and context.

How would one recognize an older-than-Clovis mammoth site in the Columbia Plateau? There are a number of criteria that will be need to be addressed in order to prove that humans were involved with the find (Table 2, adapted from Holen and Holen 2014:433).

The arrangement of the bones should provide the initial evidence of human involvement (Howell 1966). Meticulous recordation of the location and distribution of the remains is mandatory. The selection of preferred mastodon elements, combined with the absence of others, indicated scavenging and transport from a nearby location to the Monte Verde site (Dillehay 1997). The arrangement of the bones at the Wisconsin and Page-Ladson sites also suggested scavenging rather than hunting (Overstreet and Kolb 2003; Dunbar 2006). The upslope dispersal of bones indicated a human presence at the Manis site while the downslope dispersal of the skeleton was interpreted as a lack of human involvement at the Umatilla site (Gilbow 1981). The stacking of femora across one another and atop the ribs and the separation and reorientation of the mandible from the cranium was considered indicative of human activity at the Lindsay site (Davis and Wilson 1985:98).

Table 2. Types and Definitions of Human-Induced Modifications at Potential Pre-Clovis Archaeological Sites

Type of Modification or Association	Description
Impact notches	Semicircular or arcuate indentations on the fractured edge of a long bone produced by percussion
Spiral fractures	Tensile failures along a helical path produced by breaking at oblique angles to the longitudinal axis of the bone
Bone flakes	Bone debitage produced by percussion that have attributes comparable to lithic flakes produced by human agency
Flake scars on bone surfaces	Patterned indentations on bone surfaces indicating that flakes have been removed
Patterned distribution of bones	Human-induced arrangement of skeletal elements
Preferential breakage	The intentional breakage of thick cortical limb bones while leaving lighter bones unbroken
Modified bone tools	Skeletal elements of modification by use wear
Chipped-stone tools	Manufactured lithic artifacts exhibiting multiple flake scars
Anvils or hammer-stones	Cobbles, associated with bone assemblages, that are interpreted as percussors or anvils
Lithic flakes	Utilized flakes or debitage from tool manufacture or modification

The best way to demonstrate a human presence at a potential site would be the recovery of closely associated bone and/or lithic artifacts. Bone tools are common in Upper Paleolithic sites and it is clear that the First Americans used bone-tipped weapons in the Pacific Northwest, as indicated at the Manis site. Proponents of pre-Clovis sites have more claims for the presence of bone tools compared to Clovis and later sites (Agenbroad 1988:66) so the recognition of bone tools is critical for acceptance. Proboscidean long bones and teeth were used as cores to produce expedient tools at the Bluefish Caves and Monte Verde sites. The absence of lithic tools at the Wisconsin sites has been attributed to the use of bone tools that did not preserve or to scavenging, which would not have required weapons. Lithic tools are scarce at Clovis sites and typological distinct lithic artifacts are absent at pre-Clovis sites. Context was used to explain the presence of sandstone manuports at the Lindsay site. The limited number of lithic tools found to date in older-than-Clovis assemblages, such as at the Page-Ladson and Wisconsin sites, are generic bifaces or debitage that would not have been recognized as Paleoindian artifacts had they been found in a typical CRM surface survey or in a shovel test pit. The most common type of lithic artifact at pre-Clovis sites is debitage, most of which appear to be small flakes generated during the sharpening of curated tools (Andrefsky 2014). In addition to careful excavation, fine screening is also mandatory for the recovery of fragmentary tools and debitage.

Both the Coplen Spring and Donahoe Spring sites were reported as having stone tools so it seems likely that similar items will be recovered at sites in the Columbia Plateau. The ideal pre-Clovis lithic artifact to find in a mammoth site would clearly be a WST projectile point. WST points are fairly common at early sites in the southern Plateau including Sentinel Gap on the Columbia River (Galm and Gough 2008), Marmes Rockshelter on the lower Snake River (Hicks 2004), Hatwai (Ames et al. 1981; Sanders 1982) and Kelly Forks (Longstaff 2013; Polito 2017) on the Clearwater River, Coopers Ferry on the lower Salmon River (Davis et al. 2017; Davis et al. 2019), and elsewhere. WST points have now been found in older-than-Clovis radiocarbon-dated contexts, such as at Paisley Caves (Jenkins et al. 2012), at the sites along Buttermilk Creek (Waters et al. 2018; Williams et al. 2018), as well as in the Columbia Plateau (Brown et al. 2019; Davis et al. 2019) so that finding a WST point associated with a mammoth now seems possible.

Another aspect of lithic analysis should be protein residue analysis, which has been successfully conducted at multiple sites in the southern Columbia Plateau (Sappington 2010). If lithic tools or debitage had been used to process a mammoth it should be possible to test them against antiserum from a modern Asian elephant. Despite the absence of faunal remains, this technique has successfully identified evidence of proboscidean processing on two tools, a handstone and a modified flake, at Paisley Caves (Jenkins et al. 2014:494, Figure 28.5b). A WST Haskett point was identified as positive for elephant antiserum at a site in Utah (Duke 2015:109–112). The positive identification of elephant residue on the potential core from the Grove site, or on the potential debitage from the Wenas Creek or Ledgerwood sites, would have made a strong case for demonstrating that those items were indeed artifacts that had been employed or produced during the processing of mammoths.

After documenting the faunal elements in the field, another means for identifying processing involves determining the presence of cut marks. While machinery

is likely to have damaged some of the bones during the initial discovery, extreme care needs to be taken during the excavation and transportation of the remains to the laboratory. Reports of cut marks need to be very strict and some claims, such as at some of the sites in Wisconsin (Overstreet and Kolb 2003) and Lindsay in Montana (Davis and Wilson 1985) have been rejected by others (Krasinski 2010, 2016). The identification of cut marks in the past has been highly subjective but the six criteria recently employed for the faunal collection at Bluefish Caves (Bourgeon 2015; Bourgeon et al. 2017) should make this type of analysis more standardized and reliable. It is also critical to examine the location of the cut marks since some elements are more likely than others to exhibit them. Other evidence of processing includes the identification of spiral fractures, polishing, and burning. While it made the fieldwork much slower, the use of wooden tools at Tolo Lake prevented the possible misidentification of cut marks. The recognition of bone flakes and tools made from bones and teeth will also be essential. The examination of existing collections is probably not a worthwhile endeavor since most, if not all, of those sites were exposed by machinery and then excavated with metal tools including shovels and trowels (Krasinski 2010, 2016).

Chronology is always critical in archaeology and especially so with potential early sites. A sense of geology is essential for understanding context (Goebel and Keene 2013). When megafauna are encountered the geological setting itself should provide a preliminary age; mammoths found in glacial flood contexts are likely to be natural (Gough et al. 2017). Deposition by glacial flooding probably accounts for the mammoths in the Tri-Cities area, at Hells Gate State Park, and at the Port of Clarkston and the likelihood of human involvement is minimal in those cases. The presence of glacial erratics among the mammoth bones at Coyote Canyon was interpreted as strong evidence for a natural occurrence at that site. Until approximately 12,500 BP the Cordilleran ice sheet covered virtually all of British Columbia, with the Okanogan Lobe extending across northern Washington and the Purcell Trench Lobe extending down northern Idaho, so that it is unlikely that mammoths or mastodons will be found to the north of those areas (Allen et al. 1986:107; Menounos et al. 2017:784). However, the mammoths and the mastodon in southeastern Wisconsin were found south of the Lake Michigan Lobe (Joyce 2014) and the Manis mastodon was just south of the Puget Lobe so sites could be found along the southern periphery of the Cordilleran ice sheet in north-central Washington or northern Idaho along the Purcell Trench.

Direct radiocarbon dating is the key to determining whether a site is actually pre-Clovis in age. Dating of associated materials is problematical; the use of vegetal matter was one basis for questioning the age of the Manis site from 1977 until 2011 (Waters et al. 2011). Improvements in technology led to the recent AMS direct dating of the specific rib with the embedded projectile point at the Manis site which provided conclusive proof of its older-than-Clovis age. Years of questions pertaining to the age of a human presence at Bluefish Caves seems to have been resolved by the careful identification of cut marks combined with radiocarbon dating of only distinctly butchered elements. Multiple dates are mandatory such as with Manis, Wisconsin, and Page-Ladson sites. In some cases the bones may not be dateable due to mineralization such as at Tolo Lake, or degradation, such as at the Port of Clarkston. The evidence of human involvement in association with

mammoths that are dated older than 16,000 BP, such as at the Ledgerwood and Wenas Creek sites, is still likely to encounter resistance unless all or most of the criteria listed in Table 2 are addressed.

Human ancestors began interacting with mammoths in Eurasia during the lower Paleolithic and the First Americans brought this tradition with them into the New World. Since the 1930s there has been a demonstrated association between mammoths and Clovis Culture. Since the 1970s mammoths and/or mastodons have been found in pre-Clovis contexts in nearly all culture areas in North America including the Arctic (Bluefish Caves), the Plains (Lindsay), the Northeast (Schaefer and Hebior), the Southeast (Page-Ladson), the Great Basin (Paisley Caves), and the Northwest Coast (Manis), as well as in South America (Monte Verde).

It is extremely likely that pre-Clovis sites exist in the Columbia Plateau, as well. The first older-than-Clovis site in the Plateau will not be identified by the presence of temporally distinct diagnostic artifacts. Rather, it will be an inadvertent discovery of a tusk or large bones in a construction zone that will need to be followed quickly by painstaking excavations in order to document the arrangement of bones, breakage patterns, the presence or absence of certain elements, and the recognition of bone and/or stone tools in the field. A geologist will be required to date the context of the site and if it is below the level of the Missoula flood deposits it will probably represent a natural event. It will be imperative to follow meticulous fieldwork with laboratory analyses including the identification of indisputable cut marks, protein residue analysis, and the direct radiocarbon dating of culturally modified bones.

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WHY ARE THERE NO PRE-CLOVIS MAMMOTH SITES IN THE COLUMBIA PLATEAU?

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“Mammoths” and “Mammoth-Bisons” in Ancient Art of the Northern Far East¹

Alexander I. Lebedintsev

Translation by Richard L. Bland

Abstract *This article discusses “images of mammoths.” Margarita A. Kir’yak believes them to be animalistic sculptures of small form. The only method of identification of these objects is visual. The interpretation of inexpressive pictures of animals on stone flakes from pre-Neolithic and Early Neolithic complexes of the Far East is disputable. M. A. Kir’yak comes to an erroneous conclusion that Paleolithic sculptures of mammoths are evidence that a cult of animals appeared in the northern Far East at the same time as in Europe and Siberia. In her opinion, the image of the mammoth occupies the main place in mobile art among the zoomorphic characters in Northeast Asia and quantitatively outnumbers Siberian finds. “The mammoth sculptures” considered in this review give rise to doubts regarding such conclusions.*

The spiritual creativity of ancient man has attracted the attention of many specialists. In the last decade works have appeared in which researchers introduce into scientific circulation new materials on “pervobytnyi primitiv” [“primitive entity”]—art of small form, paying special attention to semantics. Unfortunately, the source analysis of the finds, as a rule, is absent. Only after the creation of a source base are any attempts at semantic disclosure possible, with the norms of scientific argument necessary for this.

In this work “images of mammoths” from the northern Far East are examined, which were assigned by M. A. Kir’yak (Dikova) to animalistic sculpture of small form (Kir’yak 2003:67–70). The only method of “identification” of shaped objects used by researchers of Paleolithic art of the Northeast is visual (Kir’yak 2005:132).

Most the mammoth figures were found among materials from the Paleolithic site of Ushki I in Kamchatka (Figure 1: 1–4, 6–7).

A pendant from Upper Paleolithic Layer VII of the Ushki I site (Figure 1:1) was made from a thin polished blade, which had round holes made in the upper and lower parts. The pendant was broken along a line passing through the holes, and therefore another hole for attachment was drilled on the remaining large part. Traces of two holes thus remained at the bottom of the pendant. The protrusions that were formed are unlikely “separate trunk and legs,” as the researcher [Kir’yak] suggests, of an envisioned “mammoth.” What is more, the author of the find himself, N. N. Dikov (1979:39), saw nothing zoomorphic in this pendant. And, noting that this pendant has traces of wear on one surface, M. A. Kir’yak (2003:147) comes to the rather bold and unconfirmed conclusion that the “sewed on” pendant is documentary evidence of “a rather early mammoth cult in Northeast Asia.”

A small flat sandstone pebble from Layer VI of the Ushki I site (Figure 1:2) has lineal marks on two sides that were formed by cutting. There is no specific

¹*Bulletin KRAUNTs* (Kamchatka Regional Organization Education-Science Center). Humanities, 2005, no. 2. Petropavlovsk-Kamchatskii: Kamchatskii gosudarstvennyi universitet im. Vitusa Beringa, 2005.

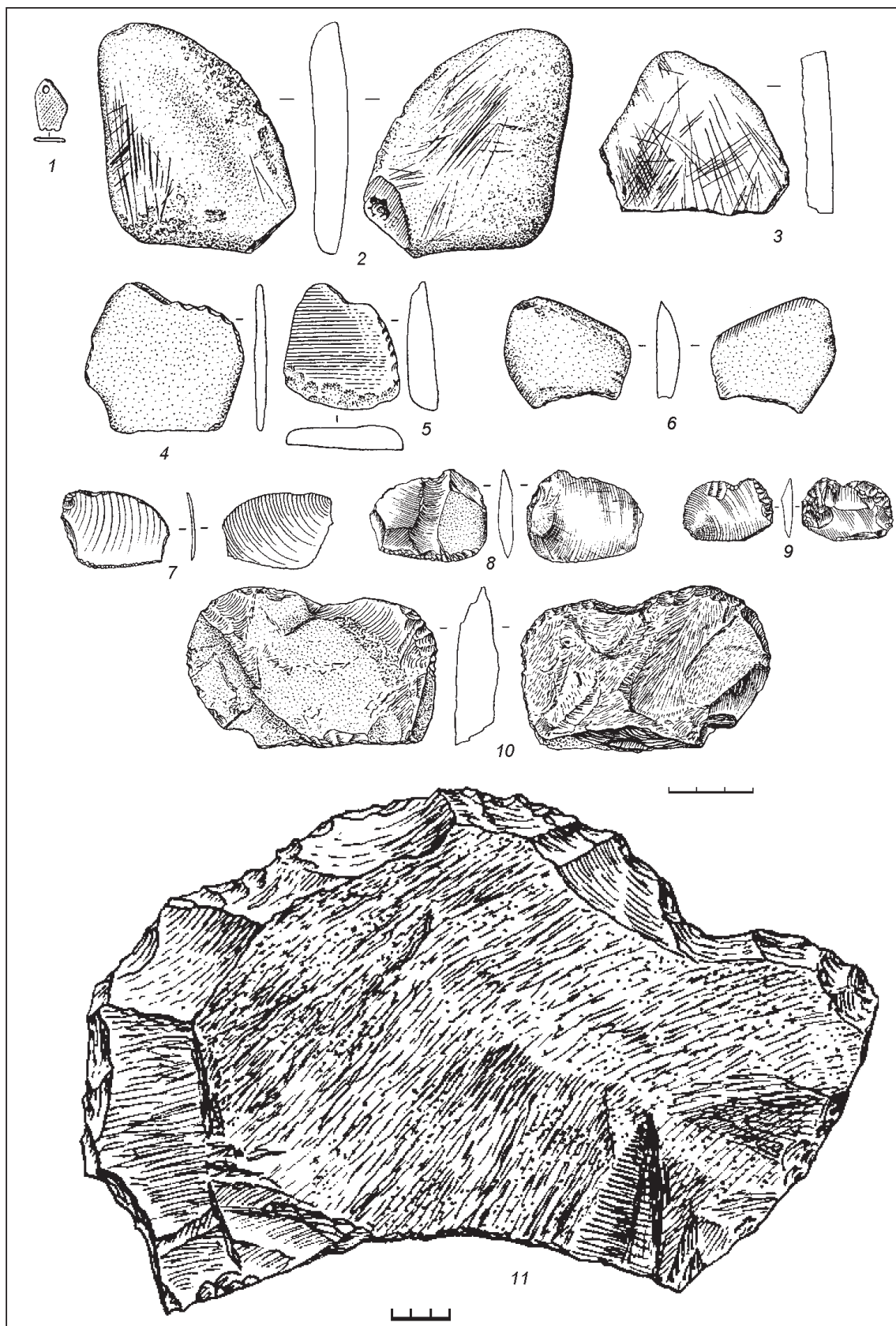


Figure 1. Artifacts from sites: 1-4, 6-7—Ushki I; 5—Ul'khum I; 8—Bol'shoi El'gakhchan I; 9—Tytyl' V; 10—Tytyl'vaam II; 11—Druchak-Vetrennyi.

figure (“which is guessed a trunk”) in these lines. M. A. Kir’yak (2003:68) “guesses” a mammoth on the pebble. N. N. Dikov (1979:63) also saw the figure of a mammoth on this pebble. Z. A. Abramova (*Paleolit SSSR* 1984:327) expressed doubt about the interpretation of several anthropo-zoomorphic objects which include the discussed “mammoth-like figure.” Mentioned traces of ocher on the pebble also explain little, since ocher stains are rather often encountered in Cultural Layer VI of the Ushki I site.

Another “figure” from this same layer of Ushki I is like the preceding (Figure 1:3). A generous share of imagination is needed in order to see something in it. Straight lines were carved on one side of the slab (typical traces of production activities).

A small obsidian flake with pebble cortex and retouch along the edge was found in a “burial pit” in the Ushki I site (Layer VI). N. N. Dikov (1993a:25) determined it to be an image of a mammoth (Figure 1:4). M. A. Kir’yak (2003:68), for whom this flake somehow became a split shale slab of gray fine-grained sandstone (?), also believes that this find—made by crude trimming of the edge and a marginal break that marks the transition (?) along the line of the trunk-lower extremities—is certainly an image of a mammoth. To prove this, in our view, is very difficult since all the modification of this flake is usual for making a scraper edge. No details characteristic of mammoth figures are given for this find.

Another retouched flake of obsidian from this same “burial pit” attracted the attention of the researchers as the figure of an ancient animal (Figure 1:7). N. N. Dikov (1993a:25) saw in it the figure of a bison. M. A. Kir’yak (2003:68) recognizes in this object the image of a mammoth, a peculiarity of which is the natural design of long white inclusions. The upper and lower edges of this flake were worked by fine retouch. Chips and breakage do not bear any representational load. M. A. Kir’yak determines an ordinary scraper to be the figure of a “mammoth-bison” (turned upside-down) (Ibid., photo 4).

A flat, small gray, porous pebble from Layer VI of the Ushki I site was also determined to be the reduced figure of a mammoth (Figure 1:6) (Kir’yak 2003:68). The grinding on this pebble was formed by its use as a push-plane. The triangular projections emerge due to the break of part of the pebble. Chipping and rubbing occurred on the pebble as a result of various actions.

N. N. Dikov (1974:158; 1979:38; 1993a:29) repeatedly mentioned the existence of mammoth hunting in the later Paleolithic among the Ushki people. However, these assertions were at the level of assumptions and were not supported by any substantiating evidence. More justified is the opinion that Ushki people hunted moose, reindeer, bison, and horse (Dikov 1979:57), and the postulated assumption of a “crisis state” of transition from mammoth hunting to smaller fauna in Kamchatka is not confirmed in any way (Kashin 2003:121).

Figures of “mammoth fauna” were discovered in several early sites in Chukotka (Figure 1:5, 9, 10).

The shaped item from the Ul’khum I site (Figure 1:5) of dark-gray andesite in the form of a slightly modified pebble spall reminded the researchers of the retouched image of a mammoth (Dikov 1993b:22–23; Kir’yak 2003:69). Noting the schematic nature of modification of this item, N. N. Dikov believed this figurine was a “quite vivid example of primitive entity art.” The reasons given for the special accent on a “trunk” and “hanging wool” on this item are doubtful, since its very form

and modification do not distinguish it from other scraper-like tools. This item most probably had a utilitarian assignment. In addition, the mixing of materials from this site and the lack of dates create difficulties in determining the age of this find.

The retouched flake from the Tytyl' V site (Figure 1:9), based on its outline, was determined to be the sculpture of a mammoth (Kir'yak 2003:69–70). And in an inverted form this artifact now seems to be reminiscent of a bison. In the opinion of that author, the attention of the ancient artist was focused on modeling primarily the front and upper parts of this figurine. However, based on the whole description, a notch in the upper part is more distinct and visible, but whether it was intentional is impossible to prove. It is entirely probable that this notched upper surface was the natural edge of the flake. Modification by retouch of some areas does not provide a basis to accept the used means of forming as an artistic technique. This artifact was found on the surface of the site along with other Neolithic material, so assigning it to an earlier time is problematic.

The figurine of a “mammoth-bison” from the Tytyl'vaam II site (Bilibin District of the Chukotka Autonomous Region) (Figure 1:10) (Kir'yak 2003:70) is an ordinary scraper-like tool for working hides that existed during the Stone Age and later and are encountered rather often in sites of Chukotka. N. N. Dikov (1979:302) assigned such scrapers to a separate group (IX). In the opinion of M. A. Kir'yak, “polyiconism is sensed” in the small sculpture examined: the rear part of a bison is perceived and the fore part of a mammoth. It is just as difficult to date this find since it was discovered among diachronic cultural remains during clearing on the surface where sod had been removed.

In the Severo-Evensky District of the Magadan Region, a retouched flake “similar in technique of preparation” was found in the site of Bol'shoi El'gakhchan I (Figure 1:8). M. A. Kir'yak (2003:68–69) believes this artifact to be the condensed image of a mammoth and a bison. The unreality of this interpretation is obvious to anyone reading the description of this artifact, especially that concerning the parts of the body of the “mammoth” (trunk, place of occurrence of tusks, short tail).

But readers are invited to “see” mammoths not just in small and miniature objects (from 1–2 to 7–8 cm). A macro-artifact (Figure 1:11), identified by I. E. Vorobei (1996:44) as a slab of diabase “with a flaked concave-convex edge and distinguishable spurs” found at the Druchak-Vetrennyi site (Severo-Evensky District of the Magadan Region), is assigned by M. A. Kir'yak (2003:69) to a macro-sculpture of a mammoth, though I. E. Vorobei himself was not inclined to consider this large percussion (?) tool a zoomorphic sculpture. All the characteristic features of a “mammoth” given by M. A. Kir'yak—the “bulging” forehead, moveable part of the trunk, short tail, short toes (though the legs are not separated), and wooliness—are no more than the result of imagination.

The allocation of zoomorphic features based on principles of contour requires more weighty and convincing criteria. The criteria proposed by M. A. Kir'yak (2002:9–10), on the basis of which the author determines that the artifacts are sculptures of small form, largely reflects a subjective approach: the determination of the image of an animal based on the outline of retouched flakes or tools that have no clear and special features that permit them to be reliably assigned to productions of art, and the acceptance of the texture of the raw material as a technique of artistic expression.

Moreover, some features, often inaccessible to visual inspection, are visible to the researcher only with a significant magnification, which was unavailable for people of ancient periods. The explanation for the schematic nature of the images as the result of reduction in size does not add confidence to their reliability.

Trace analysis was not used in the study of the artifacts assigned to representational objects, though its decisive role is noted in the “identification” of art objects (Kir’yak 2005:132).

The existence of a hybrid mythical being—“mammoth-bison”—in the Paleolithic of the Northeast is also objectionable (2005:133). Such images are not even present in the Paleolithic art of Europe (Elinek 1982).

It should also be noted that in the Paleolithic of Europe mammoth figures were not made from flakes, but rather bone, mammoth tusk, marl, and clay were used for making them. “Sculpted-bas relief images of mammoths” from the Malaya Syya site (Eastern Siberia) (Larichev 1980) have been justly criticized and not accepted as productions of primitive art (Gryaznov et al. 1981), and therefore they cannot be used as evidence of the existence of such objects of art in the Paleolithic of Eurasia and Northeast Asia in particular.

Featureless, and therefore controversial, images of animals on stone flakes of pre-Neolithic and early Neolithic complexes of the Far East encounter objections in their interpretation (Kosarev 2003:40).

M. A. Kir’yak (2003:147) concludes that Paleolithic figurines of mammoths attest that a cult of animals was formed in the Northern Far East as early as in Europe and Siberia. In her opinion, the image of a mammoth occupies the leading place in mobile art among the zoomorphic entities of Northeast Asia and even in significant degree exceeds numerically Siberian finds. The “mammoth figures” examined in this review cast doubt on such conclusions.

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Alexander Ivanovich Lebedintsev (b. 1952), leading researcher, archaeologist, has actively participated in the work of the Northeast Asian Archaeological Expedition as team leader (Okhotsk coast, Ushkovskaya Paleolithic site). He took part in excavations on Wrangel Island (Chertov Ovrage site), Kolyma (Siberdik, Congo, and Multan sites), and Kamchatka (Ushki I and Ushki V sites). In 1990, A. I. Lebedintsev defended his thesis at the Leningrad branch of the Institute of Archeology of the USSR, Academy of Sciences. He presently supervises research in archeology, ethnology, and history at the Northeastern Interdisciplinary Scientific Research Institute (NEISRI) of the Far East Branch

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**Abstracts from the 71st Annual Northwest
Anthropological Conference, Boise, Idaho,
28–31 March 2018¹**

Hosted by Boise State University and the Idaho State Historical Society

Symposia

**The Mowitch Project—Traditional and Contemporary Methods of Hunting
and Use Confederated Tribes of the Colville Reservation**

Organizers: Roderick Donald, Adam N. Rorabaugh, and Arrow Coyote

Chair: Arrow Coyote

Mowitch means “deer” in the Sanpoil language, and this project entails documenting through film, the steps involved in deer procurement and processing: hunting, gutting, skinning, butchering, and tanning. This symposium/panel is part of the production process whereby the Mowitch film makers will present portions of the film and have a panel discussion with the audience. The results will help focus the narration portion of the project that will be integrated into the final production of the film. This video will serve to educate and preserve the traditional/contemporary methods of deer procurement and hide processing.

*The Mowitch Project—Traditional/Contemporary Methods of Hunting and Use:
Introduction and Film Editing*

Travis Adams

*The Mowitch Project—Traditional/Contemporary Methods of Hunting and Use: Hunting
and Processing Changes Through Time*

Mitchell Peone

*The Mowitch Project—Traditional/Contemporary Methods of Hunting and Use: The Use of
Deer Meat Within Our Teachings*

Sylvia Tatshama Peasley

*The Mowitch Project—Traditional/Contemporary Methods of Hunting and Use: Showing
You how to Brain Tan a Deer Hide*

Brian Monaghan

The Mowitch Project—Panel Discussion.

Panelists: Arrow Coyote, Travis Adams, Sylvia Tatshama Peasley, Brian Monaghan

¹ The printed issue provides session abstracts, titles, and participants. Titles and authors of posters are also included. Abstracts of individual papers and posters can be found in the digital version of *JONA* 53(2) at <http://www.northwestanthropology.com>.

**The Context of a Holocene Thermal Climactic Native American Skeleton
Discovered in the Upland Yakima Basalt Folds Area of South-Central
Washington State**

Chair: David G. Rice

In early May 1982 a pre-NAGPRA inadvertent discovery of a deeply buried Native American skeleton was discovered during the Golden Blade Exercise training maneuver by the U.S. Army near the Yakima Training Center, Washington. Army personnel consulted the Wanapum Indian Community regarding the circumstances of the discovery, and agreed to an Army effort to recover the grave and document its contents within two days, and arrange for reburial of the remains. On August 10, 1982, the remains were reburied by Yakama and Wanapum Indian tribes at an agreed upon location. No report of these finds, their age, setting or environmental context was ever written. The purpose of this session is intended to organize this material for a technical report to share our surprising findings.

The burial was protected by a rock cairn. It covered an extended adult male skeleton with a number of age-related anomalies. Nearly all bones were represented and in good condition, due in part to the depth of the subsequent geological deposits. The body was originally dug into a natural bed of Mt. Mazama volcanic tephra, which also covered and encapsulated the burial fill and rock cairn, suggesting a date from soon after its eruption, 6850 calendar years BP—at the climax of the Holocene Thermal Maximum. The 2.5 meter depth of this grave deposit, and its stratigraphy may provide supporting new information about Columbia Basin paleo-climate during and after soon after the Holocene Thermal Optimum.

The Curious Old Man (Cold Creek Man) and His Early Stone Beads in the Upland Yakima Basalt Folds

Dave Munsell

The Environmental Setting and Geochronology of a Curious Old Man Buried in the Upland Yakima Basalt Folds

David G. Rice

Some Comments Regarding the Osteological Remains of the Curious Old Man Buried in the Upland Yakima Basalt Folds

Lourdes Henebry-DeLeon, Discussant

**Pacific Northwest Consortium for Geophysics in Archaeology and CRM:
“Where Are We? Where Are We Headed?”**

Organizers: Rory Becker, Colin Grier, Steven Hackenberger, Lee Liberty, Lew Somers

An informal and open discussion will be led by five practitioners regarding applications of geophysical survey methods in archaeology as they serve three purposes: research, teaching and/or applications. Research objectives include technological innovation, investigating site formation, feature definition. Teaching reaches students, managers, and experts. Applications include developers, agencies, and tribal programs with interest in cost-effective discovery, sampling for evaluation and data recovery, and non-intrusive survey methods. Interested attendees will be asked to share perspectives and experiences. The discussion is part of a call for greater collaboration in the development and training in geophysical methods for archaeological practice in the Pacific Northwest.

Discussion Leaders: Rory Becker—Eastern Washington U.; Colin Grier—Washington State U.; Steven Hackenberger—Central Washington U.; Lee Liberty—Boise State U.; Lew Somers—Geomagnetics and Archaeophysics

General Session: Bioanthropology and Lithics

Session Chairs: Akiko Nosaka, Scott Thomas

No Wizardry in These Bones: Tips and Tricks for Working With, and As, An Osteologist
Tom Ostrander

Fertility Trends Among First-Generation Japanese Immigrant Women in Seattle
Akiko Nosaka and Donna L. Leonetti

Male care and life history traits among primates: a comparative analysis
Alexander Sheldon and Kermyt G. Anderson

Reflections in Stone Tools: A Life Story of Don E. Crabtree
Yuumi Danner

Student Flintknappers: New Tool Makers Help Reveal Old Technology
Marci Monaco

Percussion Blade Cores and Blades: A Late Prehistoric Lithic Tradition in Southeastern Oregon
Scott Thomas

Dating the Western Stemmed Tradition in the Northern Great Basin
Dennis Jenkins and Thomas J. Connolly

Nevertheless, She Persisted: Women's Contributions to Pacific Northwest Anthropology

Organizers: Alexander Stevenson and Stephenie Kramer

Our combined academic and professional histories in Pacific Northwest anthropology are dominated by endeavors (research and compliance) led by women. While the work of women like Erna Gunther, Marian Smith, and Vi Hilbert serve as foundations for research, other women's contributions have often gone unrecognized or undervalued. To our knowledge, there has never been an explicit examination of women's contributions to Pacific Northwest anthropology in the history of practice in the region. This is curious, considering many of the earliest CRM firms in the northwest were started by women, and women hold many influential academic positions at major universities in the region. This session will include papers inspired by, in honor of, about, for, and/or by women and will recognize these contributions to the professional and scientific discipline of Pacific Northwest anthropology as a whole.

Women in our Midst: Role Models, Mentors, and Leaders in Our Past, Present, and Future
Alexander Stevenson

Roar: A Brief History of Feminist Archaeology in Pacific Northwest CRM
Kelly Bush

I Been in the Right Place (And It Must Have Been the Right Time)
Sarah Campbell

Standing on Their Shoulders: Persistent Takeaways from Female Role Models

Paula Johnson

Considering Women's Contributions to NW Anthropology in Light of the Jungian Anima Archetype within a Man's Mind

David G. Rice

Taking On Dominant Narratives: A Paper in Honor of the Work of Dr. Julie Stein

Amanda Taylor and Stephanie Jolivette

Do Not Walk the Path Alone: Navigating a Complex Professional Hierarchy with a Strong Mentor

Stacy L. Bumback and Michelle Yellin

Kia Slawdee (Grandmother and Woman)

Rhonda Foster

Roar—A Brief History of Feminist Archaeology in Pacific Northwest CRM

Kelly Bush

Discussion

Discussants: Virginia Butler, Lorelea Hudson, and Michelle North

Colville Confederated Tribes History/Archaeology Program General Session: Perspectives on Traditions and Resources.

Organizers: A Roderick Donald and Adam N. Rorabaugh

For members of the Confederated Tribes of the Colville Reservation Colville Confederated Tribes (CCT)] there is continuity between past and present. The presenters in this symposium demonstrate the efforts of the CCT History/Archaeology (CCT H/A) program in preserving the traditional practices of the constituent tribes of the CCT. CCT H/A works cooperatively with federal, state, other tribal and local agencies to ensure our history is not forgotten or diminished. This session also depicts the importance of protecting tribal rights and sovereignty within the context of professional cultural resource management.

A Brief Introduction to the Confederated Tribes of the Colville Reservation's History and Archaeology Program

Roderick Donald

Hunting Traditions in the Upper Columbia River

Arrow Coyote

Plants, People and Places: Mapping Historic Cultural Plants and Populations

Pendleton Moses

Results of the 2016–2017 Net Pens (45OK247) Excavations

Adam N. Rorabaugh

Colville Tribes Engaged in the Basin: FY2017 in Retrospect

Robert Sloma

Ethnographic Research with Pacific Northwest Tribes

Organizer: Donald Shannon

This session will highlight the importance of ethnographic research with Tribes in the Pacific Northwest, and to show how the Federal compliance process can generate ethnographic work. Panelists will include Federal Agencies who fund ethnographic research, academicians who work with regional Tribes, and representatives from Tribal cultural resource programs. We will discuss some of the differences between academically driven ethnography and compliance ethnography, both through consultants and research done by Tribes. Compliance ethnographic work highlights the living culture of Tribes in the Pacific Northwest, exemplified by issues such as: cultural adaptation to a new riverine ecology; restricted use of traditional homelands to hunt and gather culturally significant plants; the complex dynamics of access to salmon and salmon fishing; and many more. The importance of ethnographic research, specifically related to Traditional Cultural Properties, is increasingly acknowledged in management documents generated by land-managing agencies.

Panelists: John Pouley, OR State Historic Preservation Office, Shawn Steinmetz, Breice Edwards, Grand Ronde Tribes, Christina Phillips, University of Idaho, Scott Williams from Washington State DOT, and Kristen Martine and Dave Johnson, Bureau of Land Management

Shifting Perspectives and Future Directions for Northwest Coast Archaeology: A Symposium by Washington State University Graduate Students.

Organizer: James Brown

It is useful to ongoing archaeological inquiry that different trajectories of thought and research be used to interpret and understand the past. The drift between humanistic and scientific approaches in of itself generates new data, research questions and tools useful to archaeology. This session presents the views of a new generation of scholars emerging in the context of a sea of changing theory and working to define new questions and directions. These papers discuss a diverse array of subjects pertaining to the Northwest Coast region, including: modern cultural resources, settlement patterns, sociopolitical organization, labor, subsistence, and seasonal land-use. Further, these papers build upon new and previously published datasets. The research presented in this symposium provide additional insights to the precontact history of the Northwest Coast. Through the papers presented in this session we contribute to the archaeology of the Northwest Coast and the rethinking of topics that have been the subject of archaeological inquiry for the last 30–40 years.

Searching for Diversity: A Detailed Zooarchaeological Analysis of Birds from San Juan Islands Sites

Emily L. Whistler

*Re-Evaluating Bulb Size as a Proxy for Camas (*Camassia ssp.*) Management in the Willamette Valley of Oregon*

Molly Carney and Stephenie Kramer

Investigating Feasting in a Precontact Coast Salish House: Zooarchaeological and Paleobotanical Analysis of a Potential Feasting Feature at DgRv-006, Galiano Island, BC

Samantha Lee Fulgham and Colin Grier

Washed Away

Robert H. Gargett and Kate A. Shantry

Seasonal Sociopolitical Reversals and the Reinforcement of Autonomy and Fluidity among the Coast Salish

Emily Helmer

Settlement Change and Political Organization of the San Juan Islands for the Past 3000 Years

James W. Brown and Galen Miller-Atkins

Politics on the Landscape: Evaluating Settlement Organization in the San Juan Islands

Galen Miller-Atkins and James W. Brown

The Role of Labor in the Creation of Northwest Coast Landscapes

Nathaniel James

Discussion

Colin Grier, Discussant

General Session: Culture and Society

Session Chairs: Shareena Parks, Thomas J. Connolly

Re-Awakening Ancient Salish Sea Basketry: Applying Generationally-Linked Archaeology

Dale Croes and Ed Carriere

Re-Awakening Salish Sea Basketry: Continuing Research of the Biderbost Wet-Site Basketry Materials

Elizabeth Hawes

Refusing to Dwell on the Past: The Story of An Afghan Refugee

Logan Amstadter

Inadvertent Discovery of Human Remains on the Siletz Bayfront, Lincoln City, Oregon: A Case Study on Siletz Tribal History

Thomas J Connolly, Robert Kentta, and Jeanne McLaughlin

Critical Review of Imagery of NWC Coast Salish Past Lifeways

Bea Franke

Paddling as Methodology

Danielle Gendron

*Debunking the “Sh**hole” Epithet: The Conditions and Contributions of African Immigrants in the United States*

Kassahun Kebede

Cultural and Social Biases in Educational Access

Hannah MacIntyre

Imagining Truth, History and Reality of the Vestige

Kelsey Maloy

Cultural Relativism and Moral Absolutism: Philosophers and Anthropology

Shareena Parks

Finding Common Ground: Navigating Ideological Diversity and Coexistence in Northern Idaho's Alternative Food Movement

Alleah Schweitzer

Coffee Talk: High-End Coffee in the Modern World

Julia Smith

Origins of the Modern Concept of Race

Donald E. Tyler

Oregon Archaeology and the Legacy of Dr. Richard (Dick) Ross.

Organizer: Dennis Griffin

For over three decades, Dick Ross served as a professor of anthropology/archaeology at Oregon State University where he helped to teach his students about human diversity and the role of anthropology and archaeological excavation skills and analysis, while not losing sight of the people and cultures one works with. Dick was one of the founders of the Association of Oregon Archaeologists and served as its first President. Dick's early years at OSU focused on investigating sites along Oregon's coast before expanding his areas of interest inland along some of the state's major rivers to the Willamette Valley. With the rise of CRM and the expansion of archaeology programs throughout the Northwest, Dick recognized early the importance of archaeologists consulting and collaborating with Native American Tribes and he helped to establish a series of Cultural Resource Conferences that provided a forum for archaeologists and tribes to learn to work together. This session features presentations by a small sample of his colleagues that highlight topics that were important to Dick; be it research in areas of the state where Dick spent many years investigating, the broadening in recognition of archaeology beyond artifacts to include the importance of traditional knowledge, efforts leading to legislative changes in the protection of archaeological sites and burials, as well as the continued importance of tribal consultation.

Dr. Richard (Dick) Ross—Reflections on Forty Years in Oregon Archaeology

Dennis Griffin

The Legacy of Indiana Ross.

Esther Stutzman

Dick Ross and the Oregon Native American Burial Law

David Brauner

Variations in Late Prehistoric/Proto-Historic Cultural Adaptations Between the Na-So-Mah And Miluk Residents of the Coquille River Estuary and the Hanis of the Coos Bay Estuary on the Southern Oregon Coast

Reg Pullen

Flashback: Pirate Cove—A Reflection on Time at 35LNC7, Depoe Bay, Oregon

Thomas E. Churchill

45 Years, What a Long Strange Trip

Ann Bennett Rogers

A History of Consultation between Archaeologists and Native Americans—Communication, Consultation and Collaboration: An Oregon Perspective

Dennis Griffin

Idaho Archeology Gone MAD: Papers in Honor of Mary Anne Davis

Organizers: Susie Osgood, Jorie Clark, Chris Shaver

Throughout her tenure with the Idaho SHPO, Mary Anne Davis has been a close colleague, supporter, and friend to all who have had anything to do with Idaho archeology, whether it be state or federal agencies, Tribes, or the public. This session is a tribute to Mary Anne's contributions to the field and the memories that we will remember her by.

Opening Remarks

Jorie Clark

Givens Hot Springs and Mud Springs: Two Old and Moldy Projects That Should See the Light of Day in an Uncertain Future

Tom Green

Bone as Fuel: Implications for Hunter-Gatherer Mobility

Mark Plew and James Eschenbrenner

Recognizing Redundant Data: Preventing Preservation and Saving the Significant

Kelli Barnes

Work on Historic Fire Lookouts in the Frank Church River of No Return Wilderness

John Rose

Kerosene Trade on the West Coast

Steve Lucas

Historical Analysis of Household Goods

Lilian Bodley

Chemical Analysis of Historical Personal Products

Meaghann Davenport and Ray Von Wandruszka

Chinese Signatures in The Boise Basin: Ongoing Research on Site 10BO357

Rena Campbell

From Bones to Behavior: Zooarchaeology and Chinese Meat Consumption Patterns in the Late Nineteenth Century of an Idaho City Mining Camp

Chelsea Codling

The Pigments of James Castle

Lily Loucks

Top Shot: Recreational and Military Firearms of Fort Boise, Idaho

Nathan May

Archaeological Testing at an 1866 North Idaho Site and Subsequent Potential Activities of Blacksmithing, Hunting, Logging, Cement Making, Homesteading, WWII Training, and Recreation

Idah Whisenant

MAD Then and MAD Now

Jorie Clark and Susie Osgood

Closing Remarks from Friends and Colleagues; Awards Presentation

Food Culture and Narrative Session

Organizer: Maureen Battistella

Back by popular demand, the NWAC Food Culture and Narrative session brings together four papers showcasing new and important field research in the anthropology of food. Historian Richard Engeman opens the session with a broad overview of Oregon's eating preferences from 1880–1980. Research anthropologist Maureen Flanagan Battistella tells of her part-historical, part-genealogical research surrounding Boise, Idaho community cook books published at the turn of the last century. Family historian Annice Olena Black follows with a case study about preparing food on a wood burning stove, and how a rural Jackson County family's food choices in the 1930s reflected status. To close, linguist Edwin Battistella brings food studies forward to examine ambiguity in food labeling practice and regulation.

*Opening Remarks**My Grandmother's Cook Book*

Richard H. Engeman

The Baptist Cook Book, Boise, Idaho, 1906

Maureen Flanagan Battistella

Making Food for a Farm Family in the 1930s: A Case Study

Annice Olena Black

Fresh, Free and Natural

Edwin Battistella

*Audience Discussion***The FCRPS Cultural Resource Program: Impacts from Reservoir Processes and Innovative Approaches to Cultural Resource Preservation in the Columbia River Basin**

Organizer: Celia Moret-Ferguson

The Federal Columbia River Power System (FCRPS) Cultural Resource Program was formed in 1997 to ensure NHPA Section 106 compliance for the operation and maintenance of 14 federally managed hydropower dam projects. Bonneville Power Administration, the US Army Corps of Engineers, and the Bureau of Reclamation cooperate with 10 federally recognized tribes, four SHPOs, and seven Federal land managers in a massive effort to manage reservoir impacts to over 4,500 archaeological and traditional sites within this 775,000-acre area of the Columbia River Basin. This session explores how ongoing site condition monitoring and modern analysis of previous and recently collected assemblages has successfully documented and assessed vast changes to archaeological resources impacted by reservoir processes. Papers highlight some of the recent innovative approaches Program participants and contractors have employed in order to research, document, and preserve traces of our history.

The Archaeology of Hungry Horse Reservoir, Northwestern Montana

D. Alex Schwab, Timothy Ryan, David C. Schwab

Early Archaic Lithics, Ongoing Reservoir Impacts, and Evaluation Potential at 45LI224, Grand Coulee Dam Lake Roosevelt

Brenda Covington

The Lack of Tucannon Components on the LSR: The view from 45WT2

Paul S. Solimano and Todd B. Ogle

Salvage Data Recovery at the Mill Creek Site (45LI6) in Lake Roosevelt

Christopher M. Casserino

Comparing the Accuracy of Two GPS Receivers within the Federal Columbia River Power System

Kaylie Bass and Allie Taylor

**Postclassic Flaked Stone Technology in the Coatlan del Rio Valley, Mexico:
Evaluating Evidence for Production and Consumption in an Aztec**

Provincial Context

Organizer: Bradford Andrews

This symposium presents the preliminary results of a technological analysis of flaked stone artifacts from the Aztec period regional center of Coatlan Viejo in Western Morelos, Mexico. These data were recovered as part of the Instituto Nacional de Antropología e Historia (I.N.A.H.)'s Proyecto Coatlan initiated in 1975. They were recovered from 4 x 4 m surface collections conducted at the sites of Coatlan Viejo (CDR22) and a nearby residential area referred to as CDR27. The Coatlan Viejo regional center appears to have been incorporated into the Aztec Triple Alliance sometime around A.D. 1350. Hence, the artifacts treated here represent a valuable dataset with which to evaluate flaked stone technology and provisioning in a provincial context. Of particular interest is an assessment of the types and proportions of the different technologies represented at the sites (e.g., prismatic blade, biface, etc.) and whether there is evidence for the onsite production and/or maintenance of flaked stone implements. Moreover, the issue of tool function has also been assessed. Ultimately, these data can be used to make initial inferences about the dynamics of Late Postclassic production, trade, and exchange in southwestern Morelos. These data contribute to a growing body of data on the production and consumption of flaked stone tools in provincial Aztec-period households in Morelos and the Valley of Toluca.

Aztec Period Archaeology in the Coatlan del Rio Valley, Western Morelos, Mexico

Dennis Lewarch

A Technological Analysis of Obsidian Flaked Stone Tools from Two Aztec Sites in the Coatlan del Rio Valley

Paris Franklin

Late Postclassic Formed Tools of Coatlan Del Rio: A Comparative Analysis

Ian Farrell

The Cutting Edge: What Obsidian Use-wear Analysis Can Say About Function

Mitch McElwain

Assessing the Coatlan del Rio Flaked Stone Collections: A Comparative Perspective

Bradford Andrews

General Session: Archaeology, Methods, and Settlement

Session Chairs: Noelle Wyatt, William Schroeder

Rethinking "Anthropogenism" and Discerning Anthropogenic Site Vegetation

John Harris

Monte-Carlo Summed Probability Distributions as a Demographic Proxy: A Case Study from the Ruby Pipeline Excavations

Mark E. Hall

Talking Talus

Maurice Major

Unmanned Aircraft Systems and Machine Learning for Archaeological Prospection

Ryan Pacheco and Dale Hamilton

Of Ruptures and Raptures: Locating Ideology with LiDAR Imagery

William Schroeder

Errors Across Lithic Analysts: How much is Enough Training? A Comparison Analysis of the Neely Collection

Noella Wyatt, Breann Stoner, Elizabeth Armstrong, and Patrick T. McCutcheon

Finding Bia Ogoi: The Application of Historic Documents and Geomorphology to the Understanding of Nineteenth Century Landscape Change of the Bear River Valley, Franklin County, Idaho

Kenneth P. Cannon, Kenneth Reid, Joel Pederson, and Molly Boeka Cannon

Paleoindians in Yellowstone National Park: Implications for the Rockies, Snake River Headwaters, Great Basin, and Great Plains Research

Douglas MacDonald

Patterns of Mobility among the Evenki of Eastern Siberia

Karl Mertens

An Examination of Early Sites on the Oregon Coast

Kathryn Fujiye Nuss

Climate Change, Landslides, and the Palaeodemography of the Northern Columbia Basin in the Late Holocene: The View from Kettle Falls

Ian Hutchinson

Design Anthropology in the Pacific Northwest (Papers, Panel, Demonstration)

Organizers: Kendall House and Aaron Thornburg

For over fifty years, anthropologists have been quietly finding a niche in the business world. Over the last decade, the number of anthropologists working in business has increased greatly. The intersection of design, anthropology, and ethnography has proven particularly inviting. This panel will explore four questions: What does design anthropology look like? What does anthropology bring to the design process? How does design change anthropology? What opportunities does design offer to students of anthropology, from bachelor's to graduate degrees? This round table panel will discuss these questions in relation to student and faculty design ethnography projects. The panel will conclude with a rapid demonstration of the collaborative nature of design.

Open Prosthetics Design Anthropology Project: Visual Methods in Design Ethnography

Aaron Thornburg

Design Anthropology at Boise State: Lessons from the First Year

Kendall House

Beyond Membership: Professional Service to the Society

Moderator/Presenter: Chris Noll

Archaeological societies depend on individuals to volunteer countless hours to manage the business of the organization, recruit members, and lead activities that engage those members. Society service is invaluable to the success of the organization but also provides benefits to those to serve. For many archaeologists society and committee service is a key part of the profession with personal and career rewards. This panel assembles officers from the Idaho Archaeological Society (IAS), Association of Oregon Archaeologists (AOA), Association for Washington Archaeology (AWA), Maritime Archaeological Society (MAS), and Northwest Anthropological Association (NWAA) to talk about professional service, archaeological careers, and their experiences as officers. This open discussion will provide students and young professionals with critical insights into archaeology as a profession and opportunities for engaging with the professional community.

Speakers: Noelle Shaver (IAS President), Bob Kopperl (AWA President), Matthew Diederich (AOA Vice President), Scott Williams (MAS Director), Lee Sappington (NWAA President)

Annual Transportation Symposium and Panel

Session Chairs: Scott Williams, Carolyn Holthoff

A Joint Symposium and Panel Discussion on Highlights and Issues of the Past Year's Cultural Resources Management Activities by the Regional Transportation Agencies of Idaho, Oregon, and Washington.

The Transportation Year in Review: Introduction to the Symposium and Challenges, Issues, and Developments

Scott Williams and Carolyn Holthoff

The Stockhoff Quarry Revisited: Results from Recent Highway Project

Andrew Boehm

The Old Highway 30 Project, Caldwell, Idaho

Jillian Martin

Spanning Time: The History of the Broadway Bridge: A Mitigation Project

Barbara Perry Bauer

Collaboration for Christ Chapel's Sake: The Broadway Bridge Replacement and Stabilization of Christ Chapel

Tracy Schwartz

Collaboration for Christ Chapel's Sake: The Broadway Bridge Replacement and Stabilization of Christ Chapel

Tracy Schwartz

Panel Discussion

Larissa Rudnicki (ODOT), Tracy Schwartz (IDT) and Scott Williams (WSDOT), Paula Johnson

“A Plateau House Party:” Reconsidering the Record of Columbia-Fraser Plateau Household Archaeology

Organizers: Molly Carney, James Brown, and Dakota Wallen

Archaeologists seek the remnants of houses, residences, and domiciles as these places are often considered to be microcosms of the greater social and cultural past. In the highly varied physiographic region of the Columbia-Fraser Plateau, archaeological examinations of houses have been ongoing for over 70 years. While the Plateau Handbook (Walker 1998) summarized much of that research, in the intervening 20 years considerable archaeological work has been undertaken in both the compliance and academic sectors. This forum brings together archaeologists from all backgrounds and generations to discuss Columbia-Fraser Plateau houses and identify patterns and hypotheses. Participants are asked to present a brief, five minutes or less talk on a topic of interest and engage in discussion. This session is a first attempt at synthesizing much of the household data and aims to revitalize conversations on houses and settlement pattern studies within the Interior Northwest.

Deward E. Walker, Jr. (ed.)

1998 *Handbook of North American Indians: Plateau*. William C. Sturtevant, general editor, volume 12, Smithsonian Institution, Washington, D.C.

Opening Remarks

Molly Carney, James Brown, and Dakota Wallen

Homescapes: The Once and Future Archaeozillow.com

Steven Hackenberger

Synchronic Plateau Housepit Sub-Regional Size Variation and the Potentials of Meta-Data Synthesis

Kevin J. Lyons

It's a Lot of Work

Paul Solimano

Fire and Flood: A Look at Pithouse Taphonomy

Adam Rorabaugh

A New Look at Precontact Houses at Three Sites near Ahsahka in the Clearwater River Region, North Central Idaho

Lee Sappington

The Houses of Alpawai: 1971–1975

David Brauner

Transforming a Housepit into a Home: Examining the Intersection of Identity and Space-Use Within Housepit 54

Ashley Hampton

Subsistence Intensification, Storage, and the Emergence of Pithouse Villages in Western North America.

Shannon Tushingam

Households on the Middle Columbia Residing in Collections at the Wanapum Heritage Center

Angela J. Neller, Matthew Johnson, and Steven Hackenberger

Why Not Pithouses?

James C. Chatters

Dwelling in the Inland Northwest

Melissa Goodman-Elgar

Community Space and Household Activity at Moses Lake: Re-examination and Radiometric Dating of HP-A, a Large House at the Long Beach Village Site (45GR30)

William Damitio and Shannon Tushingham

Observations on Contemporaneous Individual and Group Structures in the Late Prehistoric

Molly Carney and Kevin Lyons

The Big Cougar Creek Lodge Depression in Hells Canyon: Thoughts Concerning a Protohistoric Longhouse

Ken Reid

Engendering Households on the North American Plateau: Past Approaches, Feminist Frameworks, and Future Directions

Tiffany Fulkerson

Temporal Patterning of Houses of the Northwest Plateau and its Margins: Early Lessons on Database Construction and Data Availability

Thomas Brown

Closing/Discussion

Molly Carney, James Brown, and Dakota Wallen

General Session: Cultural Heritage Resources

Session Chairs: Molly Boeka Cannon, Juli McCoy

Preservation or Perseveration: The Cost of Trying to Save Everything

Kelli Barnes

Exploring Spatial Patterns of Ethnic Chinese Artifacts along the Central Pacific Railroad, Box Elder County, Utah

Molly Boeka Cannon, Kenneth P. Cannon, Michelle Platt, Houston Martin, and Jonathan Peart

Erasing History? Analyzing Modern Monument Destruction in an Archaeological Context

Stephanie Holton

What's Going on Out There? An Investigation of Historic Land Use Patterns at the Orchard Combat Training Center

Juli McCoy

Mid-Nineteenth Century Clay Smoking Pipes from Fort Hoskins and Fort Yamhill, Oregon

Diane Zentgraf

Management of Unanticipated Washover Deposits at 45IS298 in Oak Harbor, Washington

Kelly Bush

Yama Village, 45-KP-105, a Late 19th and Early 20th Century Japanese Village on Bainbridge Island, WA

Organizers: Floyd Aranyosa

The Japanese Village of Yama (45KP105), located on Bainbridge Island, Washington, U.S.A., was occupied from the 1880s–1920s. Yama contained approximately 250 people throughout that period, and many residents worked as migrant workers at the Port Blakely Lumber Mill. Using transnational constructs of local identities, I present a historical and archaeological analysis and interpretation of medical and health care of the Japanese community of Yama.

Yama Village: A Late 19th and Early 20th Century Japanese Immigrant Village on Bainbridge Island, Washington

Floyd Aranyosi

Ceramics Analysis from Yama Village, 45-KP-105

Dave Davis

Hydrology and Geomorphology of Yama Village, 45-KP-105

Jean Hannah

Analysis of Faunal Materials from Yama Village, 45-KP-105

Neal Endacott

The Buddhist Temple at Yama: Religious and Cultural Identity of a Late 19th- Early 20th Century Japanese-American Community

Bridget Grim

Lightning Round: Short Papers on Varied Topics of Note

Organizer: Paula Johnson

Working on cultural resources projects often leads to notable discoveries—minor mysteries unraveled, reflections on popular culture, curious bits of history, patterns seen over multiple projects in the same area. While these topics do not merit a full 15 minute paper, they are worth sharing. This series of 3–5 minute talks shares what we've learned along the way.

Early 20th Century Fly Field in Snohomish County, Washington

Jason B. Cooper

The Golden Idol: Archaeology and Archaeologists in Popular Media

Gretchen Kaehler

Consequences of Incomplete and Conflicting Site Histories

Michael Chidley

Goofy Stories, Fun Facts, and Brushes with Destiny: Revelations During Research on Airports

Paula Johnson

Don't Believe Everything You Read: A Lesson in Historical Sources and the Power of the Internet for Good

Scott Williams

Synthesis of Recent Archaeological Work at King County's Marymoor Park

Philippe D. LeTourneau

Urban Contamination: How to Archaeology Safely

Jennifer Gilpin and Alexander Stevenson

Posters

What We Gain When We Document Potential NAGPRA Collections
Armstrong, Elizabeth and Patrick T. McCutcheon

Do Lemurs at the Duke Lemur Center Socially Learn?
Batist, Carly H. and Jessica A. Mayhew

Monochrome Ultraviolet Imaging in Archaeological Analysis
Becker, Rory

Data Potential of Archaeological Deposits at Chelan Station (45CH782/783).
Breidenthal, Matt

Lakeview Ranch: Mitigating the Loss of Historic Buildings
Boyd, Anne and Jamie Litzkow

What's Cooking in the Late Archaic Kitchen? Features and Subsistence Remains from a Klamath River Village, Siskiyou County, Northern California
Clay, Vickie and William D. Hildebrandt

Shoe Analysis of a Boise Basin Chinese Mining Camp
Cockerille, Kristina and Renae Campbell

LiDAR Predictive Modeling of Kalapuya Mound Sites in the Calapooia Watershed, Oregon
Cody, Tia and Shelby Anderson

Chimpanzees Modulate Signs in Requests
Dombrasuky, Kailie, Grace Coffman, and E. Chadwick de Bree

Urban Co-Design How Oaks Offer Opportunities for Collaboration
Dunham, Haley

An Analysis of Lithic Debitage at Site 45WH004
Fey, Sean, Natalie Bankuti, Annalise Muscari

Women's Food Sharing in Siberia: Social Network Analyses by Frequencies of Transfers versus Values and Amounts Given
Fulk, Karen S., and John P. Ziker

Who Controls the Narrative? A Critical Evaluation of Occupational Affiliation and Gender in North American Archaeology Publishing
Fulkerson, Tiffany J., and Shannon Tushingam

Distribution Analyses at the Late Paleoindian Sentinel Gap Site: Toward an Understanding of Site Patterning and Social Structure
Furlong, Julia, Jerry Galm, and Stan Gough

Spatial Analysis of Prehistoric Land Use Practices at Village Site 45YA153, Middle Columbia River
Furlong, Julia and Sean Stcherbinine

Identifying Plankhouse Architecture with Geophysics: What Are Our Prospects?
Grier, Colin

Ground Penetrating Radar Archaeological Demonstration: Imaging Buried Features Exposed in Construction Trenches

Hackenberger, Steven, James McLean, and Jon Shellenberger

Let's Speed This Up: Testing the Applicability of Machine Learning in Ceramic Trademark Identification

Hallingstad, Ellen and Mitchell Overdick

Early to Middle Holocene Occupations of Long Valley, Idaho: A Synthesis of Private Collections and Surface Finds from an Erosional Context

Harris, Lucille and Joe Bergstrom

10-OE-2256; The Shoofly Rock Alignment Complex

Hall-Holton, Joseph

NAGPRA Human Remains Inventory: Making Our Work More Visible

Henebry-DeLeon, Lourdes

A Quarter Century of Archaeological Collections at the Wanapum Heritage Center

Johnson, Matt

Faunal Heterogeneity in the Middens of Prince Rupert Harbour

Johnson, Raini

Indigenous Landscape Modification in the Pacific Northwest Coast: A Case Study Using the Binford Hunter-Gatherer Database

Johnson, Royce

Modeling Shoreline Site Survival under Predicted Climate Change in the Puget Sound

Jolivette, Stephanie and Sarah R. Hibdon

The Bertelson Artifact Collection from Old Man House (45KP2): A Central Puget Sound Type Collection

Lewarch, Dennis and Stephanie E. Trudel

Early Placer Gold Discoveries in Washington Territory (ca.1853–ca.1868).

Litzkow, Jamie M.

Archaeogeophysics in WA—What is it Good For?

Maroney, Kendra

Cultivation of the Backwater: Weirs as a Window into Historical Ecology and Ecosystem Engineering in the Lower Columbia

North, Michelle and Virginia L. Butler

More Than Just a Bone to Pick: Deciphering Walla Walla's Cultural Consumption Patterns at the Turn of the Century

O'Brien, Stephanie and Lindsay Costigan

Making Better Guesses: Archaeological Modeling for Adaptive Land Management in the Teanaway

Palmer, Sara and Thomas Laxson

Social Stratification and Resources Processing, Case #2: A Northwest Case Study of Camas and Salmon Using the Binford Hunter-Gatherer Database

Pennell, Jennifer

Masticatory Stress and the Human Chin

Pfeiffer, Chelsea

Social Stratification and Resources Processing, Case #1: A Northwest Case Study of Acorns and Salmon Using the Binford Hunter-Gatherer Database

Shannon, Ollie

The Development of Warfare in Native British Columbia: An Evolutionary Approach Using the Binford Hunter-Gatherer Database

Smith, Sonja

Feature Driven Archaeological Interpretation of Multi Method Geophysical Surveys

Somers, Lew

Faunal Analysis of a Sample Unit at the Grissom Site, 45KT301, Central Washington

Spencer, Steven and Patrick Lubinski

The Impact of Web Based Visitor Education on Human-Tibetan Macaque (Macaca thibetana) Interactions at Mt. Huangshan, China

Stauch, KiriLi, Lori K. Sheeran, Jessica A. Mayhew

Investigating Least Cost Path from Raw Material Sources to Bridge River Site (EeR14)

Vance, Emma and Liz Dolinar

GPR and Cadaver Dogs to Close a Nampa P.D. Cold Case

Von Lintig, Matthew R, Tate Meehan, Thomas D Mikesell, Gabriel Gribler, Zongbo Xu, Thomas Harper, Megan Mason

Washington State University Archaeological Research at the Hart Mountain National Antelope Refuge, Lake County, Oregon

Wallen, Dakota, Andrew Frierson, and Tiffany Fulkerson

Archaeological Expectations Based Upon Resident Fisheries in the Owyhee River

Wardle, Wes

Archaeological Excavations at the Swenson Site (10-EL-1417), Southwest Idaho

Wassenhove, Anne Van, Connor Neal, Weston Wardle, Keana Winninger and Mark Plew



BASKETRY FROM THE OZETTE VILLAGE ARCHAEOLOGICAL SITE

A TECHNOLOGICAL, FUNCTIONAL, AND COMPARATIVE STUDY

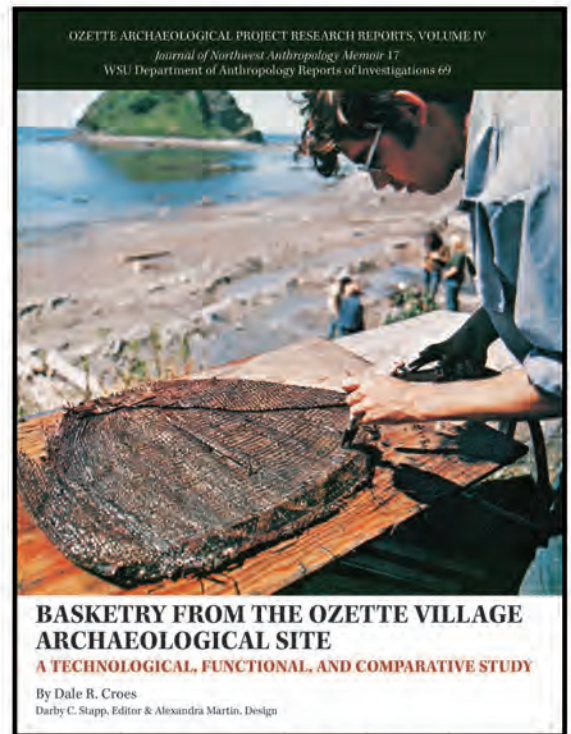
By Dale R. Croes

Darby C. Stapp, Editor & Alexandra Martin, Design

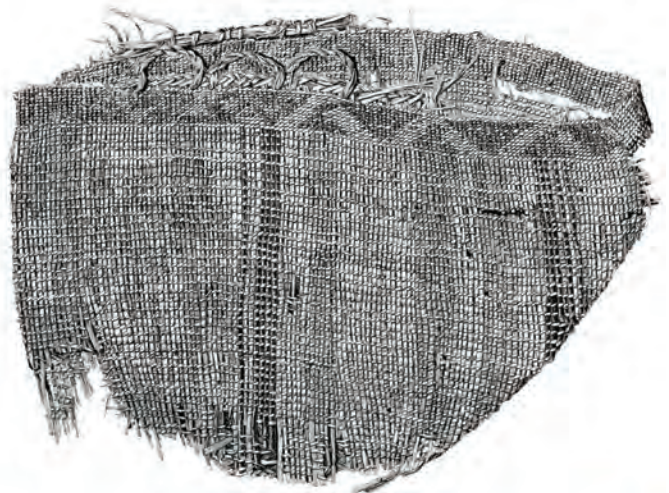
Over three centuries ago, a large mudslide covered a section of the Makah village of Ozette. In a waterlogged condition, thousands of wood and fiber artifacts were preserved. Working in equal partnership with the Makah Indian Nation, Washington State University (WSU) archaeologists excavated a section of this site; I was the WSU graduate student who undertook the study of hundreds of ancient basketry items. To make sure I understood the Ozette baskets, the tribe had me work directly with Makah Master Basketmakers at the Neah Bay school, resulting in this unique synergy of cultural and scientific analysis and synthesis.

- First, my study here defines the diverse Ozette basketry attributes (modes) and statistically compares them to ancient basketry from all known Northwest Coast wet sites.
- Second, I combine culturally important basketry attributes, as learned from Makah basketmakers, into basketry types which also are compared to types found at other wet sites; the results clearly indicate a continuity of basketry cultural styles in three regions of the Northwest Coast for 2,000 to 3,000 years.
- And third, I combined the Ozette basketry types into functional sets; they are ideal for this purpose, since they are recovered in their original position in an ancient household and contain original contents. I computer mapped positions of baskets, hats and mats in Ozette House 1 demonstrating the location of different family units and reflecting the status and activities of household members.

My three-level analysis of basketry from Ozette Village and other Northwest Coast wet sites demonstrates a prominent role for basketry artifacts in our region's archaeological research.



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NORTHWEST ANTHROPOLOGICAL CONFERENCE 2020

Plurality of Voices

The 2020 Northwest Anthropological Conference continues the tradition of exciting anthropological research, learning, and networking. The conference will be hosted by Central Washington University on **March 25–28, 2020, in Ellensburg, WA.**

As a crossroad in the Pacific Northwest, central Washington represents a complex mosaic of voices; voices that we, as anthropologists, are interested in listening to, partnering with, learning from, and understanding. Yet at times, when immersed in the daily demands of our profession, we can mistakenly take these voices for granted—or worse, we become oblivious to their existence. To challenge such tendencies and reiterate the intentional inclusivity that should characterize anthropological practice, the 73rd NWAC's theme will focus on the importance of forming and celebrating inclusive partnerships with those who reside in our areas of research.

DATES TO KNOW:

SESSION PROPOSALS AND PAPERS/POSTERS

Session proposals due February 3, 2020

Contributed paper/poster abstracts due February 18, 2020

STUDENT PAPER COMPETITION

Student paper titles and abstracts due January 10, 2020

Selected student papers will be notified on January 15, 2020

Selected student paper manuscripts due February 20, 2020

More information, including Student Paper Competition entry details and guidelines, available at:

www.nwaconference.com

www.facebook.com/NWACConf

www.northwestanthropology.com/northwest-anthropological-conference

**Please direct questions about the
Northwest Anthropological Conference
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Note: *JONA* is not affiliated with NWAC aside from publishing Student Paper Competition winners.

71st Northwest Anthropological Conference



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Program

71st Annual Meeting
Northwest Anthropological Association
March 28-31, 2018

The Riverside Hotel
2900 W. Chinden Blvd., Boise Idaho 83714

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Volunteers

The organizing committee wish to thank the numerous volunteers who provided invaluable assistance in helping arrange and support conferences activities. Without your support we would be unable to host NWAC. We deeply appreciate your efforts!

Conference Events and Meetings

Conference Registration (Conference registration is required for all conference events)

Wednesday – March 28, 2018	5:00 p.m. – 8:00 p.m.
Thursday – March 29, 2018	7:30 a.m. – continues throughout the day
Friday – March 30, 2018	7:30 a.m. – continues throughout the day

(The registration desk is also the information desk, the lost and found and the message center).

Exhibits Room is located in the Aspen Room, First Floor. Exhibitors can access it beginning Weds. at 5 p.m. and again Thursday morning at 7:30 a.m.

Meetings:

Association of Oregon Archaeologists (AOA), Laurel Room
Thursday, March 29, 2018 5:00 – 6:30 p.m.

NWAC Business Meeting Lunch Clearwater Room
Friday, March 30, 2018 12:00 – 1:15 p.m.

Association of Washington Archaeologists (AWA), Juniper Room
Friday, March 30, 2018 5:00 – 6:30 p.m.

Schedule At A Glance

Wednesday – March 28, 2018

Opening Reception 5:00 – 8:00 p.m. Snacks provided, cash bar
Riverside Hotel Lobby

Thursday – March 29, 2018

Plenary Welcoming Ceremony with Ted Howard, Shoshone-Paiute Tribes
8:30 a.m., Ponderosa Room

Sessions Begin 9:00 a.m. – see program for specific room assignments

NWAC Ice Cream Social 5:00 – 6:00 p.m., Fireside Foyer

Walking Tour of Historic Downtown Boise 5:30 p.m.- 7:00 p.m.

Meets at hotel lobby, details to follow.

AWA Pub Crawl 6:00 p.m. – ?

This is a ticketed event and fundraiser for the AWA. Meets in lobby, details to follow.

Friday – March 30, 2018

Sessions Begin 8:30 a.m. (NOTE earlier time)

Banquet Reception 6:00 – 7:00 p.m. Snacks provided and cash bar

NWAC Banquet 7:00 – 9:00 p.m. --Featuring AWA Student Awards, Student Paper
Hotel Ballroom Competition Awards, Special Banquet Presentation
on Yellowstone, Dance Lessons, and a Generally
Great Time!

Saturday – March 31, 2018

Field Trip to Celebration Park. Meet in hotel lobby at 8:15 a.m. See Field Trips page for details.



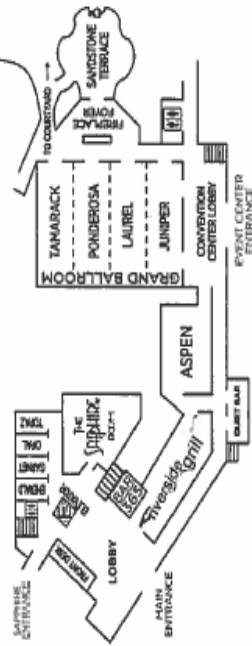


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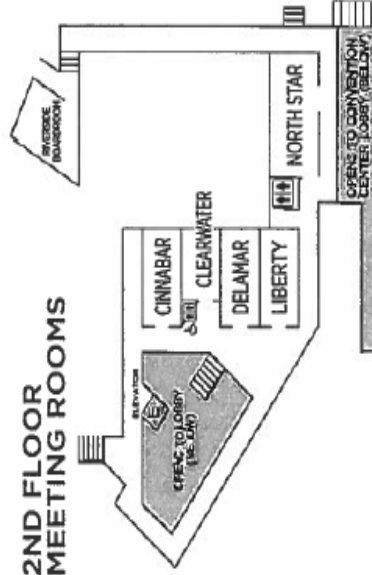
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71st Northwest Anthropological Conference

About those Field Trips

➤ **Downtown Walking Trip, Thursday March 29th: 5:30 p.m.**

Meets at hotel lobby and proceeds downtown. Transportation arrangements to be announced.

➤ **Celebration Park Trip, Saturday March 31st: 8:30 a.m.-approx. 1:00 p.m., meet in hotel lobby at 8:15 a.m. NOTE NEW TIME!**

Participants in the Saturday, March 31 field trip to Celebration Park should meet outside the front of the host hotel by 8:15 a.m. for a scheduled 8:30 a.m. departure. If you missed the cut-off for signing up online for this field visit, you are welcome to ‘caravan’ out with the main group.

For those who registered online for this trip: transportation is being provided by Boise State University in several 12-person passenger vans and a large SUV (drivers are also provided by BSU). *If you change your mind about going on this trip please inform Mark Plew, mplew@boisestate.edu, so we can adjust transportation.*

The drive to this unique archaeological park is approximately one hour. Participants will be on-site at the park for several hours, with return to the hotel by 1 p.m. Water is available at the site, and the park recommends you bring a bottle of your own to refill. Because the Idaho weather may be variable, participants are encouraged to come prepared with clothing appropriate for rain or shine, hot or cold, as well as hiking boots, snacks, sunscreen, and a hat that provides sun protection. Hiking sticks and cameras are also recommended.

Park staff will be show-casing “DStretch”, a tool for the digital enhancement of rock art, and will have a limited number of devices on-site for visitors to use. The Park encourages people with great interest in DStretch to visit their cell phone app store to purchase the DStretch app for personal use on your cellphone (\$20). Please purchase and download the app prior to field trip departure as the Park has very limited wifi.

Please join us for a
Special Banquet Presentation

Before Yellowstone: A Journey

Dr Douglas MacDonald

Since 1872, Euro-American visitors have flocked to Yellowstone National Park to gaze in awe at its dramatic geysers, stunning mountains, and impressive wildlife. Yet more than a century of archaeological research shows that that this beautiful landscape has a long history of Native American cultural use and value. Here, people have hunted bison and bighorn sheep, fished for cutthroat trout, and gathered bitterroot and camas bulbs here for at least 11,000 years. In this special NWAC event, Dr. MacDonald tells the story of new archaeological discoveries from nearly 2,000 sites, and describes and explains what we can learn from these ancient cultural places.

Please sign up to the Friday Night Banquet to join us for this presentation.



Art by Eric Carlson

SESSIONS

Please Note: Sessions are given in chronological order, not by session type.

Wednesday evening, March 28, 2018

5-8 pm. **Registration and Reception**, Riverside Hotel Lobby

Thursday morning, March 29, 2018

Session T-1. The Mowitch Project- Traditional and Contemporary Methods of Hunting and Use Confederated Tribes of the Colville Reservation (Symposium and Panel).

Room: **Ponderosa**

Organizers: **Roderick Donald, Adam N. Rorabaugh, and Arrow Coyote**

Chair: **Arrow Coyote**

Session Abstract:

Mowitch means “deer” in the Sanpoil language, and this project entails documenting through film, the steps involved in deer procurement and processing: hunting, gutting, skinning, butchering, and tanning. This symposium/panel is part of the production process whereby the Mowitch film makers will present portions of the film and have a panel discussion with the audience. The results will help focus the narration portion of the project that will be integrated into the final production of the film. This video will serve to educate and preserve the traditional/contemporary methods of deer procurement and hide processing.

Meets 9:00-10:15 a.m.

- 9:00 The Mowitch Project – Traditional/Contemporary Methods of Hunting and Use: Introduction and Film Editing.
Travis Adams
- 9:15 The Mowitch Project – Traditional/Contemporary Methods of Hunting and Use: Hunting and Processing Changes Through Time.
Mitchell Peone
- 9:30 The Mowitch Project – Traditional/Contemporary Methods of Hunting and Use: The Use of Deer Meat Within Our Teachings.
Sylvia Tatshama Peasley
- 9:45 The Mowitch Project- Traditional/Contemporary Methods of Hunting and Use: Showing You how to Brain Tan a Deer Hide.
Brian Monaghan
- 10:00 The Mowitch Project- Panel Discussion.
Panelists: Arrow Coyote, Travis Adams, Sylvia Tatshama Peasley, Brian Monaghan

Session T-2. Association for Washington Archaeology (AWA) Advocacy Workshop-Get Informed and Get Involved: How To Communicate With Your Elected/Appointed Officials About Cultural Resources (Workshop)

Room: **Laurel**

Moderator/Presenter: **Mary Rossi.**

Session Abstract:

Between bidding for contracts, conducting surveys and excavations, analyzing collections, and writing reports, who has time for advocacy? Many among us may have hoped that someone else would take care of this task. However, long-simmering and now more recent, new attacks on the current system of cultural resource protections have elevated the critical need for all of us to communicate effectively and often to our elected/appointed officials at all levels of government (federal, state, local) about cultural resources and the benefits of their protection.

Given the current climate, are you ready to advocate? Do you need some guidance or some refreshers? Are you attending the SAA meetings in DC and need help preparing to storm Capitol Hill? If you answered “yes” to any of these, then this AWA Workshop is for you!

Join our experienced and enthusiastic panel for the following discussion:

- 1) What’s happening? - tips for learning about/tracking the latest news about policies/legislation that will impact cultural resources;
- 2) What do I do about it? - tips for communicating to elected/appointed officials (i.e. the decision makers) in person, via telephone, or in writing;
- 3) What else can I do? - strategies for individual engagement in other types of advocacy efforts;
- 4) An open discussion with attendees about issues and ideas for more effective advocacy.

We would also like to compile a list of those attending the SAA meetings in DC in April who would be interested in visiting their elected officials on Capitol Hill. If you love working to protect cultural resources, you can’t put advocacy off any longer. Let’s all get informed and get involved!

Meets 9:00-10:30 a.m.

Workshop panelists:

Mary Rossi-Program Director for APT-Applied Preservation Technologies, a program of the nonprofit Eppard Vision, moderator/panelist

Allyson Brooks-Washington State Historic Preservation Officer (SHPO) and Director of the WA State Dept. of Archaeology and Historic Preservation (DAHP), panelist

Brian Durkin-President of the Archaeological Law & Policy (ALP) Center, panelist

Kathryn Harris-Society for American Archaeology (SAA) Washington State Government Affairs Network State Representative (GANSR), panelist

Anna Neuzil, Society for American Archaeology (SAA) Oregon State Government Affairs Network State Representative (GANSR), panelist

Session T-3. The Context of a Holocene Thermal Climactic Native American Skeleton Discovered in the Upland Yakima Basalt Folds Area of South-Central Washington State. (Symposium)

Room: **Clearwater**

Chair: **David G. Rice**

Session Abstract:

In early May 1982 a pre-NAGPRA inadvertent discovery of a deeply buried Native American skeleton was discovered during the Golden Blade Exercise training maneuver by the U.S. Army near the Yakima Training Center, Washington. Army personnel consulted the Wanapum Indian Community regarding the circumstances of the discovery, and agreed to an Army effort to recover the grave and document its contents within two days, and arrange for reburial of the remains. On August 10, 1982, the remains were reburied by Yakama and Wanapum Indian tribes at an agreed upon location. No report of these finds, their age, setting or environmental context was ever written. The purpose of this session is intended to organize this material for a technical report to share our surprising findings.

The burial was protected by a rock cairn. It covered an extended adult male skeleton with a number of age-related anomalies. Nearly all bones were represented and in good condition, due in part to the depth of the subsequent geological deposits. The body was originally dug into a natural bed of Mt. Mazama volcanic tephra, which also covered and encapsulated the burial fill and rock cairn, suggesting a date from soon after its eruption, 6850 calendar years B.P. – at the climax of the Holocene Thermal Maximum. The 2.5 meter depth of this grave deposit, and its stratigraphy may provide supporting new information about Columbia Basin paleo-climate during and after soon after the Holocene Thermal Optimum.

Meets 9:00-9:45 a.m.

- 9:00 The Curious Old Man (Cold Creek Man) and his Early Stone Beads in the upland Yakima Basalt Folds
Dave Munsell
- 9:15 The Environmental Setting and Geochronology of a Curious Old Man buried in the upland Yakima Basalt Folds.
David G. Rice
- 9:30 Some comments regarding the Osteological Remains of the Curious Old Man buried in the upland Yakima Basalt Folds.
Lourdes Henebry-DeLeon, Discussant

Session T-4. Pacific Northwest Consortium for Geophysics in Archaeology and CRM: “Where are we? Where are we headed?” (Panel).

Room: **Liberty**

Organizers: **Rory Becker, Colin Grier, Steven Hackenberger, Lee Liberty, Lew Somers**

Session Abstract:

An informal and open discussion will be led by five practitioners regarding applications of geophysical survey methods in archaeology as they serve three purposes: research, teaching and/or applications. Research objectives include technological innovation, investigating site formation, feature definition. Teaching reaches students, managers, and experts. Applications include developers, agencies, and tribal programs with interest in cost-

effective discovery, sampling for evaluation and data recovery, and non-intrusive survey methods. Interested attendees will be asked to share perspectives and experiences. The discussion is part of a call for greater collaboration in the development and training in geophysical methods for archaeological practice in the Pacific Northwest.

Meets 9:00-10:00 a.m.

Discussion Leaders:

Rory Becker – Eastern Washington U.; Colin Grier – Washington State U.; Steven Hackenberger – Central Washington U.; Lee Liberty, Boise State U.; Lew Somers, Geomagnetism and Archaeophysics.

Session T-5. General Poster Session: Archaeological Management and Settlement

Room: **Cinnabar**

Meets 9:00-11:00 a.m.

Posters:

1. Who Controls the Narrative? A Critical Evaluation of Occupational Affiliation and Gender in North American Archaeology Publishing.
Tiffany J. Fulkerson and Shannon Tushingham
2. Modeling Shoreline Site Survival under Predicted Climate Change in the Puget Sound
Stephanie Jolivette and Sarah R. Hibdon
3. Cultivation of the Backwater: Weirs as a Window into Historical Ecology and Ecosystem Engineering in the Lower Columbia
Michelle North and Virginia L. Butler
4. Making Better Guesses: Archaeological Modeling for Adaptive Land Management in the Teanaway
Sara Palmer and Thomas Laxson
5. Distribution Analyses at the Late Paleoindian Sentinel Gap Site: Toward an Understanding of Site Patterning and Social Structure
Julia Furlong, Jerry Galm, and Stan Gough
6. Spatial Analysis of Prehistoric Land Use Practices at Village Site 45YA153, Middle Columbia River
Julia Furlong and Sean Stcherbinine
7. Early to Middle Holocene Occupations of Long Valley, Idaho: A Synthesis of Private Collections and Surface Finds from an Erosional Context
Lucille Harris and Joe Bergstrom
8. LiDAR Predictive Modeling of Kalapuya Mound Sites in the Calapooia Watershed, Oregon
Tia Cody and Shelby Anderson
9. 10-OE-2256; The Shoofly Rock Alignment Complex
Joseph Hall-Holton

Session T-6. General Session: Bioanthropology and Lithics. (Symposium)

Room: **Opal**

Session Chairs: **Akiko Nosaka, Scott Thomas**

Meets 10:00 a.m.-12:00 p.m.

- 10:00 No Wizardry in These Bones: tips and tricks for working with, and as, an osteologist
Tom Ostrander
- 10:15 Fertility Trends among First-generation Japanese Immigrant Women in Seattle
Akiko Nosaka and Donna L. Leonetti
- 10:30 Male care and life history traits among primates: a comparative analysis
Alexander Sheldon and Kermyt G. Anderson
- 10:45 Reflections in Stone Tools: A Life Story of Don E. Crabtree
Yuumi Danner
- 11:00 Student Flintknappers: New Tool Makers Help Reveal Old Technology
Marci Monaco
- 11:15 Percussion Blade Cores and Blades: A Late Prehistoric Lithic Tradition in Southeastern Oregon
Scott Thomas
- 11:30 Dating the Western Stemmed Tradition in the Northern Great Basin
Dennis Jenkins and Thomas J. Connolly

Session T-7a. Nevertheless, She Persisted: Women's Contributions to Pacific Northwest Anthropology. (Symposium)

Room: **Tamarack**

Organizers: **Alexander Stevenson and Stephenie Kramer**

Session Abstract:

Our combined academic and professional histories in Pacific Northwest anthropology are dominated by endeavors (research and compliance) led by women. While the work of women like Erna Gunther, Marian Smith, and Vi Hilbert serve as foundations for research, other women's contributions have often gone unrecognized or undervalued. To our knowledge, there has never been an explicit examination of women's contributions to Pacific Northwest anthropology in the history of practice in the region. This is curious, considering many of the earliest CRM firms in the northwest were started by women, and women hold many influential academic positions at major universities in the region. This session will include papers inspired by, in honor of, about, for, and/or by women and will recognize these contributions to the professional and scientific discipline of Pacific Northwest anthropology as a whole.

Meets 1:30-noon and again in afternoon.

- 10:30 Women in our Midst: Role Models, Mentors, and Leaders in Our Past, Present, and Future.
Alexander Stevenson
- 10:45 Roar: A Brief History of Feminist Archaeology in Pacific Northwest CRM
Kelly Bush
- 11:00 I been in the right place (and it must have been the right time).
Sarah Campbell
- 11:15 Standing on Their Shoulders: Persistent Takeaways from Female Role Models.
Paula Johnson
- 11:30 Considering Women's Contributions to NW Anthropology in Light of the Jungian Anima Archetype within a Man's Mind.
David G. Rice
- 11:45 Taking On Dominant Narratives: A Paper in Honor of the Work of Dr. Julie Stein.
Amanda Taylor and Stephanie Jolivette

This session breaks for lunch; reconvenes in Tamarack Room at 1 pm.

Thursday afternoon, March 29, 2018

Session T-7b. Nevertheless, She Persisted: Women's Contributions to Pacific Northwest Anthropology. (Symposium)

Room: **Tamarack**

Organizers: **Alexander Stevenson and Stephenie Kramer**

This session continues from the morning.

- 1:00 Do Not Walk the Path Alone: Navigating a Complex Professional Hierarchy with a Strong Mentor.
Stacy L. Bumback and Michelle Yellin
- 1:15 Kia Slawdee (Grandmother and Woman).
Rhonda Foster
- 1:30 Roar - A Brief History of Feminist Archaeology in Pacific Northwest CRM
Kelly Bush
- 1:45 Discussion.
Discussants: Virginia Butler, Lorelea Hudson, and Michelle North.

Session T-8. Colville Confederated Tribes History/Archaeology Program General Session: Perspectives on Traditions and Resources. (Symposium)

Room: **Ponderosa**

Organizers: **A Roderick Donald and Adam N. Rorabaugh**

Session Abstract:

For members of the Confederated Tribes of the Colville Reservation Colville Confederated Tribes (CCT)] there is continuity between past and present. The presenters in this symposium demonstrate the efforts of the CCT History/Archaeology (CCT H/A) program in preserving the traditional practices of the constituent tribes of the CCT. CCT H/A works cooperatively with federal, state, other tribal and local agencies to ensure our history is not forgotten or diminished. This session also depicts the importance of protecting tribal rights and sovereignty within the context of professional cultural resource management.

Meets 1:00-2:15 p.m.

- 1:00 A Brief Introduction to the Confederated Tribes of the Colville Reservation's History and Archaeology Program.
Roderick Donald
- 1:15 Hunting Traditions in the Upper Columbia River.
Arrow Coyote
- 1:30 Plants, People and Places: Mapping Historic Cultural Plants and Populations.
Pendleton Moses
- 1:45 Results of the 2016-2017 Net Pens (45OK247) Excavations.
Adam N. Rorabaugh,
- 2:00 Colville Tribes Engaged in the Basin: FY2017 in retrospect.
Robert Sloma

Session T-9. Poster Session: Pacific Northwest Consortium for Geophysics in Archaeology and CRM: "Where are we? Where are we headed?" (Posters).

Room: **Cinnabar**

Session Abstract:

Posters will feature several case studies that represent applications of geophysical survey methods in archaeology as they serve three purposes: research, teaching and/or applications. Case studies involve combinations of these purposes. Research objectives include technological innovation, investigating site formation, feature definition. Teaching reaches students, managers, and experts. Applications include developers, agencies, and tribal programs with interest in cost-effective discovery, sampling for evaluation and data recovery, and non-intrusive survey methods. The posters are part of a call for greater collaboration in the development and training in geophysical methods for archaeological practice in the Pacific Northwest.

Meets 1:00-3:00 p.m.

Posters:

1. Monochrome Ultraviolet Imaging in Archaeological Analysis
Rory Becker
2. Identifying Plankhouse Architecture with Geophysics: What are our prospects?
Colin Grier
3. GPR and Cadaver Dogs to Close a Nampa P.D. Cold Case
Matthew R Von Lintig, Tate Meehan, Thomas D Mikesell, Gabriel Gribler, Zongbo Xu, Thomas Harper, Megan Mason
4. Archaeogeophysics in WA - What is it Good For?
Kendra Maroney
5. Ground Penetrating Radar Archaeological Demonstration: Imaging Buried Features Exposed in Construction Trenches.
Steven Hackenberger, James McLean, and Jon Shellenberger
6. Feature Driven Archaeological Interpretation of Multi Method Geophysical Surveys
Lew Somers

Session T-10. Ethnographic Research with Pacific Northwest Tribes. (Panel)

Room: **Clearwater**

Organizer: **Donald Shannon**

Session Abstract:

This session will highlight the importance of ethnographic research with Tribes in the Pacific Northwest, and to show how the Federal compliance process can generate ethnographic work. Panelists will include Federal Agencies who fund ethnographic research, academicians who work with regional Tribes, and representatives from Tribal cultural resource programs. We will discuss some of the differences between academically driven ethnography and compliance ethnography, both through consultants and research done by Tribes. Compliance ethnographic work highlights the living culture of Tribes in the Pacific Northwest, exemplified by issues such as: cultural adaptation to a new riverine ecology; restricted use of traditional homelands to hunt and gather culturally significant plants; the complex dynamics of access to salmon and salmon fishing; and many more. The importance of ethnographic research, specifically related to Traditional Cultural Properties, is increasingly acknowledged in management documents generated by land-managing agencies.

Meets 1:30-2:30 p.m.

Panelists: John Pouley, OR State Historic Preservation Office, Shawn Steinmetz, Breice Edwards, Grand Ronde Tribes, Christina Phillips, University of Idaho, Scott Williams from Washington State DOT, and Kristen Martine and Dave Johnson, Bureau of Land Management.

Session T-11. Shifting Perspectives and Future Directions for Northwest Coast Archaeology: A Symposium by Washington State University Graduate Students. (Symposium)

Room: **Juniper**

Organizer: **James Brown**

Session Abstract:

It is useful to ongoing archaeological inquiry that different trajectories of thought and research be used to interpret and understand the past. The drift between humanistic and scientific approaches in of itself generates new data, research questions and tools useful to archaeology. This session presents the views of a new generation of scholars emerging in the context of a sea of changing theory and working to define new questions and directions. These papers discuss a diverse array of subjects pertaining to the Northwest Coast region, including: modern cultural resources, settlement patterns, sociopolitical organization, labor, subsistence, and seasonal land-use. Further, these papers build upon new and previously published datasets. The research presented in this symposium provide additional insights to the pre-contact history of the Northwest Coast. Through the papers presented in this session we contribute to the archaeology of the Northwest Coast and the rethinking of topics that have been the subject of archaeological inquiry for the last 30-40 years.

Meets 2:30 -5:00 p.m.

- 2:00 Searching for Diversity: A Detailed Zooarchaeological Analysis of Birds from San Juan Islands sites
Emily L. Whistler
- 2:15 Re-Evaluating Bulb Size as a Proxy for Camas (*Camassia* ssp.) Management in the Willamette Valley of Oregon.
Molly Carney and Stephenie Kramer
- 2:30 Investigating Feasting in a Precontact Coast Salish House: Zooarchaeological and Paleobotanical Analysis of a Potential Feasting Feature at DgRv-006, Galiano Island, BC
Samantha Lee Fulgham and Colin Grier
- 2:45 Washed Away
Robert H. Gargett and Kate A. Shantry
- 3:00 Seasonal Sociopolitical Reversals and the Reinforcement of Autonomy and Fluidity among the Coast Salish
Emily Helmer
- 3:15 Settlement Change and Political Organization of the San Juan Islands for the Past 3000 Years.
James W. Brown and Galen Miller-Atkins
- 3:30 Politics on the Landscape: Evaluating Settlement Organization in the San Juan Islands
Galen Miller-Atkins and James W. Brown
- 3:45 The Role of Labor in the Creation of Northwest Coast Landscapes.
Nathaniel James
- 4:00 Discussion.
Colin Grier, Discussant

Session T-12: General Session: Culture and Society (Symposium)

Room: **Laurel**

Session Chairs: **Shareena Parks, Thomas J. Connolly**

Meets 1:30-5:00 p.m.

- 1:30 Re-Awakening Ancient Salish Sea Basketry: Applying Generationally-Linked Archaeology
Dale Croes and Ed Carriere
- 2:00 Re-Awakening Salish Sea Basketry: Continuing Research of the Biderbost Wet-Site Basketry Materials
Elizabeth Hawes
- 2:15 Refusing to dwell on the past: The story of An Afghan Refugee
Logan Amstadter
- 2:30 Inadvertent Discovery of Human Remains on the Siletz Bayfront, Lincoln City, Oregon: A Case Study on Siletz Tribal History
Thomas J Connolly, Robert Kentta, and Jeanne McLaughlin
- 2:45 Critical Review of Imagery of NWC Coast Salish Past Lifeways
Bea Franke
- 3:00 Paddling as methodology
Danielle Gendron
- 3:15 Debunking the “sh**hole” Epithet: The Conditions and Contributions of African Immigrants in the United States.
Kassahun Kebede
- 3:30 Cultural and Social Biases in Educational Access
Hannah MacIntyre
- 3:45 Imagining Truth, History and Reality of the Vestige
Kelsey Maloy
- 4:00 Cultural Relativism and Moral Absolutism: Philosophers and Anthropology
Shareena Parks
- 4:15 Finding Common Ground: Navigating Ideological Diversity and Coexistence in Northern Idaho’s Alternative Food Movement
Alleah Schweitzer
- 4:30 Coffee Talk: High-End Coffee in the Modern World
Julia Smith
- 4:45 Origins of the Modern Concept of Race
Donald E. Tyler

Session T-13: Oregon Archaeology and the Legacy of Dr. Richard (Dick) Ross. (Symposium)

Room: **North Star**

Organizer: **Dennis Griffin**

Session Abstract:

For over three decades, Dick Ross served as a professor of anthropology/archaeology at Oregon State University where he helped to teach his students about human diversity and the role of anthropology and archaeological excavation skills and analysis, while not losing sight of the people and cultures one works with. Dick was one of the founders of the Association of Oregon Archaeologists and served as its first President. Dick's early years at OSU focused on investigating sites along Oregon's coast before expanding his areas of interest inland along some of the state's major rivers to the Willamette Valley. With the rise of CRM and the expansion of archaeology programs throughout the Northwest, Dick recognized early the importance of archaeologists consulting and collaborating with Native American Tribes and he helped to establish a series of Cultural Resource Conferences that provided a forum for archaeologists and tribes to learn to work together. This session features presentations by a small sample of his colleagues that highlight topics that were important to Dick; be it research in areas of the state where Dick spent many years investigating, the broadening in recognition of archaeology beyond artifacts to include the importance of traditional knowledge, efforts leading to legislative changes in the protection of archaeological sites and burials, as well as the continued importance of tribal consultation.

Meets 2:00-3:45 p.m.

- 2:00 Dr. Richard (Dick) Ross – Reflections on Forty Years in Oregon Archaeology
Dennis Griffin
- 2:15 The Legacy of Indiana Ross.
Esther Stutzman
- 2:30 Dick Ross and the Oregon Native American Burial Law
David Brauner
- 2:45 Variations in Late Prehistoric/Proto-Historic Cultural Adaptations between the Na-So-Mah And Miluk Residents of the Coquille River Estuary and the Hanis of the Coos Bay Estuary On The Southern Oregon Coast
Reg Pullen
- 3:00 Flashback: Pirate Cove – A Reflection on Time at 35LNC7, Depoe Bay, Oregon
Thomas E. Churchill
- 3:15 45 Years, What a Long Strange Trip
Ann Bennett Rogers
- 3:30 A History of Consultation between Archaeologists and Native Americans – Communication, Consultation and Collaboration: An Oregon Perspective
Dennis Griffin

Session T-14. General Poster Session: Subsistence and Technological Approaches

Room: **Cinnabar**

Meets 3:00-5:00 p.m.

Posters:

1. Faunal Analysis of a Sample Unit at the Grissom Site, 45KT301, Central Washington
Steven Spencer and Patrick Lubinski
2. Faunal Heterogeneity in the Middens of Prince Rupert Harbour
Raini Johnson
3. What's Cooking in the Late Archaic Kitchen? Features and Subsistence Remains from a Klamath River Village, Siskiyou County, Northern California
Vickie Clay and William D. Hildebrandt
4. Archaeological Expectations Based Upon Resident Fisheries in the Owyhee River
Wes Wardle
5. What We Gain When We Document Potential NAGPRA Collections
Elizabeth Armstrong and Patrick T. McCutcheon
6. The Bertelson Artifact Collection from Old Man House (45KP2): A Central Puget Sound Type Collection
Dennis Lewarch and Stephanie E. Trudel
7. An Analysis of Lithic Debitage at Site 45WH004
Sean Fey, Natalie Bankuti, Annalise Muscari
8. Investigating least cost path from raw material sources to Bridge River site (EeR14)
Emma Vance and Liz Dolinar
9. Data Potential of Archaeological Deposits at Chelan Station (45CH782/783).
Matt Breidenthal
10. Let's Speed This Up: Testing the Applicability of Machine Learning in Ceramic Trademark Identification
Ellen Hallingstad and Mitchell Overdick
11. Women's Food Sharing in Siberia: Social Network Analyses by Frequencies of Transfers versus Values and Amounts Given.
Karen S. Fulk and John P. Ziker

Friday morning, March 30, 2018

Session F-1. Idaho Archeology Gone MAD: Papers in Honor of Mary Anne Davis. (Symposium)

Room: **Tamarack**

Organizers: **Susie Osgood, Jorie Clark, Chris Shaver**

Session abstract:

Throughout her tenure with the Idaho SHPO, Mary Anne Davis has been a close colleague, supporter, and friend to all who have had anything to do with Idaho archeology, whether it be state or federal agencies, Tribes, or the public. This session is a tribute to Mary Anne's contributions to the field and the memories that we will remember her by.

Meets 8:30 a.m.-12:15 p.m.

- 8:30 Opening Remarks
Jorie Clark
- 8:45 Givens Hot Springs and Mud Springs: Two Old and Moldy Projects That Should See the Light of Day in an Uncertain Future
Tom Green
- 9:00 Bone as Fuel: Implications for Hunter-Gatherer Mobility
Mark Plew and James Eschenbrenner
- 9:15 Recognizing Redundant Data: Preventing Preservation and Saving the Significant
Kelli Barnes
- 9:30 Work on Historic Fire Lookouts in the Frank Church River of No Return Wilderness
John Rose
- 9:45 Kerosene Trade on the West Coast
Steve Lucas
- 10:00 Historical Analysis of Household Goods
Lilian Bodley
- 10:15 Chemical Analysis of Historical Personal Products
Meagham Davenport and Ray Von Wandruszka
- 10:30 Chinese Signatures in The Boise Basin: Ongoing Research on Site 10BO357
Rena Campbell
- 10:45 From Bones to Behavior: Zooarchaeology and Chinese Meat Consumption Patterns in the late 19th Century of an Idaho City Mining Camp
Chelsea Codling
- 11:00 The Pigments of James Castle
Lily Loucks

- 11:15 Top Shot: Recreational and Military Firearms of Fort Boise, Idaho
Nathan May
- 11:30 Archaeological Testing at an 1866 North Idaho Site and Subsequent Potential Activities of Blacksmithing, Hunting, Logging, Cement Making, Homesteading, WWII Training, and Recreation
Idah Whisenant
- 11:45 MAD Then and MAD Now
Jorie Clark and Susie Osgood
- 12:00 Closing Remarks from Friends and Colleagues; Awards Presentation.

Session F-2. Food Culture and Narrative Session. (Symposium)

Room: **Liberty**

Organizer: **Maureen Battistella**

Session Abstract:

Back by popular demand, the NWAC Food Culture and Narrative session brings together four papers showcasing new and important field research in the anthropology of food. Historian Richard Engeman opens the session with a broad overview of Oregon's eating preferences from 1880-1980. Research anthropologist Maureen Flanagan Battistella tells of her part-historical, part-genealogical research surrounding Boise, Idaho community cook books published at the turn of the last century. Family historian Annice Olena Black follows with a case study about preparing food on a wood burning stove, and how a rural Jackson County family's food choices in the 1930s reflected status. To close, linguist Edwin Battistella brings food studies forward to examine ambiguity in food labeling practice and regulation.

Meets 8:30-10:00 a.m.

- 8:30 Opening Remarks
- 8:45 My Grandmother's Cook Book
Richard H. Engeman
- 9:00 The Baptist Cook Book, Boise, Idaho, 1906
Maureen Flanagan Battistella
- 9:15 Making Food for a Farm Family in the 1930s: A Case Study.
Annice Olena Black
- 9:30 Fresh, Free and Natural
Edwin Battistella
- 9:45 Audience Discussion

Session F-3. The FCRPS Cultural Resource Program: Impacts from Reservoir Processes and Innovative Approaches to Cultural Resource Preservation in the Columbia River Basin (Symposium)

Room: **Delamar**

Organizer: **Celia Moret-Ferguson**

Session Abstract:

The Federal Columbia River Power System (FCRPS) Cultural Resource Program was formed in 1997 to ensure NHPA Section 106 compliance for the operation and maintenance of 14 federally managed hydropower dam projects. Bonneville Power Administration, the US Army Corps of Engineers, and the Bureau of Reclamation cooperate with 10 federally recognized tribes, four SHPOs, and seven Federal land managers in a massive effort to manage reservoir impacts to over 4,500 archaeological and traditional sites within this 775,000-acre area of the Columbia River Basin. This session explores how ongoing site condition monitoring and modern analysis of previous and recently collected assemblages has successfully documented and assessed vast changes to archaeological resources impacted by reservoir processes. Papers highlight some of the recent innovative approaches Program participants and contractors have employed in order to research, document, and preserve traces of our history.

Meets 8:30-9:45 a.m.

- 8:30 The Archaeology of Hungry Horse Reservoir, Northwestern Montana
D. Alex Schwab, Timothy Ryan, David C. Schwab
- 8:45 Early Archaic Lithics, Ongoing Reservoir Impacts, and Evaluation Potential at 45LI224, Grand Coulee Dam Lake Roosevelt
Brenda Covington
- 9:00 The Lack of Tucannon Components on the LSR: The view from 45WT2.
Paul S. Solimano and Todd B. Ogle
- 9:15 Salvage Data Recovery at the Mill Creek Site (45LI6) in Lake Roosevelt
Christopher M. Casserino
- 9:30 Comparing the Accuracy of Two GPS Receivers within the Federal Columbia River Power System.
Kaylie Bass and Allie Taylor

Session F-4. Postclassic Flaked Stone Technology in the Coatlan del Rio Valley, Mexico: Evaluating Evidence for Production and Consumption in an Aztec Provincial Context (Symposium)

Room: **Garnet**

Organizer: **Bradford Andrews**

Session Abstract:

This symposium presents the preliminary results of a technological analysis of flaked stone artifacts from the Aztec period regional center of Coatlan Viejo in Western Morelos, Mexico. These data were recovered as part of the Instituto Nacional de Antropología e Historia (I.N.A.H.)'s Proyecto Coatlan initiated in 1975. They were recovered from 4 x 4 m surface collections conducted at the sites of Coatlan Viejo (CDR22) and a nearby residential area referred to as CDR27. The Coatlan Viejo regional center appears to have been incorporated into the Aztec Triple Alliance sometime around A.D. 1350. Hence, the artifacts treated here represent a valuable dataset with which to

evaluate flaked stone technology and provisioning in a provincial context. Of particular interest is an assessment of the types and proportions of the different technologies represented at the sites (e.g. prismatic blade, biface, etc.) and whether there is evidence for the onsite production and/or maintenance of flaked stone implements. Moreover, the issue of tool function has also been assessed. Ultimately, these data can be used to make initial inferences about the dynamics of Late Postclassic production, trade, and exchange in southwestern Morelos. These data contribute to a growing body of data on the production and consumption of flaked stone tools in provincial Aztec-period households in Morelos and the Valley of Toluca.

Meets 8:30-9:45 a.m.

- 8:30 Aztec Period Archaeology in the Coatlan del Rio Valley, Western Morelos, Mexico
Dennis Lewarch
- 8:45 A Technological Analysis of Obsidian Flaked Stone Tools from Two Aztec Sites in the Coatlan del Rio Valley
Paris Franklin
- 9:00 Late Postclassic Formed Tools of Coatlan Del Rio: A Comparative Analysis.
Ian Farrell
- 9:15 The Cutting Edge: What Obsidian Use-wear Analysis Can Say About Function
Mitch McElwain
- 9:30 Assessing the Coatlan del Rio Flaked Stone Collections: A Comparative Perspective.
Bradford Andrews

Session F-5. General Session: Archaeology, Methods, and Settlement. (Symposium)

Room: **North Star**

Session Chairs: **Noelle Wyatt, William Schroeder**

Meets 8:30-11:00 a.m.

- 8:30 Rethinking "Anthropogenism" and Discerning Anthropogenic Site Vegetation.
John Harris
- 8:45 Monte-Carlo Summed Probability Distributions as a Demographic Proxy: A Case Study from the Ruby Pipeline Excavations.
Mark E. Hall
- 9:00 Talking Talus
Maurice Major
- 9:15 Unmanned Aircraft Systems and Machine Learning for Archaeological Prospection.
Ryan Pacheco and Dale Hamilton
- 9:30 Of Ruptures and Raptures: Locating Ideology with LiDAR Imagery
William Schroeder
- 9:45 Errors Across Lithic Analysts: How much is Enough Training? A Comparison Analysis of the Neely

Collection.

Noella Wyatt, Breann Stoner, Elizabeth Armstrong, and Patrick T. McCutcheon

- 10:00 Finding Bia Ogoi: The Application of Historic Documents and Geomorphology to the Understanding of 19th Century Landscape Change of the Bear River Valley, Franklin County, Idaho.
Kenneth P. Cannon, Kenneth Reid, Joel Pederson, and Molly Boeka Cannon
- 10:15 Paleoindians in Yellowstone National Park: Implications for the Rockies, Snake River Headwaters, Great Basin, and Great Plains Research.
Douglas MacDonald
- 10:30 Patterns of mobility among the Evenki of Eastern Siberia.
Karl Mertens
- 10:45 An Examination of Early Sites on the Oregon Coast.
Kathryn Fujiye Nuss
- 11:00 Climate change, landslides, and the palaeodemography of the northern Columbia Basin in the late Holocene: the view from Kettle Falls.
Ian Hutchinson

Session F-6. Undergraduate Research in the Northwest and Environs using the Binford Hunter-Gatherer Database (Poster Session)

Room: **Cinnabar**

Organizer: **Pei-Lin Yu and Royce Johnson**

Meets 9:00-11:00 a.m.

Session Abstract:

Lewis R. Binford's database of environmental data and ethnographically derived hunting and gathering projections (Binford and Johnson 2014) has been used in North America and across the globe to conceptualize research questions and refine hypotheses. Boise State University undergraduates are working with the Binford database to help develop and refine original research problems. In this session, undergraduate researchers from Boise State University present original projects using data from the Pacific Northwest and environs. This is the first-ever session featuring undergraduate research with the Binford database at the NWAC.

Posters:

1. Social Stratification and Resources Processing, Case #1: A Northwest Case Study of Acorns and Salmon Using the Binford Hunter-Gatherer Database
Ollie Shannon
2. Social Stratification and Resources Processing, Case #2: A Northwest Case Study of Camas and Salmon Using the Binford Hunter-Gatherer Database
Jennifer Pennell
3. The Development of Warfare in Native British Columbia: An Evolutionary Approach Using the Binford Hunter-Gatherer Database.
Sonja Smith

4. Indigenous Landscape Modification in the Pacific Northwest Coast: A Case Study Using the Binford Hunter-Gatherer Database
Royce Johnson

Session F-7. Design Anthropology in the Pacific Northwest (Papers, Panel, Demonstration)

Room: **Delamar**

Organizers: **Kendall House and Aaron Thornburg**

Meets: 10:30 a.m.-12:00 p.m.

Session Abstract:

For over fifty years, anthropologists have been quietly finding a niche in the business world. Over the last decade, the number of anthropologists working in business has increased greatly. The intersection of design, anthropology, and ethnography has proven particularly inviting. This panel will explore four questions: What does design anthropology look like? What does anthropology bring to the design process? How does design change anthropology? What opportunities does design offer to students of anthropology, from bachelor's to graduate degrees? This round table panel will discuss these questions in relation to student and faculty design ethnography projects. The panel will conclude with a rapid demonstration of the collaborative nature of design.

10:30 Open Prosthetics Design Anthropology Project: Visual Methods in Design Ethnography.
Aaron Thornburg

10:45 Design Anthropology at Boise State: Lessons from the First Year.
Kendall House

11:00 Panel and Q&A

11:30 Demonstration and Q&A

Session F-8. Beyond Membership: Professional Service to the Society (Panel)

Room: **Garnet**

Moderator/Presenter: **Chris Noll**

Session Abstract:

Archaeological societies depend on individuals to volunteer countless hours to manage the business of the organization, recruit members, and lead activities that engage those members. Society service is invaluable to the success of the organization but also provides benefits to those to serve. For many archaeologists society and committee service is a key part of the profession with personal and career rewards. This panel assembles officers from the Idaho Archaeological Society (IAS), Association of Oregon Archaeologists (AOA), Association for Washington Archaeology (AWA), Maritime Archaeological Society (MAS), and Northwest Anthropological Association (NWAA) to talk about professional service, archaeological careers, and their experiences as officers. This open discussion will provide students and young professionals with critical insights into archaeology as a profession and opportunities for engaging with the professional community.

Meets 10:30 a.m. – 12:00 p.m.

SPEAKERS

Noelle Shaver (IAS President)
Bob Kopperl (AWA President)
Matthew Diederich (AOA Vice President)
Scott Williams (MAS Director)
Lee Sappington (NWAA President)

Friday afternoon, March 30, 2018

Session F-9: Annual Transportation Symposium and Panel (Symposium)

Room: **Laurel**

Session Chairs: **Scott Williams, Carolyn Holthoff**

Session Abstract:

A Joint Symposium and Panel Discussion on Highlights and Issues of the Past Year's Cultural Resources Management Activities by the Regional Transportation Agencies of Idaho, Oregon, and Washington. 2 hours run time.

Meets 1:00-3:15 p.m.

- 1:00 The Transportation Year in Review: Introduction to the Symposium and Challenges, Issues, and Developments
Scott Williams and Carolyn Holthoff)
- 1:30 The Stockhoff Quarry Revisited: Results from Recent Highway Project
Andrew Boehm
- 2:00 The Old Highway 30 Project, Caldwell, Idaho
Jillian Martin
- 2:15 Spanning Time: The History of the Broadway Bridge: A Mitigation Project
Barbara Perry Bauer
- 2:30 Collaboration for Christ Chapel's Sake: The Broadway Bridge Replacement and Stabilization of Christ Chapel
Tracy Schwartz
- 2:45 Collaboration for Christ Chapel's Sake: The Broadway Bridge Replacement and Stabilization of Christ Chapel
Tracy Schwartz
- 3:00 Panel Discussion:
Larissa Rudnicki (ODOT), Tracy Schwartz (IDT) and Scott Williams (WSDOT)
Paula Johnson

Session F-10: A Plateau House Party:” Reconsidering the Record of Columbia-Fraser Plateau Household Archaeology (Symposium/Lightning Presentations)

Room: **Ponderosa**

Organizers: **Molly Carney, James Brown, and Dakota Wallen**

Session Abstract: Archaeologists seek the remnants of houses, residences, and domiciles as these places are often considered to be microcosms of the greater social and cultural past. In the highly varied physiographic region of the Columbia-Fraser Plateau, archaeological examinations of houses have been ongoing for over 70 years. While the Plateau Handbook (Walker 1998) summarized much of that research, in the intervening 20 years considerable archaeological work has been undertaken in both the compliance and academic sectors. This forum brings together archaeologists from all backgrounds and generations to discuss Columbia-Fraser Plateau houses and identify patterns and hypotheses. Participants are asked to present a brief, five minutes or less talk on a topic of interest and engage in discussion. This session is a first attempt at synthesizing much of the household data and aims to re-vitalize conversations on houses and settlement pattern studies within the Interior Northwest.

Deward E. Walker, Jr. (ed.)

1998 *Handbook of North American Indians: Plateau*. William C. Sturtevant, general editor, volume 12, Smithsonian Institution, Washington, D.C.

Meets 1:00-3:30 p.m.- NOTE these are very short presentations.

1:00-1:10 Opening Remarks.

Molly Carney, James Brown, and Dakota Wallen

1:10-1:30 Homescapes: The Once and Future Archaeozillow.com

Steven Hackenberger

Synchronic Plateau Housepit Sub-Regional Size Variation and the Potentials of Meta-Data Synthesis

Kevin J. Lyons

It's a Lot of Work

Paul Solimano -

1:30-1:50 Fire and Flood: A Look at Pithouse Taphonomy

Adam Rorabaugh

A New Look at Pre-Contact Houses at Three Sites near Ahsahka in the Clearwater River Region, North Central Idaho

Lee Sappington

The Houses of Alpowai: 1971-1975

David Brauner

- 1:50-2:10 Transforming a Housepit into a Home: Examining the Intersection of Identity and Space-Use Within Housepit 54
Ashley Hampton
- Subsistence Intensification, Storage, and the Emergence of Pithouse Villages in Western North America.
Shannon Tushingham
- Households on the Middle Columbia Residing in Collections at the Wanapum Heritage Center
Angela J. Neller, Matthew Johnson, and Steven Hackenberger
- 2:10-2:30 Why not Pithouses?
James C. Chatters
- Dwelling in the Inland Northwest
Melissa Goodman-Elgar
- Community Space and Household Activity at Moses Lake: Re-examination and Radiometric Dating of HP-A, a Large House at the Long Beach Village Site (45GR30)
William Damitio and Shannon Tushingham
- 2:30-2:50 Observations on Contemporaneous Individual and Group Structures in the Late Prehistoric
Molly Carney and Kevin Lyons
- The Big Cougar Creek Lodge Depression in Hells Canyon: Thoughts Concerning a Protohistoric Longhouse
Ken Reid
- Engendering Households on the North American Plateau: Past Approaches, Feminist Frameworks, and Future Directions
Tiffany Fulkerson
- 2:50-3:15 Temporal Patterning of Houses of the Northwest Plateau and its Margins: Early Lessons on Database Construction and Data Availability
Thomas Brown
- Closing/Discussion
Molly Carney, James Brown, and Dakota Wallen

Session F-11. General Poster Session: Biological Anthropology and Cultural Resources Research

Room: **Cinnabar**

Meets 1:00-3:00 p.m.

Posters:

1. Chimpanzees Modulate Signs in Requests
Kailie Dombrowsky, Grace Coffman, and E. Chadwick de Bree

2. Masticatory Stress and the Human Chin
Chelsea Pfeiffer
3. The Impact of Web Based Visitor Education on Human-Tibetan Macaque (*Macaca thibetana*) Interactions at Mt. Huangshan, China
KiriLi Stauch, Lori K. Sheeran, Jessica A. Mayhew
4. Do lemurs at the Duke Lemur Center Socially Learn?
Carly H. Batist and Jessica A. Mayhew
5. Washington State University Archaeological Research at the Hart Mountain National Antelope Refuge, Lake County, Oregon
Dakota Wallen, Andrew Frierson, and Tiffany Fulkerson
6. Lakeview Ranch: Mitigating the Loss of Historic Buildings
Anne Boyd and Jamie Litzkow
7. Urban Co-design How Oaks Offer Opportunities for Collaboration
Haley Dunham
8. A Quarter Century of Archaeological Collections at the Wanapum Heritage Center
Matt Johnson
9. Archaeological Excavations at the Swenson Site (10-EL-1417), Southwest Idaho
Anne Van Wassenhove, Connor Neal, Weston Wardle, Keana Winner and Mark Plew
10. Shoe Analysis of a Boise Basin Chinese Mining Camp
Kristina Cockerille and Renae Campbell
11. More than Just a Bone to Pick: Deciphering Walla Walla's Cultural Consumption Patterns at the Turn of the Century.
Stephanie O'Brien and Lindsay Costigan
12. Early Placer Gold Discoveries in Washington Territory (ca.1853 – ca.1868).
Jamie M. Litzkow
13. NAGPRA Human Remains Inventory: Making Our Work More Visible.
Lourdes Henebry-DeLeon

Session F-12. General Session: Cultural Heritage Resources (Symposium)

Room: **Liberty**

Meets 3:30-4:45 p.m.

Session Chairs: **Molly Boeka Cannon, Juli McCoy**

- 3:30 Preservation or Perseveration: The Cost of Trying to Save Everything
Kelli Barnes
- 3:15 Exploring Spatial Patterns of Ethnic Chinese Artifacts along the Central Pacific Railroad, Box Elder County, Utah
Molly Boeka Cannon, Kenneth P. Cannon, Michelle Platt, Houston Martin, and Jonathan Peart
- 3:30 Erasing History? Analyzing Modern Monument Destruction in an Archaeological Context
Stephanie Holton
- 3:45 What's Going on Out There? An Investigation of Historic Land Use Patterns at the Orchard Combat Training Center
Juli McCoy
- 4:00 Mid-Nineteenth Century Clay Smoking Pipes from Fort Hoskins and Fort Yamhill, Oregon
Diane Zentgraf
- 4:15 Management of Unanticipated Washover Deposits at 45IS298 in Oak Harbor, Washington
Kelly Bush

Session F-13: Yama Village, 45-KP-105, a late 19th and Early 20th Century Japanese village on Bainbridge Island, WA. (Symposium)

Room: **North Star**

Meets 3:00-4:15 p.m.

Organizers: **Floyd Aranyosa**

Session Abstract:

The Japanese Village of Yama (45KP105), located on Bainbridge Island, Washington, U.S.A., was occupied from the 1880s-1920s. Yama contained approximately 250 people throughout that period, and many residents worked as migrant workers at the Port Blakely Lumber Mill. Using transnational constructs of local identities, I present a historical and archaeological analysis and interpretation of medical and health care of the Japanese community of Yama.

- 3:00 Yama Village: A Late 19th and Early 20th Century Japanese Immigrant Village on Bainbridge Island, Washington.
Floyd Aranyosi
- 3:15 Ceramics Analysis from Yama Village, 45-KP-105.
Dave Davis
- 3:30 Hydrology and Geomorphology of Yama Village, 45-KP-105.
Jean Hannah
- 3:45 Analysis of Faunal Materials from Yama Village, 45-KP-105.
Neal Endacott

4:00 The Buddhist Temple at Yama: Religious and Cultural Identity of a Late 19th- Early 20th Century Japanese-American Community
Bridget Grim

Session F-14: Lightning Round: Short Papers on Varied Topics of Note. (Lightning Presentations/Symposium)

Room: **Garnet**

Meets 3:00-4:45 p.m. NOTE these are very short presentations.

Organizer: **Paula Johnson.**

Session Abstract:

Working on cultural resources projects often leads to notable discoveries—minor mysteries unraveled, reflections on popular culture, curious bits of history, patterns seen over multiple projects in the same area. While these topics do not merit a full 15 minute paper, they are worth sharing. This series of 3-5 minute talks shares what we've learned along the way.

3:00 Early 20th Century Fly Field in Snohomish County, Washington.
Jason B. Cooper

3:15 The Golden Idol: Archaeology and Archaeologists in Popular Media.
Gretchen Kaehler

3:30 Consequences of Incomplete and Conflicting Site Histories.
Michael Chidley

3:45 Goofy Stories, Fun Facts, and Brushes with Destiny: Revelations During Research on Airports.
Paula Johnson

4:00 Don't Believe Everything You Read: A Lesson in Historical Sources and the Power of the Internet for Good
Scott Williams

4:15 Synthesis of Recent Archaeological Work at King County's Marymoor Park
Philippe D. LeTourneau

4:30 Urban Contamination: How to Archaeology Safely
Jennifer Gilpin and Alexander Stevenson

ABSTRACTS

Adams, Travis

Editing the Mowitch Film

The word “mowitch” means deer in the language of the San Poil people. To some people it may be just an animal but to the 12 tribes that occupy the Colville Reservation it means a lot more. This introduction video takes a quick look into the Mowitch Project, a film that will be completed later on this year that will document the full process of harvesting a deer from beginning to end. The goal of this project is to educate people on how to process a deer by using both traditional and contemporary methods of hunting and tanning the hide. I was given the video footage not knowing how much work goes into properly taking care of a deer after the kill. After hours of editing and asking questions about the process I have learned more about the uses of the mowitch than I had learned my entire life prior to working on this film. This proves that the use of modern technology can be instrumental to passing on the traditions of our people.

Anderson, Kimberly

A Historical and Archaeological Evaluation of Medical and Healthcare at Yama (45KP105), a late 19th-early 20th Japanese American Community

The Japanese Village of Yama (45KP105), located on Bainbridge Island, Washington, U.S.A., was occupied from the 1880s-1920s. Yama contained approximately 250 people throughout that period, and many residents worked as migrant workers at the Port Blakely Lumber Mill. Using transnational constructs of local identities, I present a historical and archaeological analysis and interpretation of medical and health care of the Japanese community of Yama.

Andrews, Bradford W.

Assessing the Coatlan del Rio Flaked Stone Collections: A Comparative Perspective

Addressing the contents of the symposium papers, this paper not only comments on what the Proyecto Coatlan data indicate about production and provisioning in the southwestern corner of the modern state of Morelos, but also how these data compare to similar, recent studies carried out in Morelos and the Valley of Toluca. For years, systematic analyses of flaked stone assemblages from Aztec period sites have largely been confined to contexts in the Basin of Mexico. That is problematic if our goal is to understand the dynamics of the Aztec Triple Alliance from a holistic perspective; we need to understand what happened in both the core and the periphery. Although we do not have as tight a chronological control over the Coatlan surface material as we would like, one thing that seems apparent is that this area was relatively impoverished in terms of access to, and ubiquity of flaked stone obsidian implements. This mirrors to some extent the patterns evident in both Morelos and the Valley of Toluca. Collectively, these data have important implications for understanding how the complex Mesoamerican Postclassic world system was affected by the socio-political changes associated with Aztec imperialism.

Aranyosi, E. Floyd

Yama Village: A Late 19th and Early 20th Century Japanese Immigrant Village on Bainbridge Island, Washington

Overview of the three-year survey and excavation of 45-KP-105, the history of the site, and the Olympic College field school.

Armstrong, Elizabeth, Patrick T. McCutcheon

What We Gain When We Document Potential NAGPRA Collections

Recent efforts to generate a comparable set of data on ground stone tools has led to a revitalization of a classification used by Robert Greengo on the mid-stem Columbia River pit house villages. Our original interests were to compare ground stone tools from the upper Yakima River Valley to those from domestic locations on the Columbia River. While that data is in the process of being analyzed, another opportunity presented itself where we could apply the classification to a set of ground stone artifacts that will soon be repatriated. This provided an opportunity to work closely with the interested parties to capture a set of data that would be informative on the question of what exactly is represented in ground stone tools from burial contexts vs. domestic contexts. In this poster, we present the process by which we have begun to analyze these artifacts using non-repatriated ground stone tools as examples. There are many challenges working with these artifacts that range from the conditions of the artifacts themselves to generating comparable measurements. It is clear thus far that close consultation with interested parties is vital to cooperation between generating data and respecting cultural traditional practices.

Bankuti, Natalie, Sean Fey, Annalise Muscari

A Lithic Analysis from Site 45-WH-004

Our study explores variation in material type, reduction strategy, and the range of tools utilized and produced at 45-WH-004, a site in Sumas, Washington near the Canadian border estimated to be utilized during the Marpole Phase of the Salish Sea region. We analyzed a total of 144 artifacts from three test pits excavated in 10cm levels by Keith Montgomery in 1979. The artifacts were mostly lithic flakes but also several slate knives, abraders, and bifaces were identified which allowed us to speculate on the purpose of the site. This research complements Montgomery's analysis of an extensive cataloged lithic assemblage, 2,135 artifacts, that were surface collected with point provenience in a plowed field. Artifacts from the test pits, which Montgomery did not include in his research, represent intact cultural deposits below the plow zone in which a hearth feature was identified. Attributes selected to document bipolar reduction, which we initially identified to be utilized at the site, were separated into three distinct material types and include the presence and absence of linear flake scars and the number of crushing platforms.

Barnes, Kelli

Preservation or Perseveration: The Cost of Trying To Save Everything

Our study explores variation in material type, reduction strategy, and the range of tools utilized and produced at 45-WH-004, a site in Sumas, Washington near the Canadian border estimated to be utilized during the Marpole Phase of the Salish Sea region. We analyzed a total of 144 artifacts from three test pits excavated in 10cm levels by Keith Montgomery in 1979. The artifacts identified were mostly lithic flakes but also included several slate knives, abraders, and bifaces, which allowed us to speculate on the purpose of the site. This research complements Montgomery's analysis of an extensive cataloged lithic assemblage, 2,135 artifacts, that were surface collected with point provenience in a plowed field. Artifacts from the test pits, which Montgomery did not include in his research, represent intact cultural deposits below the plow zone in which a hearth feature was identified. Attributes selected to document bipolar reduction, which we initially identified to be utilized at the site, were separated into three distinct material types and include the presence and absence of linear flake scars and the number of crushing platforms.

Bass, Kayley, Allie Taylor

Comparing the Accuracy of Two GPS Receivers within the Spokane Arm of the Federal Columbia Power System

Global Positioning System (GPS) units are consistently used in archaeological settings in public, private, and tribal sectors. With the increase of GPS unit types on the market, questions arise for which unit is leading in accuracy, time efficiency, and cost effectiveness with respect to archaeology. This study assesses the pros and cons of recording geographic points with each the Bad Elf GNSS Surveyor and Trimble GeoXT 6000. Evaluations of the units occurred in three different types of landscapes and under different weather conditions frequently encountered within the FCRPS Spokane Arm Area of Potential Effects. Receiver accuracy was evaluated considering the average repeated measurements that include up to 100 measurements. The accuracy of the devices in each landscape and weather condition were assessed, as well as time and cost efficiency, and ease of use. The results including precision, accuracy, and overall ease of use are discussed.

Batist, Carly H., Jessica A. Mayhew

Do lemurs at the Duke LeMur Center socially learn?

Recent years have seen a rapid increase in primate cognition studies, however, lemurs have been largely overlooked. As the most ancestral primate lineage, lemurs occupy a unique phylogenetic role; therefore, studying their cognitive abilities can help elucidate the evolution of complex cognition in primates. We studied learning abilities in 59 lemurs using a two-action apparatus that required an individual to push or pull open a door to obtain a food reward. Experimental groups had a previously trained push model and control groups had no model. Latency to success positively correlated with proficiency rate. There was a positive correlation between average number of times an individual observed another group member's successes and that individual's proficiency rate, suggesting that watching other individuals succeed helped to improve a lemur's own proficiency rate. Latency to touch the apparatus was shorter in push/pull groups than in control groups. This suggests that having a trained model in the group reduced neophobia in other group members, likely through an underlying social facilitation mechanism. These results provide some evidence for social learning in lemurs. This study adds to evidence of lemur learning abilities and provides evidence for potential species-specific cognitive differences. Additional studies are required to fully understand the cognitive underpinnings of these learning differences and how they reflect species-specific ecological niches.

Battistella, Edwin

Fresh, free and natural

Part of what we do in understanding language is filling in the blanks—we take words and phrases that have potential meaning and make them more explicit. When there is more than one way to do this, the possibility for ambiguity and misreading arises. Even a simple five-word supermarket sign like “Buy two—get one free” has multiple opportunities for misreadings. This paper considers the potential for misreading in food labeling, signage and advertising. Looking especially at the polysemy and vagueness in the usage of such words as “fresh,” “natural,” “organic,” “super,” and more. The focus of the talk on the potential for both confusion and deception that arise at the intersection of prescribed language and colloquial usage and the role of common interpretive strategies in causing misinterpretation. Time permitting some in-depth examples of contested language will be illustrated.

Battistella, Maureen Flanagan

The Baptist Cookbook, Published Boise, Idaho in 1910

Discovered in Ashland, Oregon in 2018, the Baptist Cook Book is worn and stained from decades of use. Its pages are sewn together in signatures, four loose stitches holding the work together. The Baptist Cook Book is a classic example of the community cook book, this one a compilation of tested recipes published by the Ladies and Society of the First Baptist Church of Boise, Idaho. Part genealogy, part history, part gender studies, this paper will consider how the Baptist Cook Book, printed by Joseph Collins of Boise, Idaho in 1910 reflects the women who contributed recipes, how the recipes reflect the lives of these Boise, Idaho women and their world. Further, this paper will examine how a community cook book reveals the economics, politics and demographics of place and the larger feminine ideals of western culture.

Becker, Rory, Berenice Chavez

Monochrome Ultraviolet Imaging in Archaeological Analysis

Monochrome ultraviolet (UV) photography provides a new method in the analysis across several archaeological data types. In this study, the technique is used to enhance the interpretation of figures on a collection of finely incised catlinite tablets from the Red River Valley of Minnesota and North Dakota and sediment samples from a rockshelter site in southwest Texas. A comparison of traditional methods with the monochrome UV imagery shows a high level of detail in the imagery that is not readily discernible using traditional methods. Marks and incised lines visible in the UV imagery but not visible in the illustrations, color photography, or to the aided/unaided eye, inform the sedimentary processes, manufacture processes, and interpretation of data collected from these sites.

Bennett-Rogers, Ann

45 Years, What a Long Strange Trip

Forty-five years ago, I completed my first archaeology course from Richard Ross. The curves in the road have lead in many directions. This paper will follow that road and demonstrate how a discussion of Traditional Ecological Knowledge (TEK) is an important part of cultural resource management.

Black, Annice Olena

Making Food for a Farm Family in the 1930s. A diary case study.

Marguerite Watson Black kept a diary from the late 1920's till her death in 2007. She was the local school teacher and married John Black in 1933, a Jackson Co rancher/farmer. She moved into the home of a second generation Oregon wagon train pioneer family. Marguerite's diary provides a unique and very personal insight detailing how meals, food choices and food preparation reveal the reality of daily life and social aspirations. Using Home Extension cookbooks, Ziegelman's A Square Meal and other sources, this case study will examine how Marguerite's diary reflects 1930s subsistence farm life.

Bodley, Lilian, Ray von Wandruszka

Historical Analysis of Household Goods

Household goods are, and always have been, items that are discarded on a daily basis in our homes. Trash piles near historical settlements are therefore often treasure troves of artifacts that tell stories about the lives of the people who used them. It is interesting to both analytical chemists and historical archaeologists to analyze the many unknown substances that are found in association with household containers. Not only are paper labels usually long gone, but bottles and jars may have been reused and contain remnants of materials that have no relation to the original contents. There are many examples of historical household goods that require chemistry for identification – ranging from glue, to cough relief

salves, to traditional Chinese medicines.

Boehm, Andrew

The Stockhoff Quarry Revisited: Results from Recent Highway Project

The Stockhoff Quarry site is an extensive raw material source area that has been utilized since the terminal Pleistocene. Previous research demonstrated the quarry was primarily a bifacial reduction area composed of numerous discrete quarrying and knapping areas. This study presents the results of an ODOT highway expansion project where 1,204 artifacts and three discrete lithic reduction areas were identified. Results of the lithic analyses indicate very similar patterns compared to previous research, supporting the hypothesis that a near uniform reduction strategy was used throughout the site. Results of obsidian sourcing indicate that artifacts from each of the three areas came from sources to the southwest of Stockhoff Quarry, potentially reflecting seasonal human mobility patterns. Finally, LIDAR data are compared to recorded quarrying locations in an attempt to identify unrecorded quarries.

Boyd, Anne, Jamie Littzkow

Lakeview Ranch: Mitigating the Loss of Historic Buildings

Visitors to Bureau of Land Management (BLM) recreation areas often associate historic buildings with their overall experience. Sometimes these buildings need to be removed – for various reasons – and the public may feel a sense of loss, or even anger. One way to help mitigate this loss is to provide interpretive information illustrating the history behind former buildings. This spring, the BLM will be removing four buildings at Lakeview Ranch, an historic cattle ranch in Lincoln County, Washington. An interpretive kiosk will then be built to display historic photographs of the buildings, and to discuss the history of the people who once lived there. This poster shows the kiosk display, and discusses the need for providing historic mitigation in public recreation areas where buildings have been lost.

Breidenthal, Matt

Data Potential of Archaeological Deposits at Chelan Station (45CH782/783)

Early Holocene archaeological deposits at Chelan Station (45CH782/783), inadvertently discovered during construction of a waterline to the Beebe Springs Fish Hatchery in 2010, consist of sparsely distributed lithic and faunal artifacts buried beneath volcanic ash from Mt. Mazama. Limited archaeological testing suggests that people bearing tools related to the Old Cordilleran Tradition (cobble tools and leaf-shaped points) occupied a productive floodplain environment as early as $9,160 \pm 50$ BP, exploiting salmon and large game. Located within an alluvial terrace along the Rocky Reach of the Columbia River in North Central Washington, the study area includes an approximately 1,200 m-long transect exposed during waterline excavation. A stratigraphic model used to characterize site formation processes was constructed based on field observations of sediments and soils in the study area. To provide a lower limiting date on the cultural deposits, possible volcanic ash samples (n=2) collected during archaeological testing were submitted to the Washington State University Geanalytic Laboratory for identification. Results demonstrate these samples do not represent volcanic ash deposits, but rather a feldspar and quartz-rich alluvium that may derive from the Wenatchee River Basin. Magnetic susceptibility measurements confirm the presence of buried organic layers and the influence of fire. The record of early Holocene floodplain accretion and paleoenvironmental change expressed in buried soils, suggests that the Chelan Station deposits are unique to the Rocky Reach. Columbia River floodplain landforms in the study area may have been influenced by Cascade Range alpine glacial advances.

Brown, James W., Miller-Atkins, Galen

Settlement Change and Political Organization of the San Juan Islands for the Past 3000 Years

The archaeology of the Salish Sea is dominated by coastal shell middens. These middens have been thought of as the result of food refuse, however, recent research has shifted this view. Shell middens can be thought of as the remains of villages, cemeteries, food production and processing locations, and monumental constructions that comprise a diverse anthropogenic landscape. In the San Juan Islands, shell middens comprise a large part of the archaeological record. Even though there is an extensive record of shell middens there is limited evidence for the settlement pattern of the past inhabitants. Using previously published data this study utilizes shell midden area as a proxy for large and small villages as well as resource procurement locations. This analysis compares these settlement types temporally and spatially to test theoretical expectations of political organization. Spatial and temporal analyses indicate that prior to Euro-American contact Coast Salish settlements were politically decentralized.

Brown, Thomas J.

Temporal patterning of houses of the Northwest Plateau and its Margins: Early lessons on database construction and data availability

As part of my dissertation, I have proposed a project that compares temporal patterning of houses between the Plateau, and the Fraser Valley/Northern Great Basin, from ~ 7,000-3000 calBP using a combination of Summed Probability Distributions (SPDs) of radiocarbon data and Bayesian chronological modelling. Here, I discuss my experiences, so far, in trying to collate the necessary data to highlight what I feel are significant issues in data availability and presentation.

Bumback, Stacy L., Michelle Yellin

Do Not Walk the Path Alone: Navigating a Complex Professional Hierarchy with a Strong Mentor

Women are gaining an increasingly influential role as mentors in the field of archaeology in the Pacific Northwest, as marked by the growing number of women in leadership roles in both the public and private sectors. Personally, I attribute a great deal of my success in the industry to a handful of female mentors. I have come to realize, however, that the guidance and direction given by many women in our industry is framed within a social construct based on our experiences within a traditionally male-dominated field. Throughout my career, I have been advised to choose between beauty or smarts because I could not be both; I was encouraged to color my hair grey so that colleagues would listen to the sage advice of an older woman; and I was urged to not take a long maternity leave because it could derail my career. The role of a mentor is powerful and influences the path we may take in the field. This kind of advice can greatly impact a woman's sense of professional identity and self-worth within her industry – especially if it comes from another woman. This paper examines some of the ways in which female mentorship has evolved within the traditionally male-dominated field of archaeology. It is intended to daylight some of these experiences, discuss the power and influence we have as mentors, and create a platform for encouraging all people to help each other become better mentors.

Bush, Kelly

Roar-A Brief History of Feminist Archaeology in Pacific Northwest CRM

This paper explores the effect of feminist thought on the rise of CRM in the 1980's and gives some specific anecdotal herstorical contingencies for how we do what we do today. Incredible characters in the story of Feminist Archaeology in the northwest are highlighted. A critique is provided of how modern sexist thought has infected our analysis and interpretation of the archaeological record. Also included is a brief feminist evaluation of the modern state of CRM.

Bush, Kelly***Management of Unanticipated Washover Deposits at 45IS298 in Oak Harbor, Washington***

This paper describes the strategies and field tactics used to manage deposits encountered during monitoring of deep excavations for a wastewater treatment plant in Oak Harbor Washington. The work on this site is regulated by an MOA and associated archaeological work plan (AWP); the AWP was reviewed / approved by six tribes, two agencies and the Washington State Department of Archaeology and Historic Preservation. However, the overwash deposits were not considered when crafting the contingencies for the AWP. When encountered, the driving strategy was to coordinate thoroughly and work efficiently to interpret the deposits for the interested parties and gain consensus. Then we had to implement this while tracking sediments on a complex construction site. The solution involved compromises and the implementation required constant fine tuning. Encountering this deposit has changed the way we will approach monitoring projects on or near a spit lagoon complex in the future.

Campbell, Renae***Chinese Signatures in The Boise Basin: Ongoing Research on Site 10BO357***

Site 10BO357 (FS No. BS-780) is an historical placer mining site located along Grimes Creek in the Boise National Forest. This site is part of a larger legacy of Chinese mining and entrepreneurship in Southern Idaho's Boise Basin, which was home to over 1,500 Chinese men, women, and children who accounted for as much as 49.9 percent of the local population in the late nineteenth century. Site 10BO357 was one of several Chinese-occupied sites recorded and excavated in the 1980s as part of a land exchange. A summary report was prepared at the time, but a comprehensive catalog and analysis of the recovered materials have only recently been completed. This presentation provides a summary of ongoing research into site 10BO357 and the preliminary results of artifact analysis. The archaeological collection, which includes nearly 5,000 artifacts, attests to the diversity of products available to Boise Basin residents in the late nineteenth century and to the enduring signatures that the Chinese community left on the landscape of the Boise Basin.

Campbell, Sarah***I been in the right place (and it must have been the right time)***

My perspective on women in archaeology and other field sciences starts in the early 70s. New social movements made less traditional fields attractive to young women, but we faced educational and work place barriers upon entering those careers. I landed in a good place when I came to the Pacific Northwest, and my experience at University of Washington was more positive than women I knew in other graduate programs. Over the subsequent decades I witnessed many changes including the effects of affirmative action on employment in education, agencies, and consulting firms. The positive effects and progress are not universal, and we have not achieved gender equality today. I was fortunate to experience little gender discrimination but acknowledge how easily my passion for archaeology could have been extinguished if I had not had positive support from mentors and colleagues.

Cannon, Kenneth P., Kenneth Reid, Joel Pederson, Molly Boeka Cannon***Finding Bia Ogoi: The Application of Historic Documents and Geomorphology to the Understanding of 19th Century Landscape Change of the Bear River Valley, Franklin County, Idaho***

On the frigid morning of 29 January 1863, the California Volunteers under the command of Patrick Connor attacked the Shoshone village at Bia Ogoi in response to ongoing hostilities between whites and Native groups. The result was the death of at least 250 Shoshone, many of them women and children, and 21 soldiers. Over the course of the past 150 years extensive landscape modification has occurred from both natural and human agents obscuring the events of this fateful day. A major focus of a recent NPS-

funded study was the reconstruction of the 1863 landscape. This effort employed not only traditional on-the-ground geomorphic studies, but also a series of historic documents and maps based upon first hand experiences. We will present the methods employed in this study to describe a changing landscape and its implications for the archaeological study of the Bear River Massacre events.

Cannon, Molly Boeka, Kenneth P. Cannon, Michelle Platt, Houston Martin, Jonathan Peart
Exploring Spatial Patterns of Ethnic Chinese Artifacts along the Central Pacific Railroad, Box Elder County, Utah

In 2015 USU Archeological Services, now Cannon Heritage Consultants, in partnership with Utah State University's Museum of Anthropology, received a pass-through grant from the Utah Division of State History from the National Park Service's Underrepresented Community Initiative. The purpose of the project was to conduct a pedestrian survey centered on the Section Stations of Bovine and Omby and the railroad town of Terrace in Box Elder County. As part of the survey protocol, artifacts were piece-plotted using a high resolution RTK mapping unit, photographed, and described. One of the research interests of the project was to see if our methodology provided usable data for detecting temporal and spatial patterning of the ethnic Chinese artifacts that may provide information on the social dynamics of these work camps. ArcGIS spatial statistical tools were employed in these analyses. In this paper, we report on the results of our analyses from two Section Stations, Bovine and Omby.

Carney, Molly, Kevin J. Lyons

Observations on Contemporaneous Individual and Group Structures in the Late Prehistoric

Why did late prehistoric Plateau communities choose to live concurrently in both long mat lodges and individual mat lodges? While ethnographic work describes both the smaller circular and longer elliptical mat structures, archaeological data recovery tends to focus on the larger long lodges. In this paper we draw on this rich body of ethnographic literature and oral histories to create expectations for inter- and intra- structure archaeological investigations. We briefly compare these expectations with unpublished paleobotanical and geoarchaeological data from two structures in the Pend Oreille Valley, WA before concluding with initial impressions on the rhythm of past social life as seen through architectural form.

Carney, Molly, Stephenie Kramer

Re-Evaluating Bulb Size as a Proxy for Camas (*Camassia* spp.) Management in the Willamette Valley of Oregon

Previously overlooked, it is now commonly accepted that Northwest Coast peoples in the ethnographic past and present used and managed a variety of plant foods, many of which likely contributed a substantial number of calories to the diet. Establishing the time depth associated with these ethnographic behaviors, however, has been less clear. This paper addresses the antiquity of plant management practices in the Willamette Valley through the re-analysis of paleobotanical assemblages from six earth oven sites located in traditional Kalapuyan lands. We specifically focus on camas (*Camassia* spp.) bulb size to show that selective harvesting and tending of camas is visible in the archaeological record. We contextualize this analysis within Northwest Coast discourse on plant intensification, cultivation, domestication, and management, before briefly discussing the implications of plant selective harvesting and management for Northwest archaeology as a whole.

Chidley, Michael

Consequences of Incomplete and Conflicting Site Histories

Incomplete and conflicting site histories for archaeological sites generate some interesting consequences for future archaeological surveys, excavation and permitting requirements, and regulatory compliance and

consultation. This is a brief overview of such circumstances that have recently been encountered at different sites, in different states, and through different archaeologists that have had similar complicating issues.

Churchill, Thomas E.

Flashback: Pirate Cove-A Reflection on Time at 35LNC7, Depoe Bay, Oregon

With thoughts of those who have walked on before us this presentation focuses on a past investigation conducted on a shell midden site (35LNC7) by Archaeological Frontiers.

Clark, Jorie

MAD Then and Now: Closing Remarks from Her Friends and Colleagues

Throughout her tenure with the Idaho SHPO, Mary Anne Davis has been a close colleague, supporter, and friend to all who have had anything to do with Idaho archeology, whether it be state or federal agencies, Tribes, or the public. This paper is a tribute to Mary Anne's contributions to the field and the memories that we will remember her by.

Clay, Vickie L., William D. Hildebrandt

What's Cooking in the Late Archaic Kitchen? Features and Subsistence Remains from a Klamath River Village, Siskiyou County, Northern California

Recent testing and mitigation for Caltrans at the Randolph C. Collier Roadside Rest Area (CA-SIS-329) on Interstate-5 in the Klamath River Canyon revealed long buried evidence of a Late Archaic/Canyon Period I (2250-1000 cal BP) riverine village. Located on a broad terrace east of the river, and buried by up to one meter of construction fill and natural sediment, two large communal cooking features provide a glimpse into prehistoric times on the Klamath River. The features, located five meters apart, are nearly two meters in diameter and 30-70 cm deep. Radiocarbon dates indicate occupational intensity and feature use between 1244 and 1120 cal BP. Projectile points are primarily Tuluwat Series small contracting stem arrow tips made of Grasshopper Flat/Lost Iron Well obsidian, the source of which is located some 60 miles to the southeast. Well preserved bone implements include awls, a needle, pressure flakers, a bead, and leister pieces from a three-pronged fishing spear. Faunal remains show deer, pond turtle, birds, rodents, rabbits, and fish were targeted resources, and some were likely post-depositional trespassers. Fish remains are primarily sucker with fewer salmon, sculpin, and sturgeon. Shellfish remains show freshwater mussel was preferred. Plant remains included nutshells from fall ripening acorns, manzanita, and juniper, and summer ripening small seeded plants like goosefoot. This Late Archaic snapshot of abundance and variety in the resource base mirrors, in many respects, ethnographic accounts of the native Shasta people recorded by Roland Dixon and Catharine Holt over one thousand years later.

Cobb, Adrienne, Lindsey Holdener

Cobble reconstruction using cortex remnants on flake fragments (45WH004)

We present results of a test of the effectiveness of two different methods of reconstructing source cobbles from cortex present on flakes, cores, and shatter. The 300 lithics used in our study were collected in 1979 by Keith R. Montgomery from 45-WH-004, estimated to be 2400-1200 years old. The lithics were separated into fine-grained volcanic (FGV) material - comprising rhyolite, andesite, and dacite - and non-fine-grained volcanic (non-FGV) material, and cortex attributes were recorded. We applied two methods - graphical and mathematical reconstruction. The graphical reconstruction involved tracing the angle of the cortex remnant on each lithic artifact and using Adobe Illustrator to overlay the images, recreating the shape of a hypothetical original cobble. The mathematical reconstruction, inspired by Dibble (2005), involved using the cortex attributes of length and width to extrapolate the shape of the cobble using

various 3-dimensional surface area formulas. The results of both methods for each material type were compared and conclusions drawn.

Cockerille, Kristina, Rylee Robertson, Renae Campbell

Shoe Analysis of a Boise Basin Chinese Mining Camp

Currently there is not a lot of information regarding utilitarian shoes in the archaeological record, not only because of their fragile and easily perishable state, but also because they are not always seen as the most insightful reflection of our past. This poster discusses an archaeological analysis of shoe fragments found at site 10BO357 in Southern Idaho's Boise Basin. This is a late nineteenth-century mining site located along Grimes Creek in the Boise National Forest that was occupied by Chinese miners. Among the nearly 5,000 artifacts recovered from the site in 1985 were 124 shoe fragments and shoe nails, as well as one complete shoe sole. In this analysis, we will be looking at the manufacture dates, nail type, makers' marks, and shoe size and gender of the fragments in this collection. These details demonstrate the value of information that can be gathered from the analysis of utilitarian footwear, including date ranges, shoe types, and manufacturing techniques. The goal of this analysis is to contribute more information towards future research on utilitarian shoes and the people they belonged to.

Codling, Chelsea

From Bones to Behavior: Zooarchaeology and Chinese Meat Consumption Patterns in the late 19th Century of an Idaho City Mining Camp

Near Placerville along Grimes Creek in Southern Idaho's Boise Basin, is a Chinese-occupied placer mining site, BS-780. As the site where gold was first discovered in the Boise Basin in 1862, Grimes Creek was subject to intensive placer mining in the late nineteenth and early twentieth centuries. Chinese miners began arriving in the Boise Basin in the mid-1860s. Between 1870 and 1890, mining camps in places like Idaho City, Placerville, Centerville, and Pioneerville were home to nearly 2,000 Chinese individuals. The focus of this research is on the faunal remains and the insight they can provide on meat consumption habits and food culture of Chinese in Idaho. Evidence from the assemblage shows that the Chinese miners of Boise Basin consumed a variety of meats, and seemed to have a strong preference for pork, but due to the low cost of the beef, consumed sizable amounts of both meats.

Cody, Tia R., Dr. Shelby Anderson

LiDAR Predictive Modeling of Kalapuya Mound Sites in the Calapooia Watershed, Oregon

The focus of this poster is the development and testing of a LiDAR (Light Detection and Ranging) and remote sensing predictive model to identify precontact mound sites in the Calapooia Watershed in the Willamette Valley, Oregon. Mound sites are low-lying, generally ovoid, earthen features, which the Grand Ronde Tribe consider culturally sensitive locations. Various tribal sources, ethnographic accounts, and limited archaeological investigation suggest that some are burial sites. Very little is known, however, about why and how people created these mound sites, how old the sites are, and how common mound sites are across northwest Oregon. There are hundreds of unrecorded mounds in the Calapooia watershed, extending from Albany to Eugene, Oregon. Investigating and protecting these mound sites is a priority but traditional archaeological survey of the watershed is impractical given that it covers roughly 234,000 acres and is 94% privately owned. To address this problem, I use LiDAR data and aerial photography to develop a model that identifies probable mound locations in the Calapooia watershed. This model takes advantage of the unique analytical properties of a geographic information system (GIS) as well as the malleability of a LiDAR dataset. Development of the model revolves around the initial filtering of the LiDAR dataset so as to remove "noise" or non-mound features. From here the LiDAR dataset can be inverted and digitally flooded to identify "sinks" (e.g. inverted mounds) or areas in which the digital

water is trapped. After the model is created, I will test the model by carrying out a pedestrian survey in the project area to assess the positive identification rate.

Connolly, Thomas J., Robert Kentta, Jeanne McLaughlin, Julia Knowles, Chris Ruiz, Peter Hatch
Inadvertent Discovery of Human Remains on the Siletz Bayfront, Lincoln City, Oregon: A Case Study on Siletz Tribal History In 2016, human remains and associated funerary items were identified beneath a home on the Siletz Bay front in Lincoln City, Oregon. Limited archaeological work was approved to be conducted in 2017 to assess the level of disturbance and to determine whether intact burials were present, as well as to remove enough additional sand from under the house using controlled excavation methods to allow access for home structural maintenance. The discovery, within the original Siletz Reservation, provided an opportunity to assess the condition and explore the history of a Native village and cemetery, occupied most notably during the early reservation years (ca. 1856-1892) and allotment era (1892-1922). The history of this village and cemetery serves as a case study of the all too common tragic fate of cultural resources within the original Siletz Reservation.

Cooper, Jason B.

Early 20th Century Fly Field in Snohomish County, Washington

The *Golden Age of Flight* in western Washington is inexorably linked with early aviation pioneer, William Boeing. The development and construction of King County International Airport (Boeing Field) in Seattle (c. 1928) and Paine Field near Everett, Washington (c. 1936) helped propel Seattle, aka “Jet City,” and the Boeing Company to be first in flight during the 1950s. The modern airports of Boeing and Paine fields brought about the end of small flying fields across Puget Sound, including one built on a small island located within the Snohomish River estuary between Steamboat Slough and Union Slough. Gordon E. Mounce, a local car salesman and reserve flyer, built a flying field, along with a seaplane base, in 1927. The airport was dedicated with an air field day in 1928 in front of thousands of spectators. Aerial photographs show the flying field still in use into the 1950s, but abruptly ends with construction of the Interstate 5 corridor across the estuary.

Covington, Brenda

Early Archaic Lithics, Ongoing Reservoir Impacts, and Evaluation Potential at 45LI224, Grand Coulee Dam Lake Roosevelt

Cultural resources along the mainstem Grand Coulee Dam Project Area are jointly managed by the Bureau of Reclamation, Bonneville Power Administration, the National Park Service, the Confederated Tribes of the Colville Reservation, and other land owners/managers, as appropriate. This presentation will provide a preliminary overview of a pre-contact lithic scatter site (45LI224) located on a high ridge above the pre-dam Columbia River in Lincoln County, Washington. The artifact assemblage observed on the ground surface and the preliminary results of small scale testing conducted in 2017 indicate 45LI224 has an early archaic lithic workshop component. Site updates conducted over the past 20 years have documented vast changes in the distribution of cultural materials and exposure of features, which provides insight as to how quickly reservoir processes can impact sites. While these processes can cause immense and sometimes unfamiliar impacts, recent studies have found potential for pre-dam intact deposits that can be tested and used to evaluate sites such as 45LI224.

Coyote, Arrow

The Mowitch Project-Traditional and Contemporary Methods of Hunting and Use

Mowitch means “deer” in the Sanpoil language, and this project entails documenting through film, the steps involved in deer procurement and processing: hunting, gutting, skinning, butchering, and tanning. This symposium/panel is part of the production process whereby the Mowitch film makers will present portions of the film and have a panel discussion with the audience. The results will help focus the narration portion of the project that will be integrated into the final production of the film. This video will serve to educate and preserve the traditional/contemporary methods of deer procurement and hide processing.

Coyote, Arrow

Hunting Traditions in the Upper Columbia River

Hunting has a long tradition in the Upper Columbia River. Place names describe good hunting areas, early explorers describe hunting techniques, and ethnographers along with oral history describe hunting excursions and their cultural significance. In addition, there are numerous archaeological sites, artifacts, and features within the region associated with hunting. This presentation discusses hunting traditions of the upper Columbia River, particularly in the Sanpoil (snpəʔwílx), Colville (sǰʷiyiʔlp), and Lakes (sinʔickstx) territories.

Croes, Dale, Ed Carriere

Re-Awakening Ancient Salish Sea Basketry: Applying Generationally-Linked Archaeology

Ed Carriere, Suquamish Elder and Master Basketmaker, and I have been working with the U.W. Burke Museum to replicate 2,000-year-old waterlogged archaeological basketry found in the early 1960s from the Biderbost site (45SN100), along the Snoqualmie River in Snoqualmie Tribe traditional territory. Ed learned old style split cedar limb/root clam basket making from his Great Grandmother, Julia Jacobs, who raised him. Ed’s goal has always been to go back as many generations in his family to master their work. As a wet site archaeologist specializing in ancient basketry on the Northwest Coast, I work from the other direction, deep-time, statistically linking ancient basketry styles from throughout the region to the present. I had a career-changing idea while re-assessing the 2,000-year-old basketry collection from the Snoqualmie River site, asking Ed to try replicating these baskets that statistically linked through 100 generations from this site through 1,200, 750, and 500-year old Salish Sea wet site basketry to his Great Grandmother’s old style in an approach we call Generationally-Linked Archaeology. Generationally-Linked Archaeology attempts to link the current cultural Artisans back through the generations and with the archaeological evidence through a process of cultural/ideational transmission. The approach goes from the present back and deep archaeological time forward, meeting from both directions. We believe this approach could be used for study other artifact categories.

Damitio, William J., Shannon Tushingam

Community Space and Household Activity at Moses Lake: Re-examination and Radiometric Dating of HP-A, a Large House at the Long Beach Village Site (45GR30)

The Long Beach Village Site (45GR30), located along the eastern shore of Moses Lake, is comprised of 21 house pits and dates to the Late Precontact. The site was first identified archaeologically in 1947. Three years later, R. D. Daugherty led the excavation of three pit features: a large ovular house (HP-A), an adjacent circular house (HP-B), and a shallow ovular pit (Depression-C) that Daugherty suggested was a mat lodge rather than a house. Daugherty presented a brief summary of the results of the excavation in a 1952 American Antiquity paper, in which he also discusses the nearby Ridge Bottom Village Site (45GR27). Later researchers have reexamined the latter site, but 45GR30 has received little additional

attention. This brief paper is focused on HP-A which, given its size (12.25 m × 8.23 m [40.2 ft × 27 ft]) and distinctive shape among other features at the site, may have served as a gathering space for the community residing at the site. Two new radiocarbon dates obtained from the HP-A floor confirm that it was occupied during the last few centuries before contact and give new insight into the site's temporal relationship with 45GR27, which was assumed by Daugherty to be contemporaneous with 45GR30. Fragments from 11 stone smoking pipes were collected from the floor of HP-A, supporting our interpretation of the structure as a place of community interaction.

Danner, Yuumi

Reflections in Stone Tools: A Life Story of Don E. Crabtree

Dr. Don E. Crabtree, as one of the pioneers of academic flintknapping, developed an experimental approach in lithic studies during 1960s and 1970s. His diverse replication studies left a great impact on the field of archaeology not only in the Pacific Northwest, but also throughout the United States, Canada, and other countries. His story outside of publications, however, has been known by a very few people. Since his life had always been intertwined with academic flintknapping, learning his life stories allows us to better understand the importance and potential of experimental approach in archaeology. With his numerous professional and personal data collection at the Alfred W. Bowers Laboratory of Anthropology, this paper revisits the life of Crabtree and explores the contributions and influences he left in the field. It intends to help lithic students and scholars appreciate what Crabtree and his hands-on method really mean to us.

Davenport, Meaghann, Ray Von Wandruszka

Chemical Analysis of Historical Person Products

Bottles and jars with unknown contents can be an interesting challenge for historical archaeologists. Identification of the recovered materials often requires in-depth chemical analysis, which can itself be problematic because of changes that occur in many chemicals upon prolonged environmental exposure. Yet, a combination of chemical and cultural sleuthing often provides satisfactory identifications, leading to a better understanding of the historical use of materials.

Bottles with products for personal use, including medicines and grooming aids, are often discarded with small amounts of the original contents left in them. When these are identified, they can provide fascinating insights into the daily lives of the people used them – decades to centuries ago. In the present case, artifacts from around the Northwest were investigated, and the results provided the hoped-for chemical answers. Peripheral analysis brought to light some remarkable goods that were available to the people of this region in the 19th and early 20th century.

Davis, David R.

Teacups, Terracotta and Transnationalism: A Analysis of Ceramics Recovered at Yama Village (45Kp105), Bainbridge Island, WA

Yama Village (45KP105) on Bainbridge Island, Washington was initially established to quarter Japanese bachelor migrant laborers by and for the large local Port Blakely sawmill. Families soon followed, and at its zenith, Yama Village (1883-1929) contained roughly 300 residents, 50 homes, and boasted of such amenities as a restaurant and hotel, general store, tea garden, and a Buddhist temple. Surface survey and subsurface excavation were conducted at Yama Village for three seasons by the students and staff of Olympic College (2015-2017). These efforts resulted in the recovery of a large ceramic assemblage (n = 2,611). This research presents results derived from the initial analysis of these artifacts, focused through the interpretive theoretical lens of transnationalism and utilizing a typology specific to historic Japanese ceramics. This new information contributes to a more accurate understanding of both daily life at Yama

Village and of Japanese-American transnationalism and social-identity formation generally, while simultaneously adding to the archaeological record of Issei and Nisei in late nineteenth and early twentieth century Washington.

Dombrausky, Kailie, Grace Coffman, E. Chadwick de Bree

Chimpanzees modulate signs in requests

To make requests in American Sign Language (ASL), native Deaf signers modulate their signs by raising the eyebrows, maintaining eye gaze with the recipient, and holding the sign in place for an extended duration (Covington 1973). Five signing chimpanzees lived at the Chimpanzee and Human Communication Institute (CHCI). Reliable caregivers recorded systematic detailed observations of the chimpanzees' signing and the situational context in sign logs. The chimpanzees use the signs in a variety of communicative functions, such as statements, responses, descriptions, conversational devices, performatives, and requests. In a 2-year sample of sign logs requests appeared 12.5% of the time and 8.2% contained modulations (Leeds and Jensvold 2013). This study queried sign logs from 2000 - 2007 for requests and accompanying modulations by searching for keywords "raised brow", "eye gaze", "held sign", and "request." The most frequent type of modulation was raised brow (38.10%) followed by eye gaze (28.92%). The keyword "request" co-occurred with the queried modulations in 85.14% of the sign logs. Conversely the keyword "request" appeared alone in 14.86% of sign logs. This highlights the role of modulation in signaling requests. This study adds to our understanding of the patterns of sign modulation in chimpanzees, including those human signers use.

Donald, Roderick Kevin

A Brief Introduction to the Confederated Tribes of the Colville Reservation's History and Archaeology Program

The History and Archaeology Program at the Confederated Tribes of the Colville Reservation [Colville Confederated Tribes (CCT)] began in 1976 as one of the first groups of Tribal Historic Preservation Offices (THPOs) in Indian Country. There are now over 150 THPOs throughout the US. The program has grown to more than 40 employees and participates in more than 50 projects per year. A major aim of the History/Archaeology program is to promote tribal sovereignty through the identification and preservation of cultural resources within the reservation as well as tribal traditional lands.

Dunham, Haley

Urban Co-design How Oaks Offer Opportunities for Collaboration

Urban green spaces often face problems of "overuse" issues because they can serve so many functions. In their conception, designers are challenged to create spaces citizens can both connect with and use in a practical way. The interests of certain groups may sometimes be over-represented, such as public parks that offer extensive work out equipment, and these functions may not be equally appreciated by different stakeholders in the area. Co-design is a method that attempts to mitigate this issue by inviting non-technical experts to participate in the design process and collaboratively decide what the finished space will be built to resemble. This study uses the co-creation of an Oak Savanna on the campus of Portland State University as a case study for the process of co-design and examines how the co-design of the urban Oak Savanna at PSU reflects various stakeholder's interests. Using qualitative methods such as focus groups and interviews; stakeholder's interests were assessed both independently and in the context of the renovated Oak Savanna. This study is set to begin in April of 2018.

Elder, J. Tait

Design-Build in the Rearview Mirror: Lessons Learned from Transportation Projects in Washington and California

The conventional cultural resources review process assumes that a project design is complete, or at least complete enough, to have sufficient design information to adequately assess impacts to cultural resources. However, as an increasing percentage of infrastructure improvement projects transition to the design-build delivery method, this assumption may not always be appropriate. Compared to the traditional design-bid-build delivery, the design-build approach delegates a larger percentage of design work to the construction contractor, meaning that a larger percentage of the design work could occur during construction – after cultural resources review is complete. As a result, while alternative contracting mechanisms can transfer design, cost, and schedule risks to the contractor, they can increase environmental review and compliance complexity and therefore risk to the project owner. Using examples from the State Route 520, Alaskan Way Viaduct, and California High Speed Rail projects, this presentation examines how design-build affects the cultural resources review process, discusses potential approaches to accommodating for design-build, and presents observations and lessons learned.

Endacott, Neal

Where is the Beef? Inferences on Japanese Transnationalism through Cow Remains from the Yama Site, Bainbridge Island, WA

The Yama Site (45KP105), on Bainbridge Island, WA was a village occupied mostly by Japanese immigrants, and their first generation descendants, from about 1887 to 1929. Extensive surface survey and limited test excavations, by the Yama Archaeology Project, from 2015 to 2017 recovered a sizable zooarchaeological assemblage. Most of these faunal specimens are domestic cattle (*Bos taurus*), despite the fact that traditional Japanese diet included little beef. These data provide insights on transnationalism through food consumption and preparation techniques from a significant, but as yet insufficiently examined, period in the history of the U.S. Pacific Northwest.

Engeman, Richard H.

My Grandmother's Cookbook

A century of change in the growing, storing, preparing and eating of food can be viewed through Oregon's community cook books between 1885 and 1985. Chicken? Cheap today, but dear then. Oysters? Ample and delightful, then! Now? Vanished. This overview of what we ate is supplemented by information from restaurant menus, homemakers' advice from newspapers, advertising leaflets, and the scrapbooks and recipe cards of home cooks.

Farrell, Ian Lars

Late Postclassic Formed Tools of Coatlan Del Rio: A Comparative Analysis

This paper provides a brief overview of the formed flaked stone tools found at the surface collected Proyecto Coatlan sites of CDR 22 and CDR 27. In this study, formed tools are defined as those created by further reducing flakes, spalls, blades, and bifacial cores into implements made for specific uses (e.g. ritual, military, economic, etc.). In examining this collection, I attempt to identify the behaviors and activities associated with the use of these tools. While there are difficulties in ascribing specific uses to tools on a case by case basis, it is widely agreed by archaeologists that there is useful information to be gained by such an analysis. In addition to the analysis of the Coatlan tools themselves, I also consult Aztec period comparative information from the sites of Cuexcomate and Capilco in Western Morelos, Yautepac in Eastern Morelos, and the site of Calixtlahuaca in the Valley of Toluca.

In a larger context, this study complements existing data on Aztec period flaked stone tool from the Basin of Mexico by offering new insights on artifacts from an Aztec provincial context.

Franke, Bea

Critical Review of Imagery of NWC Coast Salish Past Lifeways

Images are important for the dissemination of archaeological information in a way that is easily understandable by multiple audiences, including scholars and the general public, but they can be biased in ways that misrepresent the past. Archaeologists often rely on photographs and illustrations that are object-focused, which leave out the people behind the artifacts and potentially ignore the complexity of the technology. In addition, many of these images reflect a colonial lens. I am presenting a content analysis of existing images from books and other types of displays that convey information about past lifeways of NWC Coast Salish people. The focus of the critical review is on illustrations, but I include photographs as well to look at the ratio of the types of images chosen. The critical review of imagery incorporates visual anthropology methods such as content, discourse, and semiotic analyses, where I consider a range of questions that consider the people being displayed, how they are presented, and who is displaying them. The purpose of my critical review is to understand how colonization has affected how Coast Salish people have been visually represented. From my perspective as a non-native archaeologist and illustrator, I suggest that there is a need to create new, culturally mindful illustrations that incorporate multiple perspectives on past lifeways of Coast Salish people.

Franklin, Paris M.

A Technological Analysis of Obsidian Flaked Stone Tools from Two Aztec Sites in the Coatlan del Rio valley

This paper presents the results of the technological analysis of obsidian artifacts from two sites subjected to archaeological surface collections as part of the Proyecto Coatlan. The primary objective of this analysis is to determine whether or not obsidian tools were produced on the residential terraces of these sites. I begin with a general overview of blade core, biface, and bipolar technologies, the most common ways in which Mesoamerican flaked stone tools were produced. If blades were produced in residential contexts, we would expect to find prismatic blade cores and other byproducts of blade production in relatively high frequencies; if bifaces were produced, we would expect to find a respectable amount of thinning debitage. I then present the artifact densities from the sites and discuss whether these data are consistent with on-site flaked stone tool production. Next, I present the technological breakdown of the collections. I close my discussion by concluding that, based on the artifactual breakdowns, it is improbable that blades were made at these sites, but limited bifacial and bipolar processing may have taken place. At this point, it appears as though most of the Coatlan del Rio consumers acquired their flaked stone tools in a market setting.

Fulgham, Samantha Lee, Colin Grier

Investigating Feasting in a Precontact Coast Salish House: Zooarchaeological and Paleobotanical Analysis of a Potential Feasting Feature at DgRv-006, Galiano Island, BC

In the anthropological literature, feasting has been connected to the emergence of social inequality and entrenchment of social hierarchies. Here, we consider faunal and botanical remains from a Late-period Coast Salish plankhouse to illuminate the potential role of feasting on the precontact Northwest Coast. Results are presented of zooarchaeological and paleobotanical analyses of 12 floated samples from a 40 x 10-meter plankhouse located within site DgRv-006 on Galiano Island, British Columbia. Several of these samples derive from a potential feasting feature, as indicated by an unusually high frequency of sea urchin remains. Paleobotanical analysis focuses on wood charcoal identification, which provides an indication of

wood use in the feature and across the house floor. Zooarchaeological analysis provides an indication of the degree to which remains from the posited feasting feature differ from typical domestic production and consumption. Based on these and other lines of evidence, we argue that differential use of wood and the prevalence of prestige food resources indicate feasting beyond the needs of the household. This study adds to the body of research directed towards understanding the mechanisms behind the creation and maintenance of social inequality in Northwest Coast societies.

Fulk, Karen S., John P. Ziker

Women's Food Sharing in Siberia: Social Network Analyses by Frequencies of Transfers versus Values and Amounts Given

This paper considers informal household networks by which tundra foods are distributed in Ust'-Avam, Taimyr Region, Russia. The majority of families in Ust'-Avam rely upon subsistence hunting, fishing, and trapping for their livelihood. Variation in hunting ability and interest in hunting create inequalities in local food production. Interhousehold food sharing is widespread and helps buffer consumption risk in particularly vulnerable households. This paper will compare results of analysis of previously unpublished data on the interhousehold food sharing by a sample of women in the community. The food transfers involved are portions of meat and fish transferred to the women from producers or intermediaries. This paper will compare the results of social network analysis of frequencies of transfers versus amounts of food transferred, and considers the nutritional values of food transfers (total calories, protein and fat content values) and calculated monetary valuations. This research provides another opportunity to examine the effects of variables that relate back to the widely debated explanatory hypotheses of food sharing.

Fulkerson, Tiffany J., Shannon Tushingham

Who Controls the Narrative? A Critical Evaluation of Occupational Affiliation and Gender in North American Archaeology Publishing

The vast majority (approximately 90%) of archaeological practitioners in the USA work for private sector CRM firms and federal and state agencies, and half or more are women. These professionals produce a great deal of writing output that is typically published in technical reports and classified as "grey literature." Despite the considerable amount of writing produced by these professionals, much of their research is not published in peer-reviewed journals which are widely regarded as more accessible and prestigious than grey literature. Studies have shown that women remain markedly underrepresented in peer-reviewed journal publications, but as of yet, no studies have considered the relationship between occupational affiliation and gender in archaeology publishing. In order to address these issues, we tracked the occupational affiliation and gender of authors in peer review and non-refereed archaeology journals. Our results suggest that a great deal of peer-reviewed literature—which is often heralded as the gold standard of academic achievement and confers greater professional capital—is dominated by male archaeologists in academic settings. Conversely, there is a noticeably higher representation of both women and men from CRM and agency settings, as well as women in general, in the non-refereed journals. We attribute these differences to variations in the costs and benefits of publication for people working in different professional roles. Our results suggest that non-refereed journals may provide an important means of bridging the peer review gap and give voice to individuals from diverse backgrounds and perspectives.

Furlong, Julia, Sean Stcherbinine

Spatial Analysis of Prehistoric Land Use Practices at Village Site 45YA153, Middle Columbia River

Site 45YA153 is a prehistoric village located on the mainstem Columbia River in central Washington. Recent subsurface investigations encompassing over 100 acres, within the site boundary and on the surrounding landform, resulted in the recovery of over 5,800 artifacts and ecofacts, including projectile points/knives, chipped stone and cobble tools, debitage, faunal remains, and both marine and freshwater mussel shells. Preliminary analysis of projectile point styles suggests occupation spanned the Holocene, from ca. 13,000 cal BP to 150 BP. Sediment data from nearly 3,000 shovel test excavations, observations of surface disturbances, and a 3 percent sample of hand augured shovel tests reaching a depth of up to 4 meters, are used to characterize stratigraphy and interpret landscape geomorphology. Additionally, identification of two tephra samples collected near the site will aid geomorphology and landform age interpretation. ArcGIS spatial analysis tools are used to show relationships between landform type and artifact density/location, which allow the mapping and description of site activity areas. These analyses are used to further investigate how the site fits into regional models of prehistoric land use strategies.

Furlong, Julia, Jerry R. Galm, Stan Gough

Distribution Analyses at the Late Paleoindian Sentinel Gap Site: Toward an Understanding of Site Patterning and Social Structure

The single episode of occupation at the Late Paleoindian Sentinel Gap site is represented by a highly organized distribution of artifacts and features across a bounded occupation surface. ArcGIS spatial analysis tools reveal details of this patterned distribution and in turn, provide a better understanding of the parameters and specific details of the occupation. Of particular interest in this distribution study is better definition of two features that may have served as dwellings during the site occupation. Exploring how the site occupants used and abandoned the Sentinel Gap site also facilitates a first approximation of the underlying dynamics and organization of group social structure.

Gargett, Robert H., Kate A. Shantry

Washed Away

Redeposited cultural resources were found in the tidal zone of natural backshore deposits associated with the now-reclaimed barrier beach and lagoon at Windjammer Park, in Oak Harbor, Washington. The cultural resources were found landward of intact and disturbed deposits of National Register-eligible precontact archaeological site 45IS298. While monitoring machine excavations well away from the present seashore between 1.5 m above mean sea level and 1.25 m below, we observed isolated, sensitive cultural resources, including basketry fragments, in thickly bedded, very dark gray, poorly to very poorly sorted deposits with particle sizes ranging from sand- to very coarse pebbles, whole and fragmentary marine shell, and larger particles of organic material, such as driftwood. While it seemed obvious that these were not cultural deposits, per se, it was not immediately clear how these cultural materials could have been naturally displaced from the midden, which is at least 100 m closer to the present shoreline. We conclude that these deposits are the result of 'overwash' events that are known to occur on barrier beaches during times of extremely high tides. At such times, storm-driven, high-energy wind waves burst over and through the beach ridge, entraining everything in their paths, and creating a moving mass of material analogous to a debris flow. As the flow loses energy it forms a 'washover sheet' on the back shore; if it passes into the lagoon, it forms a 'washover delta.'

Gendron, Danielle

Paddling as methodology

Using the canoe as my research vessel, I will paddle the 250-mile Trent-Severn waterway with my father to trace personal as well as national narratives to interrogate the construction of Canadian heritage. Through this waterscape I will look at 'historic' sites, plaques, stories, legends, survey records, HBC records, oral histories, and treaties to reveal the palimpsest of realities existent on the waterway as well as detail the ways in which French, British, and eventually Canada have stamped stories and heritage squashing out Indigenous landscapes and presence. I ask how these marks of heritage spark imaginations for understanding what was, what is, and what is possible (Atleo 2007) for Canada. The canoe will be our guide and mediator to the waterscape, and I interrogate the role will the canoe play throughout my research. Combining theorizations on temporality and place (Basso 1996; Bennett 2009; Lefebvre 1991; Simpson 2016); multi-sensorial methods and understandings of being in place (Concha-Holmes 2015; Ingold 2004; Whetung 2016); and utilizing experimental approaches (Elliott and Culhane 2016; Madison 2005), in this paper I discuss using an iconic symbol of Canada, the canoe and paddling as methodology.

Gilpin, Jennifer, Alexander Stevenson

Urban Contamination: How to Archaeology Safely

With increasing development in urban environments comes increased opportunity for archaeological investigation in settings that have been obscured for decades. The more of these projects we work on, the more we recognize that contamination is everywhere. In the past archaeologists have been naïve about them chemicals in the dirt that holds our data. The HRA health and safety program has helped our staff understand health issues, what questions to ask our clients, how to recognize contamination, and how to work within accepted standards to meet our clients' needs and keep our staff safe. In this short presentation we will share some of the lessons we've learned on how to 'archaeology safely' where there is urban contamination.

Goodman Elger, Melissa

Dwelling in the Inland Northwest

Prevailing archaeological models of settlements are based on the notion of a functionally discrete "house" at the center of domestic life for a replicable household group. This assumption enables us to create sampling and analytical strategies that aim to deduce household activities, and to compare houses. However, Inland Northwest (INW) ethnography presents a picture of fluid domestic relations in terms of the composition of households, and therefore also of villages. In this discussion, I raise concerns about how to accommodate fluid domestic relations into our research designs and provide some directions for how to address these concerns. For instance, reliance on the culturally loaded term "house" may be inappropriate and I suggest we use the term "dwelling" and seek to define culturally-specific attributes. Another concern is that if households are fluid, then larger domestic structures may simply relate to occupancy and not indicate largess. My aim with these talking points is not critique, but to support building approaches specific to ancestral INW lifeways.

Green, Thomas J.

Givens Hot Springs and Mud Springs: Two old and moldy projects

Givens Hot Springs and Mud Springs are two projects sponsored in the 1980s by the Idaho State Historical Society with major support from the Idaho Archaeological Society. Both sites are on private land and were threatened with destruction – these were salvage excavations. The sites are located at large hot springs on south side of the Snake River between Marsing and Walters Ferry, Idaho. Papers and articles were presented and published on these projects, but final technical reports were never completed.

Serious work towards this end is ongoing for Givens Hot Springs and near completion. Mud Springs waits offstage at the moment. The excavations at Givens found houses and middens ranging from cal BP 5400 to cal BP 957. These are evidence of late fall and winter occupations. Mud Springs was heavily looted in the 1950s. We had access to some of the collections from the site and excavations in 1984 were aimed at discovering the context of these collections.

Grier, Colin

Identifying Plankhouse Architecture with Geophysics: What are our prospects?

A dearth of plankhouse floor plans and village maps for Salish Sea communities presents significant obstacles for archaeology to address some key research questions concerning household and community organization, integration, and inequality. This poster illustrates recent attempts to generate such plans with geophysical methods, primarily ground penetrating radar, at several known village sites in the southern Gulf Islands of British Columbia. Methodological approaches and strategies are highlighted, including the role of sampling, ground truthing, and algorithms for relating GPR anomalies to specific archaeological features. Research goals are also defined, focusing on the resolution of data required for tackling key research questions in Salish Sea history. The overarching goal is to foster discussion concerning the implementation of geophysical methods to address some key and persistent archaeological objectives related to household and village organization.

Grim, Bridget

The Buddhist Temple at Yama: Religious and Cultural Identity of a Late 19th – Early 20th Century Japanese-American Community

Associated with the Port Blakely Mill on Bainbridge Island, Washington, the village of Yama was home to Japanese immigrant workers and families. The community existed from the years of 1887 to 1929 and at its peak reached a population of nearly 300. Along with the ebb and flow of its population, the Nihonmachi village grew to house several businesses and community spaces, including a building referred to by locals as “the Buddhist Temple.” Though previously assumed to have functioned as a temple only informally, research conducted as part of the 2017 Olympic College Archaeology Field School indicates that the temple was one of the earliest established in the Pacific Northwest. This presentation examines the history of the Buddhist temple at Yama, including an analysis of its role in shaping the cultural and religious identities of the residents of Yama, as well as the larger Japanese-American community of Puget Sound.

Hackenberger, Steven

Homescapes: The Once and Future Archaeozillow.com?

Patterns of house settlement, or “homescapes,” are enduring and perpetual. Patterns of house settlement have been well summarized and systematically compared within the Canadian or Northern Plateau. Similar analysis has initiated for the upper and middle Columbia and includes broad comparison with the Northern Plateau. A general explanation for settlement in all three regions, plus the Snake River, has also been formulated. These analyses need to incorporate data (and reevaluate seminal settlement studies) from the Snake and Salmon River. Data must also be combined for the lower middle Columbia and tributary rivers of central Oregon. The above efforts, creating a type of archaeozillow.com, rest on growing and grooming radiocarbon databases. Meta-regional and regional scale settlement models, include factors such as fisheries, root scheduling, terrain and transhumance for hunting, travel networks, and defensive locations. These models must ultimately be tested with data for upland settlement sites. Settlement models must account for locales where house sites are now inundated, but also where they must still be protected. This larger frame of reference will help explain and conserve homescapes.

Hall-Holton, Joseph***10-OE-2256; The Shoofly Rock Alignment Complex***

10-OE-2256, historically known as the Shoofly Rock Alignments, is an archaeological site located in Owyhee County, Idaho, within the Little Jack's Creek Wilderness Area and is managed by BLM. It lies primarily on a bluff and extends roughly one mile from a road south to north, culminating with a small (10-15ft.) cliff on its northernmost edge. The site consists of several basalt rock alignments, the largest of which extends from two large hunting blinds and slopes downhill to the north. Sites similar to this one exist in semi-arid, steppe-like ecological contexts within the Great Basin in the Western United States; rock alignment features can be found at sites in Wyoming, Oregon, Utah, and Nevada as well as in other areas of Idaho. These features have been associated with the communal hunting of pronghorn and other game animals, as evidenced by the ethnographic record and faunal assemblages. While no faunal assemblages were found on the surface of 10-OE-2256, other characteristics, including the arrangement of the rock alignments and the existence of lithic assemblages at particular locations within the site, may link it to seasonal communal hunting and the re-working of projectile points used for the hunting of a variety of game animals. Conclusively dating the site is made difficult by a lack of culturally-associated organic material, but the presence of Elko-type projectile points within the site and an historic account of the site's utilization as a pronghorn trap approximate its use as being within the Late Archaic into the Proto-Historic and Historic periods, ca. 140-3,500BP.

Hall, Mark E.***Monte-Carlo Summed Probability Distributions as a Demographic Proxy: A Case Study from the Ruby Pipeline Excavations***

As demonstrated by Shennan et al. (2013), Downey et al. (2014), Crema et al. (2016) and others, bootstrapped Monte-Carlo summed probability distributions (MCSPD) of radiocarbon dates can serve as a proxy for prehistoric populations. Hypothesis testing can be implemented using permutation testing of the MCSPDs. This talk looks at applying this methodology to part of the radiocarbon date assemblage from the Ruby Pipeline excavations. Ruby is a 680-mile natural gas pipeline stretching from Malin, Oregon to Kemmer, Wyoming. The 124 radiocarbon dates analyzed here come from 110 sites located in Oregon and northern Nevada. These sites are spread across the following five geomorphic regions (from west to east): Northern Modoc Plateau, the High Rock Country, Upper Lahontan Basin, Upper Humboldt Plains, and Thousand Springs Valley. Permutation tests indicate that the differences between the MCSPDs for each geomorphic region are not statistically significant. The overall trend in the MCSPDs is an increasing population through the Holocene with a drop during the Medieval Warm Period and in the Contact Period (circa 150 BP). The High Rock Country has the earliest occupation and the highest population densities during the Terminal Pleistocene/Early Holocene. Hiatuses in each regional MCSPD will be discussed in terms of known climatic events and phases.

Hallingstad, Ellen, Mitchell Overdick***Let's Speed This Up: Testing the Applicability of Machine Learning in Ceramic Trademark Identification***

Machine learning offers archaeologists an unprecedented method of pattern recognition, one which may make artifact identification and analysis faster and more accurate than ever before. This approach, from a growing subfield of computer science, involves creating an artificial neural network (ANN) which can learn to identify artifacts based on a provided digital reference collection. Particularly exciting is the application of machine learning to cases where identification by hand would be either impractical or impossible due to the completeness or preservation of the artifacts. This research explores such an

application, with ceramic trademarks as the key focus. A small test set of trademarks was gathered, photographed, and digitally broken to create a digital reference collection of over 100,000 sherds; this reference collection was then used to train an ANN to identify naturally broken sherds from the same test set. This addresses two primary issues: 1) creating a usable and diverse reference collection and training set from a limited source of artifacts; and 2) improving speed and accuracy of artifact identification. This research presents a preliminary look at what may be the next wave of artifact identification in the rapidly developing world of digital archaeology.

Hamilton, Dale, Adam Calkins

Unmanned Aircraft Systems in Idaho Archaeology, Where We Have Been and Where We Are Going

Since the early 20th century, archaeologists have used aerial photography to locate and record archaeological sites. Today, archaeologists can use small unmanned aircraft systems (UAS or drones) to locate and record archaeological sites. UAS provides archaeologists with a low-cost alternative for recording complex sites. In 2017, Northwest Nazarene University and the Bureau of Land Management, partnered to complete a pilot project to test the capabilities of UAS and machine learning technologies for identifying archaeological features. Study areas in southwest Idaho included a two-mile segment of the Oregon Trail as well as multiple historic can scatters. After successfully completing this project, NNU is initiating additional collaborations with the Boise National Forest, Idaho State Parks and the BLM to identify and record historic railroads, trails, mining activity and campsites.

Hammersberg, Barbara, Lourdes Henebry-DeLeon, Breann Stoner, Brooke Webley

NAGPRA Case Studies: Creating a Problem Based Learning Opportunity

Cases brought before the NAGPRA Review Committee provide opportunities to create problem based learning exercises for students studying the nuances of the Native American Graves Protection and Repatriation Act. This poster is a culmination of work done by graduate students taking Central Washington University's 400-level class – NAGPRA: Complicated Reality of Repatriation. The goal was to create a problem base learning exercise for undergraduate students utilizing two cases heard by the National NAGPRA Review Committee. Both cases were chosen because they were unique in either the outcome or process. All materials provided by the parties involved in each case were examined by the undergraduate students who reenacted the hearing using the pertinent evidence and original arguments presented. Students were not allowed to introduce any new evidence or findings since the cases were heard by the Review Committee and were not given the outcome of the cases beforehand. The first goal was to have students understand the process of navigating NAGPRA before it is heard in front of a committee. Another goal was for students to come to terms with the complexity and sensitivity of each case, as well as learning how the ambiguity of terms, language, and different types of interpretation can impact a case. The project also provided students an opportunity to gain practical experience asking and answering valid questions about the materials, organizing arguments, and finding crucial pieces of evidence to support their positions. Graduate students were able to gain valuable teaching experience as well as learning how to guide students to look for general themes within the material.

Hampton, Ashley

Transforming a Housepit into a Home: Examining the Intersection of Identity and Space-Use Within Housepit 54

This study examines issues of cultural change/continuity as embodied within a singular multi-generational housepit (Housepit 54) located within the Bridge River site in the Mid-Fraser Canyon, British Columbia, Canada. Previous research has focused on understanding the changing social dynamics at both a village and household-level, examining shifts from a more collaborative to competitive framework in response to

external environmental pressures (e.g. resource depression). As interpersonal dynamics within Housepit 54 were renegotiated within a context of increased competition, this study will address how—if at all—such changes beget corresponding shifts in identity-defining tasks in order to better understand the recursive relationship between culture, environment, and individual agency. If hunter-gatherer identities were tied to resource-extraction activities (i.e. individuals who hunted had identities based around such hunting practices) then changes in resource access may have caused subsequent, measurable shifts in how identity was constructed. This study uses Geographical Information Systems (GIS) in order to examine in fine-grained detail spatially-defined activity patterns within HP54 to illuminate the interplay between personal identity, space-use, and the emergence of inequality.

Hannah, Jean

Divining Water at Yama Village, 45KP105: Discovering archaeological and historical evidence regarding water resources in a Japanese sawmill community

Like any other new settlement, the Japanese village of Yama (45KP105) near the Port Blakely Mill in Washington State, required access to reliable, fresh water resources. Oral history describes the water collection system to be filling buckets from a nearby stream. However, as the community became more established, evidence indicates a growing diversity and sophistication in the manner in which fresh water was obtained, transported, utilized, and stored. This presentation uses archeological data such as pipes and pumps, along with historical evidence such as oral histories and photographic analysis, to trace probable changes in community water sources, storage and utilization in this dynamic Japanese American community. In doing so, we enrich the significant, but seldom told story of Issei and Nisei life in the Pacific Northwest in the late nineteenth and early twentieth centuries.

Hannold, Cynthia

The Continued Relevance of Experimental Archaeology

Experimental archaeology, which became relevant as a product of processualism in the 1960s, is now much less common in archaeological research and university curricula. Modern experimental archaeology blends phenomenological and scientific approaches, leading to a greater understanding of past technology and lifeways. If approached appropriately experimental archaeology has the ability to answer previously overlooked or unanswerable questions. Regional experimental archaeology programs that are currently contributing to this effort include both lithic and ceramic studies. The author proposes that experimental archaeology should return to the proverbial table, both as a tool for public outreach and as a tool for training the next generation of anthropologists before they are sent into the field, either for archaeological or ethnographic work.

Harris, John S.

Rethinking "Anthropogenism" and Discerning Anthropogenic Site Vegetation

How do archaeologists know what plants to look for during surveying? One of the various reasons archaeologists record vegetation at archaeological sites is out of building awareness of plants as site/feature indicators, due to their 'conspicuous' nature and co-occurrence with sites. Though, the idea of vegetal indicators has largely remained little more than archaeological folk wisdom. When archaeologists refer to plants, as well other non-human objects in the environment, as indicators, they often refer to such things as "anthropogenic". "Anthropogenic" is a flexible term used to occupy conceptual gaps between existing notions of site constituents, but despite its popular usage in the last 15 years, the word has evaded clear and constructive definition, resulting in surprisingly divergent usages over its ambiguity of what constitutes human "modification" or "influence". Without conceptual cohesion on this phenomenon, archaeologists risk overlooking data potential in 'nature', focusing on particular aspects of

anthropogenism while missing out on others. This paper seeks to bring unity to the recognition of anthropogenism, using vegetation as an example, by lashing together theory and method for the categorical recognition of such phenomena as both intrinsic and extrinsic in nature.

Harris, Lucille, Joe Bergstrom

Early to Middle Holocene Occupations of Long Valley, Idaho: A Synthesis of Private Collections and Surface Finds from an Erosional Context

The western margin of Cascade Reservoir in Valley County, Idaho contains an important record of Early to Middle Holocene human occupation. In order to develop a better understanding of potential contributions these sites can make to our understanding of the Idaho Middle Holocene and to generate testable hypotheses, we synthesized available information from private collections and surface finds data collected over the last forty years and report our findings here. The data indicate an unusually high density of Middle Holocene sites along the western edge of Long Valley at the base of the West Mountains that includes temporally overlapping use by Great Basin and Plateau affiliated groups. The sites are commonly, but not exclusively, located adjacent to streams at an elevation roughly 100 ft above the valley floor (prior to inundation by the reservoir). Based on setting, ecological context, and the presence of numerous deflated FCR features identified below the reservoir's high-water line, we suggest that camas or other plant resources were being targeted by Middle Holocene peoples. If these plant resources were being harvested and processed in quantity, this could provide the key to understanding a range of cultural developments that occurred during this period, including the first experimentations with sedentism and the development of an elaborate burial complex known as the Western Idaho Archaic Burial Complex. Further testing at these sites is warranted in order to evaluate this proposition.

Hawes, Kathleen L.

Re-Awakening Salish Sea Basketry: Continuing Research of the Biderbost Wet-Site Basketry Materials

Microscopic identification by cellular analysis of the 2,000-year-old Biderbost wet-site pack baskets, currently located at the U.W. Burke Museum in Seattle, reveals the materials used in the construction of this collection of beautiful ancient weaving technology. I worked with Suquamish Elder and Master Basketmaker Ed Carriere, and Dr. Dale Croes, Wet-Site archaeologist and an expert in the analysis of ancient Northwest Coast basketry, to understand the qualities, stylistic similarities and differences, and uses of the traditional materials found in basketry from this time period and areal region. The Biderbost baskets were recovered from the banks of the Snoqualmie River near Duvall, WA in the early 1960's (45SN100). Excavations were conducted by the Washington Archaeological Society (WAS) in one of the earliest Northwest Coast wet-site excavations. I will discuss the process of cellular analysis involving plant and plant parts (root, limb, and bark) used at this ancient site, as well as plans for future research in understanding the choice of materials from this collection. This includes comparing the Biderbost basketry materials with materials from two early Salish Sea collections: Water Hazard and Musqueam Northeast, both located in the Fraser River Delta, B.C. to explore the following hypothesis: If the 2,000-year-old styles are similar between Biderbost and Water Hazard and the materials (roots) are the same, what best explains this similarity of sites separated by over 100 miles? If the styles are similar but the materials are different, then would the connection still apply, but with individual/local variation in material choice?

Helmer, Emily

Seasonal Sociopolitical Reversals and the Reinforcement of Autonomy and Fluidity among the Coast Salish

There has been a great deal of archaeological interest in the fluid and decentralized nature of the Coast Salish sociopolitical structure. This paper addresses this unique sociopolitical organization through an analysis of five seasonal resource procurement camps in the Puget Sound region of Washington state. The seasonal camp represents a major node of the Coast Salish settlement pattern, but has remained underutilized in analyses of sociopolitical organization, in comparison to the winter village. This paper directly compares the relative investment in structure, systematic patterning, and functional differentiation of space at seasonal camps to the expected patterns of the winter plankhouse villages. By analyzing these seasonal settlements through the same lens often used to interpret plankhouse villages, an inverse relationship between the two is revealed that suggests a seasonal reversal of sociopolitical structure that would have served to reinforce autonomy and fluidity among the Coast Salish

Henebry-DeLeon, Lourdes

Some comments regarding the Osteological Remains of the Curious Old Man buried in the upland Yakima Basalt Folds

In May 1982 a Native American skeleton representing an adult male was discovered during the Golden Blade Exercise training maneuver by the U.S. Army near the Yakima Training Center, Washington. A retrodocumentation of the human remains recovered from 45-YA-344 has the potential to provide insights into early populations on the Columbia Plateau. This commentary reviews the osteological documentation and analysis included in the August 1982 physical anthropology report, "Osteological Analysis of the Cold Creek Burial", and the reliability of the data collected. Despite the difficulties in documenting human remains excavated, analyzed, and reburied in 1982, the process can potentially produce new knowledge.

Henebry-DeLeon, Lourdes

NAGPRA Human Remains Inventory: Making Our Work More Visible

In 2008, the Central Washington University NAGPRA Program and the Columbia Plateau tribes – the Colville, Nez Perce, Umatilla, Yakama Nation, and Wanapum Band of Priest Rapids - created a more visible, participatory human remains inventory process. Central let go of the "culture of secrecy" around our NAGPRA human remains documentation process and found the benefits outweigh the fears. A participatory process includes tribal representatives in all phases of the osteological analysis including completing skeletal inventory forms, recording data, describing taphonomy, and writing life histories. The change showed the tribes what we really do, generated research questions from tribal representatives and created productive, respectful working relationships. Central Washington University and the Columbia Plateau tribes have used the data to verify old data, identify and verify specific burials, and identify individuals in other collections. When we engage tribes in our work they become advocates and collaboration continues after repatriation with multi-institution tribal driven research projects.

Holton, Stephanie

Erasing History? Analyzing Modern Monument Destruction in an Archaeological Context

Cultures throughout the world have expended great amounts of energy in the practice of monument construction. Often, the resulting monuments become a part of the archaeological record through processes of either environmental or cultural deposition, and sometimes even by the means of intentional destruction. The destruction of such an energetically costly object begs explanation and is particularly relevant given the movement currently taking place across the United States to destroy or relocate

standing Confederate monuments. My project sought to place the current monument destruction in a larger historical context through the analysis of three archaeological case studies. I attempted to separate intentional destruction vs. natural site formation processes and drew on independent archival records to assess the relationship between monuments and written history. Monuments represent a constructed narrative of the past and inevitably outlive their intended function in society, which has ultimately been the cause of their destruction throughout human history.

House, Kendall

Design Anthropology at Boise State: Lessons from the First Year

In 2017 the Department of Anthropology at Boise State University, in collaboration with the College of Innovation and Design, developed a new 12 credit Design Ethnography Certificate. Currently we are developing additional coursework in design anthropology. This paper discusses why the DEC was developed, our strategies for developing content and recruiting students, and outcomes in student engagement, recruitment, and placement.

Hutchinson, Ian

Climate change, landslides and the palaeodemography of the northern Columbia Basin in the late Holocene: the view from Kettle Falls.

The numerous archaeological sites in the vicinity of Kettle Falls bear witness to the fact that large numbers of people from across the northern Plateau gathered at this cascade on the Columbia River each summer to catch salmon. We interpret a summed probability distribution function (SPDF) derived from a catalog of 106 late Holocene radiocarbon ages from these sites as an index of the relative number of people visiting the falls over the last 2000 years. Deviations between the observed SPDF and temporal patterns generated by a bootstrapped null model are strongly correlated with century-scale variability in regional palaeoclimate archived in records of glacier dynamics and wildfire activity. Phases of increased activity at Kettle Falls are correlative with the Late Antique Little Ice Age and the Little Ice Age. Reduced activity at Kettle Falls likely reflects lower numbers of returning Chinook salmon in the intervening warm periods. A marked decrease in activity at Kettle Falls from 650-550 cal BP may be indicative of prolonged failure of the salmon runs following blockage of the Columbia River by the Bonneville landslide.

James, Nathaniel

The Role of Labor in the Creation of Northwest Coast Landscapes

Past Northwest Coast landscapes are increasingly recognized as the anthropogenic result of people engaging with and reshaping the environment to suit their needs. However, there has been little effort to quantify or study the labor investment into the wide range of known landscape features in the Northwest. A method for archaeologists to pursue these questions is architectural energetics. Architectural energetics has been used both in the New and Old Worlds in a variety of cultural contexts. The explicit goal of architectural energetics is to reconstruct, estimate and quantify the expenditure of energy required to build architectural features, and from that infer the scale, organization, and complexity of labor. In this preliminary analysis I apply architectural energetics to several previously documented features, I then discuss possible implications for Northwest Coastal complexity and future directions for architectural energetics in the Pacific Northwest.

Jenkins, Dennis L.

Dating the Western Stemmed Tradition in the Northern Great Basin

Western Stemmed Tradition assemblages include projectile point types exhibiting long, thick stems, weak, sloping shoulders, and rounded, flat, or pointed bases such as Haskett, Cougar Mountain, Lind Coulee, Parman, and Lake Mojave projectile points. They are the oldest directly dated lithic technology in the Great Basin where fluted point technology has not been radiocarbon dated. This paper draws on more than 100 radiocarbon dates obtained from Western Stemmed deposits in the Paisley and Connley Caves of south-central Oregon.

Johnson, Matt

A Quarter Century of Archaeological Collections at the Wanapum Heritage Center

Archives have recently been organized at the Wanapum Heritage Center for three large archaeological collections from the Priest Rapids and Wanapum Reservoirs: those of the University of Washington, the Washington Archaeological Society, and Eastern Washington University. These collections fall almost entirely within the span of time between 1957 and 1982, during which major salvage, or “emergency” archaeology was carried out for the Priest Rapids Hydroelectric Project. The collections have complicated and unique histories encompassing over 150 sites. As part of the process to organize and describe the archival material, over 20,000 pages of documents and photographs have been cataloged and entered into the Wanapum Heritage Center repository database. To date, 14,000 pages of those records have been digitized. Additional steps have included the creation of an “archaeobiography” (a document detailing the history of the project and collection) and the creation of a site summary database. Future steps will include rehabilitation and organization of the archaeological material to gain intellectual control and achieve research ready conditions.

Johnson, Paula

Goofy Stories, Fun Facts, and Brushes With Destiny: Revelations During Research on Airports

Recent projects at rural airports in the Northwest have revealed the kinds of information and historic trivia that deserve to be shared. In this five-minutes-or-less paper, hear about goats with unique abilities, the prelude to WWII heroism, and smoke jumping.

Johnson, Raini

Faunal Heterogeneity in the Middens of Prince Rupert Harbour

The density of Salmon and Herring remains from 25 archaeological samples from 15 excavated sites in the Prince Rupert Harbour (PRH) were analyzed for assemblage heterogeneity. By examining the number of identified specimens (NISP) per liter (L) I compared three excavation methods, bulk sampling, column sampling, and auger tests. High densities of fish are present in bulk samples taken from house floor and back midden excavations while column samples and augers from house terraces and front and side middens have a much lower density. I hypothesize that inter and intra site faunal assemblage’s heterogeneity is due to sampling method and/or testing location. This difference in faunal representation between sampled areas may also suggest differential patterning in the depositional history of middens (e.g. differences between refuse and purposeful shell terrace construction). This research exemplifies the necessity of rigorous sampling methodology to properly understand intra midden heterogeneity when examining PRH faunal assemblages.

Johnson, Royce

Indigenous Landscape Modification in the Pacific Northwest Coast: A Case Study Using the Binford Hunter-Gatherer Database

The landscape of North America at the arrival of Europeans was carefully managed by the Native Americans and First Nation peoples. This is especially true for the Pacific Northwest and the Northwest Coast. There were several resource management strategies employed by the hunter gatherers living along the Northwest Coast. These ranged from the construction of large clams or root gardens and controlled burning to sculpt the landscape, to transplantation and selective harvesting practices. These methods have been recently well documented along the Northwest Coast and other areas of complex sedentary hunter gatherers. What is the mechanism that drives the adoption of these different resource management strategies? The Binford Hunter-Gatherer Database has the ability to provide relevant reference information on this subject. The mobility variables were used to create scatterplots in SPSS and a visual analysis of the results were conducted. This analysis illustrates two distinct groupings of mobility. After breaking the different methods of resource management into separate categories, those methods of resource management that rely on landscape modification are more likely to be adopted by those with lower mobility.

Jolivette, Stephanie A. E., Sarah R. Hibdon

Modeling Shoreline Site Survival under Predicted Climate Change in the Puget Sound

Recent climate change models project that sea level will rise significantly in the Puget Sound in the next 50 to 100 years. The Sound is also expected to be impacted by increased storm activity which, in combination with sea level rise, is projected to lead to increased shoreline erosion and larger and more frequent landslides. In partnership with the Pierce County Planning and Public Works, Statistical Research, Inc. (SRI) has conducted a multiyear survey project along the shoreline of the Key Peninsula. During this project we have observed evidence of extensive impacts to shell midden sites through erosion and the construction of bulkheads designed to protect shoreline property. Although all of the shell midden sites show some impacts, the extent of shell midden erosion varies significantly between sites. SRI proposes to examine the factors needed to develop a model to determine which sites are most likely to be lost to erosion in the next 50 to 100 years. This project will assess a variety of landscape factors for modeling erosion rates, including elevation above mean sea level, slope of bank, upland landslide risk, exposure to wind and wave action, and the potential of shoreline drift to contribute to, or potentially reduce erosion. This project will assess the availability of data sets needed to examine these factors in the Puget Sound, as well as provide some preliminary results for shell midden sites located on the Key Peninsula.

Kaehler, Gretchen

The Golden Idol: Archaeology and Archaeologists in Popular Media

This five-minutes-or-less paper will evaluate how archaeology is portrayed in popular media including movies and TV and how it effects real-life archaeologists.

LeTourneau, Philippe D.

Synthesis of Recent Archaeological Work at King County's Marymoor Park

King County's Marymoor Park has perhaps the highest density of precontact archaeological sites of any park in the county system and the area is extremely important to numerous western Washington Indian Tribes. The park's location adjacent to Bear Creek on the north, Lake Sammamish on the south, and the Sammamish River on the west combined with abundant salmon runs to make it a favored destination for the past ca. 13,000 years. There are 14 recorded precontact sites in the park and 4 more within 250 m of

the current park boundaries. In addition, there are 15 precontact isolates in or adjacent to the park and there are reports of a large Sammamish Indian village yet to be discovered somewhere in the undeveloped southern portion of the parkland. Marymoor Park is also the most heavily visited park in King County's 275-park system with ~3,000,000 visitors annually. This 640-acre park contains an off-leash dog area, soccer, baseball, and cricket fields, a velodrome, tennis courts, a radio-controlled aircraft field, an Audubon bird loop, community gardens, pet cemetery, and hosts numerous concerts and other events every year. All of these activities, plus associated required maintenance activities, have the potential to disturb the numerous archaeological sites in the park. King County DNRP archaeologists have recently overseen and conducted several archaeological surveys in the park.

In this brief presentation paper, I discuss the history of archaeological investigations in Marymoor Park with a focus on recent work by DNRP archaeologists that is not yet available on WISAARD.

Lewarch, Dennis E., Stephanie E. Trudel

The Bertelson Artifact Collection from Old Man House (45KP2): A Central Puget Sound Type Collection

Free-lance writer Ernest Bertelson collected more than 1,000 artifacts off the eroding beach of the Old Man House archaeological site (45KP2) in Suquamish, Washington, during the 1930s and early 1940s. Bertelson's heirs donated most of his collection to the Burke Museum of Natural History and Culture at the University of Washington. Burke archaeology collections manager Laura Phillips tracked down letters in Bertelson's papers to show he wanted the collection to reside with the Suquamish People. Previous artifact summaries by Marian Smith (1950) and Randall Schalk and David Rhode (1985) provide a general picture of the range of stylistic classes. Here we present data on more than 300 projectile points to infer time depth of occupations. The range of point types facilitates comparison with excavated assemblages from other sites, such as Sbabadid (45KI51), Bay Street Shell Midden (45KP115), Duwamish No. 1 (45KI23), 45KI1083, Tualdad Altu (45KI59), and West Point (45KI432).

Litzkow, Jamie M.

Early Placer Gold Discoveries in Washington Territory (ca.1853 – ca.1868)

Beginning in 1853, Washington Territory witnessed numerous gold discoveries that propelled immigration, commerce, and transportation in the region. The search for placer gold formed unique landscapes, social networks, and sociotechnical systems influenced by global interactions, transnational migrations, and rapid change. Archaeological data can enlighten the record regarding local and regional manifestations of such themes. In order to identify areas with the potential to yield relevant information, an investigation of early gold discoveries was undertaken. Study results clarify when and where the first strikes were made, and illustrate the transitory nature of mining camps during this frenetic phase of development in the far west.

Lyons, Ashley Lorraine

Human and Non-Human Differentiation: A Theoretical Review on Spiritualism, Political Ecology, and Existentialism

This paper will review the bridge of differentiation between humans and non-humans by taking a theoretical approach to the topic through a review of spiritualism and existentialism. The impacts of this differentiation will then be discussed through a review of political ecology, understanding how metaphysical theory can play a part in the material world. Where is the line drawn between humans and non-humans beyond biology? How do humans go out of their way to construct that strict barrier between them and their non-human neighbors? How do the interactions between humans and non-humans affect the relationship both sides have with the environment?

These are the questions that will be discussed throughout this review.

MacDonald, Douglas, Matthew R. Nelson

Paleoindians in Yellowstone National Park: Implications for the Rockies, Snake River Headwaters, Great Basin, and Great Plains Research

Over the last decade, numerous Paleoindian sites have been identified within the high-elevation Yellowstone Plateau dating the Late Pleistocene-Early Holocene. Herein, we summarize prior Paleoindian research in Yellowstone, as well as present results of our research between 2009 and 2017 at 25 sites which yielded evidence of early Native American use of Yellowstone Lake, Wyoming, North America's largest, high-elevation natural lake. Our studies include the recovery of the only Clovis points in Yellowstone, as well as excavations of a Late Paleoindian Cody Complex occupation at Fishing Bridge Peninsula. We conclude the paper with a statement regarding the implications of our research on Paleoindian use of the Rocky Mountains, Snake River headwaters, northern Great Basin, and northwestern Great Plains. Finally, we briefly summarize the results of a GIS predictive model of Paleoindian site locations based on this research.

MacIntyre, Hannah

Cultural and Social Biases in Educational Access

This study considers and evaluates the educational access of LGBTQ students, and the cultural and social influences in the Dallas-Fort Worth Metroplex area. It is largely shaped by the theoretical framework of Judith Butler's Performance Identity Theory, with the linguistic aspects expanded through the consideration of the Sapir-Whorf Hypothesis and its' theoretical expansion from Lera Boroditsky. This study utilizes a multifaceted approach. The study covers an analysis of the existing literature and public data, ethnographically captured perspectives of current teachers and administrator and recent students, and statistical evaluation, to holistically assess educational access and evaluate its' cultural and social biases within North Texas; specifically, the Dallas-Fort Worth Metroplex. The statistical evaluation replicates a national study (Fetner and Kush, 2008) at a small scale to test the model's viability and corresponding findings utility at a micro level, in the southern region. The added consideration for the Ethnic Disparity Rating (EDR) is also included in a new model. The ethnographic sample consists of interviews with educators (teachers and administrators) and former students (18-24-year-olds). They were pulled from ten districts within the statistical sample (n=55). The study concludes with recommendations for future analyses as well as policy revisions and reforms.

Major, Maurice

Talking Talus

How do you find a feature that may hide in glaring fields of stone, revealing itself only a few minutes a day on good days? How do you record a feature type whose very nature lends itself to descriptors like "amorphous," "irregular," and "subtle?" How do you jam a wide variety of forms and ages into the single category "pre-contact talus pit?" How can archaeologists learn about features whose excavation is physically and technically demanding, and in some cases a kind of desecration? What do we mean by talus pits for, anyway? I may not have solid answers, but I do have observations from a decade of finding talus features on Washington State Trust lands. I'll discuss ways of finding them using tech as old as the sun and as new as LiDAR and drone-generated point clouds, ways of recording them that result in something more than a bad photo of rocks, and ways of considering these features in context.

Maloy, Kelsey

Imagining Truth, History and Reality of the Vestige

There is a relationship between social memory and visuals that exist in the material and mixed media records. Illustrators and graphic specialists work with many disciplines and voices to publicize such knowledge pertaining to the identities of the past. It is in this descriptive transaction that has the potential to warp the image, and keep trauma silenced. I employ critical theory of the source, where did historical images come from, why do we still use them, and how they are consistently represented and preserved in social memory. Digitizing reality does not permit an infallible context of truth, it only creates a critical understanding of observation and how we use media to document ideas that are signaled and received within a social interpretation.

Martin, Jillian C.

Considering Cultural Resource Constraints in Design: Early Lessons from Old Highway 30, Caldwell, Canyon County

The Canyon Highway District #4 and the City of Caldwell are proposing roadway improvements to Old Highway 30 and a new crossing of the Boise River, north of downtown Caldwell and east of I-84 in Canyon County, Idaho. The purpose of the project is to improve user operating requirements and safety needs of the Old Highway 30 Bridge. The project is needed as the current bridge is structurally deficient and the 94-year-old deteriorating structure has met its design life. The existing truss bridge is a single lane, three span, 388-foot long structure constructed in 1922 and was listed in the National Register of Historic Places (NRHP) in 2007. This project presents many design difficulties for the Idaho Transportation Department, because the project contains numerous environmental concerns, including several notable cultural resource issues. Within the Area of Potential Effect (APE), there is a previously recorded archaeological site that was identified as a “possible burial”, several eligible linear resources (including Old Highway 30, canals, a railroad, and the Oregon Trail), two eligible bridges (one that is listed in the NRHP and one canal bridge that is eligible for the NRHP), historic architectural resources and residences, and the potential for additional unknown archaeological resources (historic and pre-contact). Additionally, the project contains two trailer parks that present significant Environmental Justice issues, a public park, and additional wetland and biological concerns. In addition to the environmental constraints, the APE contains significant landform constraints, which have impacted the design of the proposed project. The design team, in conjunction with

May, Nathan J.

Top Shot: Recreational and Military Firearms of Fort Boise, Idaho

Multiple archaeological investigations on the grounds of Fort Boise, Idaho (1863-1913), now the site of the Boise Veterans Administration, recovered over 1,500 munitions related artifacts. Analysis of two assemblages, one from a historic dump and the other from Fort Boise's Surgeons Quarters, indicates technological development of the United States Army from the Civil War to the years just before the First World War. The munitions recovered also identify the use of recreational firearms at Fort Boise which was a popular pastime on the post. Munitions recovered from domestic contexts, such as the Surgeons Quarters, also suggest children were instructed on firearm use and etiquette.

McCoy, Juli

What's Going on Out There? An Investigation of Historic Land Use Patterns at the Orchard Combat Training Center

Traditionally most low density historic archaeological sites have been labeled “sheep camps” though there has never been an established criteria of what constitutes a sheep camp. This work focuses on the

assemblage of selected archaeological sites located on the Idaho National Guard Orchard Combat Training Center (OCTC), just south of Boise, Idaho, to determine the land use of the area. The research conducted utilizes historical accounts, archaeological data and historical records with the intent of establishing a criteria that can be used to determine the potential land use that created the sites studied to determine if the label “sheep camp” is a misnomer and if so what other land use is seen in the study area.

McElwain, Mitchell E.

The Cutting Edge: What Obsidian Use-wear Analysis Can Say About Function

This paper presents the results of an analysis of use-wear on a sample of Coatlan del Rio prismatic blades. The analysis was conducted using an Olympus SZ61 microscope. Previous studies of obsidian blade technology have shown that different materials will leave distinctive signatures on recovered artifacts. Hence, the purpose of this analysis was to examine blade use-wear using magnification to address three issues: 1) to evaluate the “naked-eye” use-wear calls made during the overall technological classification of these collections; 2) to seek to identify the type of materials that were worked with these blades; 3) to evaluate whether post-depositional damage could be distinguished from use-wear. This latter issue has implications for assessing the utility of use-wear analyses on collections obtained from the surface. Functional lithic use-wear analysis can provide information about subsistence and craft practices but is often underused and under analyzed. This study, therefore, contributes to functional analysis of Aztec-period flaked stone tools in general, and those from a provincial context in particular.

Mertens, Karl

Patterns of mobility among the Evenki of Eastern Siberia

Mobility is an aspect of human activity that is highly contextual but also in need of a framework for comparative analysis through time and space. This presentation examines Evenki mobility patterns and how these patterns relate to the economic practices of hunting, fishing, and reindeer herding, and utilizes a framework for considering mobility cross-culturally. The Evenkis are an indigenous minority living throughout central and eastern Siberia in the Russian Federation. In the fall and winter of 2011/2012, fieldwork among two groups of Evenkis documented patterns of resource use, foraging, and mobility. One group lives in a village and disperses to the outlying area during the hunting and fishing seasons. The other group migrates year-round with their reindeer for hunting, trapping, fishing, and pasturage. Both groups are integrated into market and government systems through exchange of forest products for industrially produced goods, employment, taxes, and permitting. Additionally, Evenkis have changed their household and economic structure over the last century in connection with ecological and administrative conditions. This research approaches questions of human behavior and decision making as dynamic responses to complex social and environmental worlds. The information gathered through this research sheds light on contemporary indigenous mobility patterns connected to a variety of ecological, social, and economic factors.

Miller-Atkins, Galen, James W. Brown

Politics on the Landscape: Evaluating Settlement Organization in the San Juan Islands

Political and social complexity is inextricably linked to settlement organization and subsistence economies. The interconnection between politics and settlements is particularly clear when comparing the ordered neighborhoods of Teotihuacan to the dispersed residential camps of hunter-gatherers. Reconstructing political organization and social complexity in the Northwest Coast remains a highly-debated topic. Did the people in the Salish Sea live in incipient chiefdoms, autonomous villages, or some combination? The research utilizes little-used point pattern analyses and measures of spatial autocorrelation on previously-published site location data from the San Juan Islands in order to

characterize the settlement patterns of villages and resource procurement camps. The results are compared to theoretical expectations for more centralized chiefdoms and more autonomous village settlements. The research suggests that people in the San Juan Islands lived in scattered, and perhaps, independent communities. The methods employed here may help reconstruct political organization in other areas along the Northwest Coast.

Monaco, Marci

Student Flintknappers: New Tool Makers Help Reveal Old Technology

In 2015, fifteen obsidian bifacial blanks were recovered from site 35MA375 near Salem, Oregon. Experimental replication of the bifacial blanks has provided information to help answer lithic technological questions regarding the possible reduction strategies and technologies employed in the manufacture of these tools by the examination of the experimental debitage. This study is based on the analysis of the bifacial blanks recovered from the site, the use of similar material, and employing a similar reduction technology and strategy.

Monaghan, Brian

The Mowitch Project- Traditional/Contemporary Methods of Hunting and Use: Showing You how to Brain Tan a Deer Hide.

Building upon the previous presentation, I share my own experiences regarding the process of tanning a deer hide into buckskin, start to finish. There are numerous aspects of processing upon which I will present, including: seasonal considerations for optimal results; methods and techniques for preparing, stretching, scraping, smoking, and finishing buckskin; potential difficulties and solutions; ideal processing tools; and construction of necessary equipment. Based on my own life experiences as a subsistence and ceremonial hunter, I will share the techniques that have served me best.

Moon, Johnathan

Incorporating Decolonizing Methods into Ethnography

Ethnographers advocate constant reflexivity within our discipline which gives the writer a better sense of self within their own work with varying communities. This focus has been found to help the author realize their positionality, how their worldview leads to their interpretations as well as where they fit in the structures of power which govern our society. Alongside this trend in anthropology, many of the minoritized communities which anthropologists have worked with are developing their own methods and theories focusing on indigenous knowledges and voices to relay those knowledges. This paper proposes through an ethnography of Indigenous student at the University of Idaho that by maintaining reflexivity and adopting a framework such as Tribal Critical Race Theory ethnographers can combine traditional anthropological methods with new decolonizing methods to produce ethnographies with the most authentic voices possible. At this primary stage in research this paper presents a collection of self-reflective field notes with detailed outlines of the theories and methods to be applied welcoming feedback.

Moses, Pendleton

Plants, People and Places: Mapping Historic Cultural Plants and Populations

The Colville Reservation covers 1.4 million acres and includes habitat types ranging from sagebrush-steppe to subalpine, where many native plants are still gathered today. In 2017 the Cultural Plant Project began mapping place names of plants on the reservation, like “the place of hazelnut” or “aʔkʌsq̄p̄xʷit̄p̄.” Literature from the 1930s mentions a large Indian hemp population utilized for generations near a place we call “No Name Lake” to protect the confidentiality of such places. The population is still there and we have now mapped it. We are tracking down other historic sites with names like “Small place with

Camas,” adding them to our cultural plant map where they still exist. We also document culturally modified trees (CMTs), to gain a better understanding of past and current gathering locations and practices. Our goal is to consolidate information for each species and place name in order to protect, manage and restore populations.

Munsell, David A., David G. Rice

The Context of a Holocene Thermal Climactic Native American Skeleton Discovered in the Yakima Basaltic Folds Are of South Central Washington State

In early May 1982 a pre-NAGPRA inadvertent discovery of deeply buried Native American skeleton was encountered during a US Army training maneuver near the Yakima Training Center, Washington. Army personnel consulted the Wanapum Indian Community and agreed to recovery and re interment arrangements. Found artifacts include a stemmed point, a river mussel shell pendant, and over 400 small ground stone disc beads arranged in strings over the body. The grave artifacts indicate a person of high social status. The findings were in natural bed of Mt. Mazama volcanic tephra, enabling dating of around 6850 calendar years B.P. No reports of these finds, their age, or environmental context has been written. The purpose of this session is to organize this material for a technical report to share these findings.

Neller, Angela, Matthew Johnson, Steven Hackenberger

Households on the Middle Columbia Residing in Collections at the Wanapum Heritage Center

The prehistory of the Priest Rapids-Wanapum Region resides in archaeological collections curated by the Wanapum Heritage Center. Pre-dam excavations undertaken by the University of Washington documented house pits and other features along the Middle Columbia. While much of this household data has been sitting for years, parts of these collections have proven to be valuable for research undertaken by students at Central Washington University. As the Wanapum Heritage Center repository works towards gaining intellectual control of the collection, plans to rehabilitate the archaeological material to current curation standards are underway. Future research projects will demonstrate what a valuable resource these collections are for understanding households and settlement patterns in the interior Northwest along the Middle Columbia. These collections are the remaining site material for sites now inundated by the Priest Rapids Hydro-Electric Project.

Noll, Christopher D.

Beyond Membership: Professional Service to the Society

Archaeological societies depend on individuals to volunteer countless hours to manage the business of the organization, recruit members, and lead activities that engage those members. Society service is invaluable to the success of the organization but also provides benefits to those to serve. For many archaeologists society and committee service is a key part of the profession with personal and career rewards. This panel assembles officers from the Idaho Archaeological Society (IAS), Association of Oregon Archaeologists (AOA), Association for Washington Archaeology (AWA), Maritime Archaeological Society (MAS), and Northwest Anthropological Association (NWAA) to talk about professional service, archaeological careers, and their experiences as officers. This open discussion will provide students and young professionals with critical insights into archaeology as a profession and opportunities for engaging with the professional community.

North, Michelle N., Virginia L. Butler

Cultivation of the Backwater: Weirs as a Window into Historical Ecology and Ecosystem Engineering in the Lower Columbia

This poster uses the existence of a possible fish weir feature in a backwater lake on Sauvie Island in the Lower Columbia to explore questions surrounding systems of resource cultivation and human ecosystem engineering. Multiple archaeological sites in backwater areas contain large quantities of freshwater fish remains; and use of technology such as weirs would provide an efficient method of capture. However, such facilities suggest more than capture method, when considered in the larger context of landscape use and the food systems that indigenous people were part of, as demonstrated by archaeology and oral traditions. By synthesizing information surrounding precontact cultural and subsistence use of the backwaters of the Lower Columbia through the lens of historical ecology, this project seeks to highlight the broader implications of technologies that represent components in interconnected systems of indigenous aquaculture and landscape use in this rich environment.

Nosaka, Akiko, Donna L. Leonetti

Fertility Trends among First-generation Japanese Immigrant Women in Seattle

This study examines the fertility of first generation Japanese immigrant women, who came to the U.S. before 1924. Based on data collected from immigrants living in Seattle in the mid-1970s, it investigates factors associated with their comparatively high fertility. Of particular interest is the difference between women from “large kens” versus those from “non-large kens.” Kens are Japanese administrative prefectures, and “large kens” are defined as those from which many Japanese immigrants originated. This study finds that large ken women were more likely to have high fertility if they continued living in the Seattle area where there were many other Japanese immigrants. In comparison, the high fertility of non-large ken women had a stronger correlation with employment status; those who had little, or limited employment throughout their reproductive years were more likely to have high fertility. Also, non-large ken women’s employment during their early reproductive period might have contributed to delaying the onset of their reproductive years, which eventually resulted in low fertility. These findings support the inference that large ken women were more likely to receive significant support while living in the Seattle community with many other families from their natal ken. In contrast, non-large ken women were less likely to receive such support, and therefore their employment affected their fertility more significantly.

Nuss, Kathryn Fujiye

An Examination of Early Sites on the Oregon Coast

Other studies have focused on the where and when of coastal migration and habitation, this paper aims to understand how and where people lived in the landscape of Oregon’s coast. A GIS based predictive model is used to establish where there is high potential for archaeological sites. When combined with knowledge of known archaeological sites across the Pacific Northwest region, we can gain a better understanding of what we might find in these submerged sites. The expectation is that by using known archaeological sites as an analogy for what we might find in these submerged landscapes, will provide a basis for further exploration of how people lived. This research aims to expand the ways in which we envision early archaeological sites in the Americas, shifting the focus of archaeological inquiry to examine the human condition.

O'Brien, Stephanie, Lindsay Costigan

More than Just a Bone to Pick: Deciphering Walla Walla's Cultural Consumption Patterns at the Turn of the Century

Walla Walla has a rich history due to its geographic location near the confluence of the Snake and Columbia Rivers. This advantageous positioning, with its proximity to plentiful resources and agricultural opportunities, allowed the city to grow and prosper on the edge of the frontier despite isolation from other major urban centers. For a short period of time, it was notably the largest city west of Minneapolis and north of San Francisco. Though material culture from this time of rapid expansionism probably exists in deposits throughout the city, limited excavations have occurred that focus on the city's urban populace rather than its historic fort. Excavations stemming from an inadvertent discovery in 2017 identified several refuse scatters during a road construction project in the Walnut Grove neighborhood of Walla Walla. The resulting collection provides insight to the consumption habits of Walla Walla's diverse population from the late 1800s to the early 1900s. This poster presents analysis of the site's gustatory material culture, which represents the city as both an urban center with access to imports from railways, and as a city on the edge of the frontier utilizing native resources.

Ostrander, Tom

No Wizardry in These Bones: tips and tricks for working with, and as, an osteologist

The specialized nature of osteological research and practice has resulted in confusion and misunderstanding within the archeological community. This talk will explain how osteologists determine if remains are human and provide an overview of what questions osteological examination can and cannot answer. It will then provide steps for effective photography to aid accurate and timely identification of remains, proper handling of suspected remains and associated matrix, and strategies for discussing a possible inadvertent discovery with non-cultural personnel. This facilitates compliance with relevant laws, and successful future consultation. If remains are determined to be human, and a burial recovery is required, the implementation of a successful burial recovery plan requires direct step-by-step consultation between all parties and the osteologist. Confusion at this step often stems from jargon laden procedures such as isotope analysis, DNA extraction, parasitology, and noninvasive methods. These will be explained in simple terms, with a focus on the physical processes and facilities required by each method. Finally, I will provide some illustrative examples from my experience implementing an osteological practice across three states and 12+ offices. Questions at the end are welcomed and encouraged.

Pacheco, Ryan, Dale Hamilton

Unmanned Aircraft Systems and Machine Learning for Archaeological Prospection

In 2017, Northwest Nazarene University partnered with the Bureau of Land Management to complete a pilot project to test the capabilities of small Unmanned Aircraft Systems (sUAS) and Machine Learning in Archaeology. For this project, NNU recorded two historic can scatters, historic mine tailings, and two miles of the Oregon Trail with an sUAS. After data collection, NNU created orthophotomosaics and 3D models of each site from imagery acquired with the sUAS. NNU then trained a support vector machine (SVM) algorithm to identify historic cans from the imagery, resulting in higher accuracy of can identification than researchers achieved by initial visual observation of the imagery. NNU also trained an SVM to identify segments of the Oregon Trail from the sUAS acquired imagery, identifying both the main swale as well as tributary swales adjacent to the main swale. The discussion focuses on the methods employed to collect the and process the data, as well as the results.

Palmer, Sara E., Thomas Laxson

Making Better Guesses: Archaeological Modeling for Adaptive Land Management in the Teanaway

A predictive model for archaeological resources becomes a practical tool for land managers when it is fine-grained, based on the best available data, adapts to new information, and predicts the presence of sites reliably enough that stakeholders use it for project planning. As part of the development of a cultural resources management plan for the Teanaway Community Forest, the Department of Natural Resources (DNR) is creating a predictive model for prehistoric resources in the greater Teanaway River watershed that processes known site, topographic, soils, and hydrology data using a Maximum Entropy (Maxent) model. This generates a model which allows project managers to assess risk and cultural resource survey needs. It can be field-tested and then updated as surveys provide new data. The Teanaway Community Forest lies just east of Snoqualmie Pass, above the towns of Cle Elum and Ellensburg, and is co-managed by DNR and the Washington State Department of Fish and Wildlife (DFW) with input from tribes, local residents, community organizations, and state and federal project funding partners.

Parks, Shareena

Cultural Relativism and Moral Absolutism: Philosophers and Anthropology

Social scientists and philosophers have contemplated the conflict between cultural relativism and moral absolutism as they work to reconcile ideas of universal human rights with the modern understanding that morals and beliefs are culturally constructed. In this research, I explore philosophers' theories about how to deal with this conflict, and how their ideas can be illuminated and made stronger through an anthropological perspective. I will apply specific cases studies to offer an important perspective for evaluating the real-world consequences for the ideas that philosophers have put forward. In the process, this research elucidates some areas in which future theorists should focus in order to better alleviate the conflicts between moral absolutism and cultural relativism, particularly as the issue relates to how we view activism and human rights.

Peasley, Sylvia Tatshama

The Mowitch Project-Traditional/Contemporary Methods of Uunting and Use: The Use of Deer Meat Within Our Teachings

I discuss what we, as the three people who created this project, practice in regards to our subsistence hunting and how we use each deer harvested. Some people are designated hunters on our reservation, by choice, and they go out and harvest deer as requested. Others, as is the right of each tribal member, may harvest deer as needed within certain times of the year. When we go out to hunt, there is already an idea of what we will do with the meat once the successful hunt is over. The meat is either obligated to our own households, to elders, to a traditional function request, or for many other uses. So when we butcher our meat it is already ordained how it will be butchered. Perhaps deboned and cut up as roasts, steaks, stew meat and wrapped and frozen, or processed to use for drying or smoking the meat which is another way of cutting up the meat. There are many things to talk about regarding how to handle the meat, ensuring proper usage of all the deer.

Pennell, Jennifer

Social Stratification and Resources Processing, Case #2: A Northwest Case Study of Camas and Salmon Using the Binford Hunter-Gatherer Database

Here the implications of resource processing on social stratification are considered in the context of the Pacific Northwest. Salmon and camas are the respective front-loaded and back-loaded resources utilized in the following case studies. The Binford Database provides the environmental and cultural data for making projections to further evaluate the conditions in which three levels of social stratification may

exist. This project was done in conjunction with Ollie Shannon to compare and contrast the main back-loaded resources in the Pacific Northwest.

Peone, Michelle

The Mowitch Project-Traditional/Contemporary Methods of Unting and Use: Harvesting and Skinning of Deer

I will be talking about the way my family hunts and processes deer compared to how my great grandfather did, as passed down to my grandfather and then to me. I will discuss the use and types of tools, weapons, and transportation I use now compared to those of my grandparents. My family traditionally used a longbow and my great grandfather was a flint knapper who also used metal tools. He would ride his horse to where he wanted to hunt and would sometimes also hunt horseback. Today, rifles, trucks and binoculars are used instead. I will discuss the importance of how to quarter deer for meat, and Sylvia will cover preparing meat in the next paper. I will also cover how the important steps in skinning and getting the hide ready to be brain tanned, which Brian will discuss in a later talk.

Pfeiffer, Chelsea

Masticatory Stress and the Human Chin

Among the few characteristics that make modern Homo sapiens unique to their genus, the gradual enlargement of the mental protuberance, or chin, is a characteristic that is quite puzzling in regards to function and purpose. Many hypotheses have been proposed to explain this unique adaptation such as speech, masticatory stress, sexual selection, etc. However, the lack of concrete empirical data regarding the behaviors and characteristics of ancestral species of hominins creates a lack of consensus on the matter. Through this research, I attempt to explain or eliminate change in diet and masticatory stress as one of the theories associated with the development of the chin. Through visual assessment of the mandibular structures of both modern Homo sapiens, and Homo neanderthalensis as well as a short discussion of the muscle attachment sites and actions, I attempt to offer insight into how the chin is related to the aforementioned hypothesis.

Phillips, Christina Marie

Katmai National Park and Preserve: A Case Study Reviewing Current Cultural Resource Management Tribal Consultation Protocol and Promoting Culturally Responsive

Drawing on experiences working as a member of Cultural Resource Management for two seasons at Katmai National Park and Preserve, my graduate research examines the effectiveness of consultation protocol as it stands with federally recognized tribes, Alaska Native village corporations, and Alaska Native Claims Settlement Act (ANCSA) corporations. As mandated by Section 106 of the National Historic Preservation Act, Cultural Resources must consult with Indian tribes pursuant to respecting tribal sovereignty and government-to-government relationships. Owing to failed consultation and noncompliance, this research seeks to review protocol/processes that present pressing tensions in consultation exchanges. My concern for motivating research that focuses on consultation addresses underlying asymmetrical power relations perpetuated through federal agency protocol, and the challenges this develops for Cultural Resources to serve in supportive roles with tribes. The purpose of this research is to suggest that despite good intentions, there are underlying incongruities of consultation processes. Processes I focus on as developing consultation tension concerns issues of initiation, consultation settings, and representation. Within the frameworks of Critical Indigenous Research Methodologies(CIRM), I review issues of how consultation is shaped and informed by western methodologies. Issues of redressing asymmetrical power in consultation exchanges and placing new emphasis on tribes, by way of adopting CIRM, may prove more culturally responsive. I assert that new spaces/exchanges that emphasize

indigenous methodologies/frameworks will treat tribes as partners in consultation rather than clients in an exchange. Utilizing vignettes from working at Katmai and personal experiences, I will discuss the importance these themes have in designing my research that is interested in developing discussions/recommendations for culturally responsive consultation. This as a new focus in consultation can encourage greater participation. Present tension and failed consultation presents a situation now, more than ever, where Katmai needs to fulfill its trust responsibility with Alaska Native tribes. I assert to responsibly fulfill Cultural Resources role with tribes, there needs an increased emphasis on a praxis-oriented relationship-forms of praxis and inquiry that are emancipatory and empowering for tribes.

Plew, Mark, James Eschenbrenner

Bone as Fuel: Implications for Assessing Hunter-Gatherer Mobility

Noting that the use of bone as fuel can compensate for deadwood deficits, Thery-Periosot (2001:56) argues that sites with much burned bone are probably sites of temporary occupation reflecting higher levels of mobility. In this regard, bone may have extended the seasonal length of occupation of some groups during the winter period or reflect temporary locations in which little deadfall or otherwise green woods would not have been readily available. This paper tests three hypotheses relating to the use of bone as fuel in Western Snake River Plain sites—many of which have been described as temporary use locations. We examine a number of studies that have used Kelly's (2001) chipped stone mobility index to assess degrees of residential mobility in western Snake River site assemblages (Willson and Plew 2007, Plew and Wilson 2010, Plew and Willson 2013, Roberts 2015), which have in general corroborated the probably short term uses of many of the sites within the corridor. We explore this issue as it pertains to availability of combustible material and as it relates to Thery-Periosot's argument that a higher frequency of burned bone represents increased residential mobility. We utilized a multiple regression analysis of the percentage of charred bone against Roberts' modified variables of Kelly's original analysis as well as our own variables that include site elevation and distance from rivers. Our analysis suggests that those sites exhibiting greater percentages of burned bone are most commonly associated with sites at lower elevations. ($r=.603$, $p=.015$). We also note that these increases occur with sites at greater distances from rivers ($r=.581$, $p=.019$)—sites that show a decrease in the presence of groundstone ($r=.485$, $p=.47$). A lesser correlation exists for other variables. We find that the rate of burned bone appears to correlate with variables in Kelly's mobility index where those variables suggest higher levels of residential mobility.

Pullen, Reginald

Bends of the River-Defining the Late Prehistoric/Protohistoric Cultures of the Coos and Coquille

There has been a tendency of most researchers in recent years to consider the Coos and Coquille peoples to be an integrated culture depending primarily upon shellfish and fish for subsistence. However, there are many differences in the material culture and settlement patterns as well as subsistence practices of the people who lived on the Coos Bay estuary and those who resided on the Coquille River estuary. In particular, the Hanis Coos who lived on main Coos Bay differed significantly from the Miluk Coos who occupied lower Coos Bay to the northern edge of the mouth of the Coquille River and the Na-So-Mah who resided on the southern edge of the Coquille River estuary. The influence of Athapaskan encroachment to within a few miles of the mouth of the Coquille River had a profound influence upon the Na-So-Mah, who many researchers consider bilingual. Understanding these differences is critical in the formation of research questions that may only be answered through future archaeological investigations.

Reid, Ken

The Big Cougar Creek Lodge Depression in Hells Canyon: Thoughts Concerning a Protohistoric Longhouse

During the Lewis and Clark bicentennial in 2006, two lines of evidence converged on Big Cougar Creek as the site of the fishing camp visited by Sergeant Ordway on a provisioning sortie in May, 1806. Geophysical survey and site testing data (hearth spacing, trade goods, fish remains, C14 date) are consistent with Ordway's description of a Nez Perce longhouse. Located on a landform used for 1,600 years amidst a cluster of circular house depressions, the lodge may mark a shift from unilocal or ambulocal to bilocal residence patterns following catastrophic depopulation ca. 1780.

Rice, David

Considering Women's Contributions to NW Anthropology in Light of the Jungian Anima Archetype within a Man's Mind

Women involved in NW anthropology have surrounded me all of my life, and affected me during every stage of my developing career in this discipline! My view of that experience, of course, is that of a man! However, the Anima archetype in Jungian psychology provides a fleeting glimpse of an impression, any original creative impression, in any individual's mind that, unconsciously, we search for it all of our lives. It is a source of nurturing, creativity, and insight that we learn and pattern during our lives. The source of our first conscious sense of the Anima comes from the women around us at any age, particularly, in this case, from the insight and experience of their knowledge and success in their working contexts, and by the confidence they have shown in how they presented themselves to us as accomplished individual human beings.

This presentation highlights the lives of four original accomplished women who profoundly affected my emerging and ongoing career in NW Anthropology. They also have impacted the many contexts in which they worked, and created new directions and opportunities for many others, men and women, as role models for the future. From the influence of these role models, I became a personal proponent for mentoring three generations of NW anthropologists, and a more effective catalyst for Action Anthropology to bring about change in our societal mores.

Robertson, Rylee, Kristina Cockerille, Renae Campbell

Shoe Analysis of a Boise Basin Chinese Mining Camp

Currently there is not a lot of information regarding utilitarian shoes in the archaeological record, not only because of their fragile and easily perishable state, but also because they are not always seen as the most insightful reflection of our past. This poster discusses an archaeological analysis of shoe fragments found at site 10BO357 in Southern Idaho's Boise Basin. This is a late nineteenth-century mining site located along Grimes Creek in the Boise National Forest that was occupied by Chinese miners. Among the nearly 5,000 artifacts recovered from the site in 1985 were 124 shoe fragments and shoe nails, as well as one complete shoe sole. In this analysis, we will be looking at the manufacture dates, nail type, makers' marks, and shoe size and gender of the fragments in this collection. These details demonstrate the value of information that can be gathered from the analysis of utilitarian footwear, including date ranges, shoe types, and manufacturing techniques. The goal of this analysis is to contribute more information towards future research on utilitarian shoes and the people they belonged to.

Rorabaugh, Adam

Results of the 2016-2017 Net Pens (450K247) Excavations

The CCT History/Archaeology Program conducted a total station survey and excavation of 450K247, the Net Pens, a pre-contact shell midden and pithouse village site as part of the development of the RV park and fishing area. Excavation revealed three shell lens features and an assemblage consisting of bifaces (N=2), lithic debitage (N=28) consistent with bifacial retouch and worked *Odocoileus* sp. metapodial fragments (MNI=1, NISP=22) indicative of bone tool manufacture. Shellfish analysis (N=932) revealed consistency in represented taxa (*Margarifitera falcata* and *Gonidea angulata*). The eastern and northwestern portions of the site have both had significant disturbance from the development of the parking lot and Net Pens facilities and active erosion of the cut bank where pithouses had been previously documented. The results of the field investigations and background research, including recalibrating 14C dates, identified two pre-contact cultural components dating to the Kartar (2,000-4,000 BP) and Hudnut (4,000-7,000 BP) periods.

Rose, John

Recent Work on Fire Lookouts in the Frank Church-River of No Return Wilderness

This paper presents an overview of recent stabilization work conducted on historic fire lookouts located in the Frank Church-River of No Return Wilderness in central Idaho. The presentation includes information on the history of the lookouts, their current conditions, management, and recent work.

Rossi, Mary

Association for Washington Archaeology (AWA) Advocacy Workshop-Get Informed and Get Involved: How to Communicate With Your Elected/Appointed Officials About Cultural Resources

Between bidding for contracts, conducting surveys and excavations, analyzing collections, and writing reports, who has time for advocacy? Many among us may have hoped that someone else would take care of this task. However, long-simmering and now more recent, new attacks on the current system of cultural resource protections have elevated the critical need for all of us to communicate effectively and often to our elected/appointed officials at all levels of government (federal, state, local) about cultural resources and the benefits of their protection. Given the current climate, are you ready to advocate? Do you need some guidance or some refreshers? Are you attending the SAA meetings in DC and need help preparing to storm Capitol Hill? If you answered “yes” to any of these, then this AWA Workshop is for you!

Join our experienced and enthusiastic panel for the following discussion:

- 1) What’s happening? - tips for learning about/tracking the latest news about policies/legislation that will impact cultural resources;
- 2) What do I do about it? - tips for communicating to elected/appointed officials (i.e. the decision makers) in person, via telephone, or in writing;
- 3) What else can I do? - strategies for individual engagement in other types of advocacy efforts;
- 4) An open discussion with attendees about issues and ideas for more effective advocacy.

We would also like to compile a list of those attending the SAA meetings in DC in April who would be interested in visiting their elected officials on Capitol Hill.

If you love working to protect cultural resources, you can’t put advocacy off any longer. Let’s all get informed and get involved!

Rudnicki, Larissa

Growing Pains in Transportation

The Transportation Symposium will consist of multiple DOTs discussing in panel form new issues that seem to arising as a trend. Oregon DOT will be discussing Visual Impacts and ADA conflicts. I will address visual concerns and how ultimately, we see a trend of being asked to assess visual impacts not from the project out, but from the surrounding world in. The FHWA VIA does not account for this change and we had to be creative in our documentation. Additionally, currently, we are in the midst of dealing with the clashing of ADA standards and the preservation of historic resources. We, in Oregon, have a couple of projects where if we are completely compliant to the current ADA standards, we run into the risk of compromising the integrity of historic resources. For example, an eligible bridge where the walkway on either side does not meet the ADA width requirement. The options of improving the width are widening the bridge or constructing bulb outs - both of which would result in an adverse effect. We have a design exemption from SHPO saying such, but ADA parties feel that exemption is not sufficient. Ultimately, the question being asked is which takes precedence? ADA standards or the preservation of an eligible historic resource?

Sappington, Lee

A New Look at Pre-Contact Houses at Three Sites near Ahsahka in the Clearwater River Region, North Central Idaho

A variety of house pits, mat lodges, and other structures were reported in the Clearwater River Region by Lewis and Clark in 1805. Since the late 1970s, archaeologists have investigated numerous locations across the region including three house pit sites near Ahsahka. The house at the Ahsahka Sportsmen's Access Site had multiple floors and internal features dated from 2500 to 2000 BP. The largest house in the region was a 14-m diameter probable mat lodge at the Clearwater Fish Hatchery that was radiocarbon dated 1200 BP. Extensive data recovery excavations exposed 80% of the floor. Spatial analyses provided evidence of activities related to lithic tool use and manufacture, mammal processing, fishing, and storage, as well as indications of the presence of children. The most recent house was a shallow 8-m diameter structure at Canoe Camp that had lithic tools, faunal remains, and charcoal on the floor dated at 700 BP.

Schroeder, William

Of Ruptures and Raptures: Locating Ideology with LiDAR Imagery

Archaeology necessarily requires at least one artifact, a piece of technology, or something that functions as an object, to articulate and explain ideologies from the past. Slavoj Žižek finds there are three types of ideological objects: voids (or absences); large, unattractive objects left over or resultant from the past of which we are all aware; and a circulating object, one that is known to have existed and requires an ideological structure to understand it, e.g. Capitalism or Mormonism. Mark Leone identified certain technologies, e.g. fences and Mormon temple architecture, yet critical examination reveals that neither meets Žižek's definition of an object of ideological desire. The purpose of my dissertation research is to perform Landscape Archaeology landscape analysis to an historic Mormon community (Grosvont, Wyoming/Mormon Row) within Grand Teton National Park and to deconstruct the local legend of "Miracle" Spring in an effort to identify and locate 'the object.' The significance is: deconstruction of the local legend revealed 'the object' that meets Žižek's and Leone's criteria. GIS then facilitated virtual identification of 'the object' in LiDAR imagery and groundtruthing revealed its material existence. In this way, artifacts from the past were studied and understood within the framework of culture change over time within capitalism within an Historical Landscape Archaeology paradigm, a 40+-year-old research problem has been resolved, and myth is not perpetuated.

Schwab, David C., Timothy Ryan, D. Alex Schwab

The Archaeology of Hungry Horse Reservoir, Northwestern Montana

Archaeological investigations at the Hungry Horse Reservoir in northwestern Montana have revealed evidence of pre-contact campsite distribution patterns that shows a strong association with aboriginal trail systems identified and documented by the Confederated Salish and Kootenai Tribes. The theme of transportation permeates the mountainous setting of the area, being a transitional contact zone connecting two major culture areas, the Columbia Plateau and Northern Plains. Pre-contact diagnostic artifacts indicate a strong Middle Prehistoric Period presence that coincides with the Mid-Holocene warming episode suggesting intensive, regular use of mountain environments in this portion of the Northern Rockies from approximately 5,000 to 7,000 B.P. Palynological studies indicate the long term systematic use of fire by humans to promote and manage Ponderosa Pine parkland habitats along the South Fork of the Flathead River. Finally, recent UAV based remote sensing of sites on the reservoir have given us a first look at accessible and affordable approaches to measure reservoir impacts on archaeological sites.

Schwartz, Tracy, Barbara Perry Bauer

Collaborative and Creative Mitigation: The Broadway Bridge and Christ Chapel Project

Mitigation for adverse effects to historic properties can be shaped to highlight history and inform the public. When the removal of the eligible 1956 Broadway Bridge in Boise resulted in an Adverse Effect under Section 106, the Idaho Transportation Department, the Idaho State Historic Preservation Office, the Federal Highway Administration and the City of Boise worked together to minimize impacts to the nearby historic Christ Chapel, constructed in 1866, and mitigate for the loss of the historic bridge. Tracy Schwartz, Architectural Historian (ITD) and historian Barbara Perry Bauer (TAG Historical Research and Consulting) will present an overview of the creative mitigation measures developed for the project.

Schweitzer, Alleah

Finding Common Ground: Navigating Ideological Diversity and Coexistence in Northern Idaho's Alternative Food Movement

Topics concerning food sustainability, anti-globalization, and ecological conservation have fallen within the purview of an unlikely strand of farmers in northern Idaho. This paper examines the foodways of farmers in fringe pockets of Northern Idaho's farm-to-fork movement and how their positionality is rationalized within the context of a greater unified food movement. An intersection of free-market values, traditional Christian morals, and distrust in conventional methods while adhering to the principles of sustainability colors the priorities of this group. Through a mixed-method approach of interviews and participant observation, a qualitative analysis of these priorities are discussed in hopes of demonstrating the diversity of ideologies in the American alternative food movement.

Shannon, Donald

Panel Discussion on Ethnographic Research with Pacific Northwest Tribes

This session will highlight the importance of ethnographic research with Tribes in the Pacific Northwest, and to show how the Federal compliance process can generate ethnographic work. Panelists will include Federal Agencies who fund ethnographic research, academicians who work with regional Tribes, and representatives from Tribal cultural resource programs. We will discuss some of the differences between academically driven ethnography and compliance ethnography, both through consultants and research done by Tribes. Compliance ethnographic work highlights the living culture of Tribes in the Pacific Northwest, exemplified by issues such as: cultural adaptation to a new riverine ecology; restricted use of traditional homelands to hunt and gather culturally significant plants; the complex dynamics of access to salmon and salmon fishing; and many more. The importance of ethnographic research, specifically

related to Traditional Cultural Properties, is increasingly acknowledged in management documents generated by land-managing agencies.

Shannon, Ollie

Social Stratification and Resources Processing, Case #1: A Northwest Case Study of Acorns and Salmon Using the Binford Hunter-Gatherer Database

This poster will explore the development of social stratification levels in native groups, along the southern border of Oregon. Archaeological evidence will be utilized in conjunction with the Binford Database to expound on the proposed connection between high levels of acorn processing and consumption, and higher levels of social stratification. Optimal foraging theory will be applied to discuss the cultural implications between the procurement of acorns, a back-loaded resource and salmon, a front-loaded resource. This project was done in conjunction with Jennifer Pennell, to compare and contrast the main back-loaded resources in the Pacific Northwest.

Sheldon, Alexandra, Dr. Kermyt G. Anderson

Male care and life history traits among primates: a comparative analysis

While previous studies have examined the relationship between allocare and life history traits using a comparative sample of primates, none has focused on male care as the main predictor variable. Male care can reflect paternity, mating effort, or kinship, but regardless of the motive we expect it to have positive effects on offspring or female lifetime reproductive success. Male care is predicted to increase fertility by lowering age at first reproduction and increasing the pace of reproduction. We test this hypothesis using an updated comparative database of wild populations ($n = 239$ species; analytical n ranges from 40 to 174 due to missing data for many variables). To control for phylogeny (especially among the Ceboidea and Lemuroidea, where male care is most common), multilevel mixed-effects generalized linear models are used, which allow for nesting at multiple levels (e.g., superfamily, family and genus). Continuous variables were logged. We find that male care is negatively associated with lifespan, litter mass, neonatal weight, infant mortality, male endocranial volume and female endocranial volume ($p < .05$). Neither female age at first reproduction, interbirth interval, gestation length, lactation length, territoriality or neonatal weight are associated with male care. Females in species in which male care occurs thus give birth earlier, to smaller offspring or litters, and live longer lives, though the intervals between births is unchanged.

Sloma, Robert

Colville Tribes Engaged in the Basin: FY2017 in Retrospect

The Colville Tribes History/Archaeology Program is assisting the Washington State Department of Ecology (Ecology) and Bureau of Reclamation (Reclamation) with cultural resource management in the Columbia Basin based on a cooperative agreement regarding implementation of the Odessa Subarea project. The Odessa Subarea project is a groundwater replacement effort under the Columbia Basin Project in eastern Washington State designed to deliver surface water from the Columbia River to lands that currently rely on the aquifer. Since 2015, one Colville Tribes Resource Specialist has reviewed and considered specific improvements proposed under the Odessa Subarea Special Study Area – Odessa Groundwater Replacement Program, and other undertakings within the broader Columbia Basin Project region to protect cultural resources and assert Tribal interests in Traditional Territory off reservation. A summary of Fiscal Year 2017 highlights goals and accomplishments under this mutual agreement.

Smith, Julia

Coffee Talk: High-End Coffee in the Modern World

Over the last few decades, coffee has become a different kind of object of consumption: shifting from a dependable source of caffeine to a means of expression. Whether we talk about elaborately flavored espresso drinks or single source coffee from a particular place, our choice of coffee and how we talk about it has become an important means of self-expression and communication. This paper explores the choices available to people in the Inland Northwest, how those choices are framed, and how those choices reflect the growing “foodie” trend towards a kind of omnivorous consumption.

Smith, Sonja

The Development of Warfare in Native British Columbia

The Binford Database charts compiled here look into the relationship of landscape available, subsistence and the possibility of warfare in Native British Columbia. Using SPSS to analyze the Binford database the information is presented in four scatterplots. The variables measured are Effective Temperature, Calculated real rainfall, States (Alaska, British Columbia and Washington), Subsistence, Expected moderate body-size ungulate biomass, Net above-ground productivity, Expected percentage of fishing using ethnographically known hunter-gatherer cases and Projected Hunter and Gatherer density. It was found that limited landscape and the abundance of salmon does lead to an increase in warfare. The Binford database analysis has concluded that the more dependent on fishing the more sedentary a group of people are. Leading to a higher degree of territoriality, violence and warfare. Kemano, British Columbia has the highest population density and population most dependent on fishing. It could be expected to find more archaeological site tied to war, weapons and direct injuries consistent with warfare on the skeletal remains.

Spencer, Steven, Patrick Lubinski

Faunal Analysis of a Sample Unit at the Grissom Site, 45KT301, Central Washington

As a collaborative faculty-mentored undergraduate research project, we are analyzing nearly 500 specimens from a single 2 x 2 m unit excavated 1967-1971 at the upland Grissom Site in the northeast corner of Kittitas Valley in central Washington. The Grissom site is near an historic regional intertribal gathering and trading area recorded by Alexander Ross in 1814. The site was excavated by students from what is now Central Washington University (CWU), and unit U0E was dug to 120 cm below surface. Identification of vertebrate remains (excluding fish, which were previously identified) was performed collaboratively through comparisons to known osteological specimens housed at the Zooarchaeology Laboratory at CWU, with the aid of published diagnostic criteria. Taphonomic indicators recorded for each specimen included burning, weathering stage, root etching, type of break, and modifications. We identified 11 distinct taxa, including deer, pronghorn, bighorn sheep, elk, ground squirrel, and beaver, although 83% of the specimens analyzed to date were identifiable only to size class. Bones were moderately broken, so that 66% of specimens were < 3 cm in maximum size. We noted 14 culturally modified remains (3% with butchery cutmarks or impact notches) among the analyzed specimens. Nine AMS radiocarbon dates on bone for this unit indicate use from ca. 1600 B.P. to the historic era and some stratigraphic mixing. Mixing is also indicated by domestic cat and pig remains from 0-20 cm and historic glass and metal from 0-120 cm. Specimen identifications are about 95% complete, and will be followed by placing the site into context compared to other regional sites along the Columbia River.

Stauch, KiriLi, Dr. Lori K. Sheeran, Jessica A. Mayhew

The Impact of Web Based Visitor Education on Human-Tibetan Macaque (*Macaca thibetana*) Interactions at Mt. Huangshan, China

Daily visitor-macaque interactions negatively impact both macaques and visitors, leading to higher rates of macaque aggression (macaque-human, intragroup), macaque self-directed behaviors, zoonotic disease transfer (macaque-human and vice versa). Tourists interact daily with Tibetan macaques at a tourist destination, Valley of the Wild Monkeys, in Anhui, China. I made an educational website with site specific information (i.e., guidelines for conduct, park rules, conservation) which was made accessible (through QR codes) and inaccessible for an equal number of randomized days. Previous research at the indicated a correlation between decibel levels and macaque self-directed behaviors so LS, JM, and I recorded visitor-macaque interactions and decibel levels daily using an ethogram for both human and macaque behaviors, and the Sper Scientific Sound Level Pen (840018). Following data collection, I compared the frequencies of macaque and human behaviors and average decibel levels on website “on” and “off” days. On website “on” days, visitors exhibited higher rates of macaque directed behaviors ($F(1, 68) = 6.54, p < 0.05$). No difference was found in the decibel levels ($F(1, 60) = 2.34, p = 0.13$) and macaques’ rates of aggressive and self-directed behaviors during website “off” days or “on” days ($F(1, 68) = 1.49, p = 0.23$). These results indicate that, at this site, web-based technology did not help reduce the rate of stress-inducing visitor behaviors. Visitors at the site were using their phones as cameras rather than to read the website.

Stevenson, Alexander, Stephenie Kramer

Women in our Midst: Role Models, Mentors, and Leaders in Our Past, Present, and Future

Our academic and professional histories are dominated by women who have served as role models, mentors, and leaders in archaeology and historic preservation. By developing the ‘Nevertheless’ session we wanted to highlight the place of women in the field, lab, office, and classroom. This presentation will provide a spring board for our session and provide a venue for us to share our thoughts on working with and for women throughout our academic and professional histories, as short as they may be.

Stutzman, Esther

The Legacy of Indiana Ross

Dr. Richard E. Ross was one of the first anthropologists in Oregon to pursue a working relationship with tribal people in order to establish a line of communication. During the 1970s and 80s, he worked to begin conversations with tribes so that the anthropological community and the tribes could come together working for common goals such as preservation of historic sites and the subject of Native burials. ¶ I was fortunate to become a good friend of his and together we were able to undertake the task of bringing together tribal groups and anthropologists. It was during a time when the attitude toward Native people was changing for the better and it provided an ideal scene for better communication. ¶ Although he was often cast aside by his colleagues and dismissed for his views on cooperating with tribes, he persisted and began building the foundation upon which much of today's attitudes are built.

Taylor, Amanda, Stephanie Jolivette

Taking On Dominant Narratives: A Paper in Honor of the Work of Dr. Julie Stein

In this paper in honor of the contributions of Dr. Julie Stein to Northwest Coast archaeology, we explore the role that Stein and her cohort have played in challenging dominant narratives of precontact culture history using scientific evidence. Advocates of standpoint theory might suggest that Stein, Butler, Campbell, Miss, Moss, and others benefitted from an outsider's perspective--being women allowed them to see unique aspects of the past and pursue novel research questions. Another perspective casts implicit

bias as a driving force behind their scientific rigor. They had to work harder to advance their ideas, and as a result, reshaped archaeological understandings of chronology, site formation processes, social complexity, technology, and past human diet. During her career in the Northwest, Stein tackled dominant narratives both about the past and about the ways that archaeologists interpret the past. Her geoarchaeological data from English Camp in the 1990s called into question the idea that ‘the dark and the light’ strata represented different time periods. Her later work on house formation at English Camp challenged the assumption that houses and other features are immediately recognizable. Our work with Stein from 2005-2010 questioned the assumption that shell midden sites accumulate at a uniform rate. Here, we examine Stein’s work from both a standpoint theory and implicit bias lens to demonstrate that both played a role in her successful research agenda to advance the geoarchaeology of Coast Salish sites.

Thomas, Scott

Percussion Blade Cores and Blades: A Late Prehistoric Lithic Tradition in Southeastern Oregon

Percussion blades and blade cores are next to absent in archaeological assemblages of any age in southeastern Oregon. However, less than 20 late prehistoric sites, associated with Shoshone buffalo hunters, have evidence of this lithic reduction technique. In researching the literature of similar age sites with clear associations with Shoshone groups in Nevada, Idaho and Wyoming, evidence of associated percussion blade production is absent. This paper explores the distribution of these artifacts, the obsidian sources where they were procured and other assemblage traits they are commonly associated with. It is hoped that those researchers in the Intermountain West working on this time period will provide the author with clues about where and what time period(s) this lithic reduction technique is evident.

Thornburg, Aaron

Open Prosthetics Design Anthropology Project: Visual Methods in Design Ethnography

Werner Sperschneider has suggested that “[e]thnographers in the emerging field of design anthropology make extensive use of video to study how people interact with computers and other information technology devices. Many practitioners in design studies find that using video is an effective way to collect and analyse observational visual data to inform product development and design.”* This presentation will explore an application of visual ethnographic techniques in a design anthropology project on a product that heretofore has been given little attention: prostheses. In the summer of 2017, I undertook a cooperative project with Open Prosthetics, a web-based education initiative dedicated to facilitating crowd-sourced curation of information and collaboration in the field of prosthetics and coping with missing body parts in general. Open Prosthetics held its 2017 conference in Portland, Oregon, and invited me and an Eastern Oregon University student to document attendees’ experiences of and challenges with using prostheses. This presentation will screen clips from the resulting videos and explore the potential they have for being used by designers to develop more effective prostheses.

*Sperschneider, Werner. 2007. “Video Ethnography under Industrial Constraints: Observational Techniques and Video Analysis.” In *Visual Interventions: Applied Visual Anthropology*, edited by Sarah Pink, 273-293. New York: Berghahn Books.

Tushingam, Shannon

Subsistence Intensification, Storage, and the Emergence of Pithouse Villages in Western North America

As observed by Ames and Marshall in their 1980 paper, “Villages, Demography, and Subsistence Intensification on the Southern Columbia Plateau”, the southeastern Columbia Plateau has one of the best archaeological records documenting the evolution of the seasonal winter village pattern. Indeed, research in the region has the potential to contribute to global debates about topics such as the development of

sedentism, subsistence intensification, and the evolution and diversity of food storage systems. In this paper I address notions of flexibility and diversity in hunter-gatherer-fisher systems, houses, and village formation, in particular the notion of storage diversity, plant and salmon intensification, and settlement flexibility. Research on legacy collections housed at regional curation facilities has great potential to shed light on these issues, and I address current and future directions of such work at the Washington State University Museum of Anthropology.

Tyler, Donald E.

Origins of the Modern Concept of Race

Despite decades of advances in scientific and social theory, racism is still prevalent. Most people think that the world's populations can be placed roughly into one of three major racial groups with origins in Africa, Europe, and Asia. What they lack is an understanding of why people vary in visible traits. For nearly two million years, human ancestors and humans spent most of their life outdoors, and, through natural selection, developed unique, localized traits in response to climatic features such as amount of sunlight, temperature, humidity, and altitude of their geographic area. Some of these traits vary gradually over space, while others are adaptations to different climatic features that do not coincide with each other. Thus, these physiological adaptations do not fall into discrete, bounded categories and so do not conform to many people's perceptions of separate races. About 12,000 years ago, the earliest farming cultures emerged in a few areas around the world. These early farmers expanded and wiped out many hunters and gatherers as well as their unique climate adaptations, thus leading earlier scholars to propose three major races based on overly simplistic assumptions about race. This ultimately influenced the general population's perceptions of race.

Vance, Emma, Liz Dolinar

Investigating least cost path from raw material sources to Bridge River site (EeR14)

Excavations at Housepit 54, Bridge River site, British Columbia produced a large collection of lithic debitage and tools made of a wide variety of different materials. Dacite, chert, and slate are particularly common and have been sourced to a few different locations around the region. This research seeks to test transportation cost from these sources to the Bridge River site using the least cost path function in Geographic Information Systems (GIS) software. By looking at the quantity of the commonly sourced materials at Bridge River and comparing it to the cost of transport from its source it is expected that the most frequent material will come from the most easily accessible location. If the expected pattern does not emerge, it is hypothesized that the people chose lithic sources based on political, cultural, spiritual, or symbolic preference and not solely on geographic accessibility.

VanWassenhove, Anne, Connor Neal, Weston Wardle, Keana Winninger, Mark Plew

Archaeological Excavations at the Swenson Site (10-EL-1417), Southwest Idaho

During May and June of 2016, and May 2017, Boise State University conducted its annual field school at Swenson site (10-EL-1417). The site is located on private land north of the Snake River between Glens Ferry and King Hill, Idaho. Excavations sought to further explore site functions, age of deposits, and the extent to which levels of mobility might be inferred. This poster offers an overview of the material culture, use-wear analysis of lithic artifacts, lithic debitage, radiocarbon dates, and faunal remains of 10-EL-1417. As a primary research question, Kelly's (2001) index of residential mobility was used to correlate lithic assemblage data with levels of mobility. By measuring technological dimensions of the lithic assemblage and placing them within units of measurement on a dichotomous scale (e.g., low or high, rare or common, etc.), a likely mobility pattern can be ascertained from the site. This assemblage suggests high residential mobility and expedient tool production. This is consistent with the use-wear

analysis which suggests minimal use of tools probably due to high mobility and abundant raw material which could be easily produced and altered. This is also consistent with the indicators highlighted by Roberts (2015), including a lack of evidence of storage, few features, few groundstones, and simple, utilitarian pottery. These indicators suggest a foraging strategy that moves groups to resources, the utilization of task specific sites, and the production of multifunctional tools to adapt to local, seasonal resources.

Von Lintig, Matthew R, Tate Meehan, Gabriel Gribler

Ground Penetrating Radar and Cadaver Dogs to Close a Nampa P.D. Cold Case

A tip informed the Nampa, Idaho, Police Department that a cold case homicide victim may be buried beneath the floor of a Nampa School District building. The Society of Exploration Geophysics Student Chapter at Boise State University was contacted by the lead detective of the case to investigate the site with ground-penetrating radar (GPR). In the crawl space below the building, 500 MHz GPR depth profiles were acquired for initial characterization of the subsurface. The initial study on February 7, 2018 covered an anomalous area with a surface expression (a mound) with an area of ~1.5m² of compact dirt, relative to the surrounding loose sandy construction fill. In the location of the mound, GPR amplitude bright spots indicate a localized soil disturbance at 1.5-2m depth. On March 8, two cadaver dogs were used independently to identify other areas of interest. Collectively, the dogs signaled three 10m² areas underneath the building. Two of the areas pose difficulties for radar imaging due to concrete structures. The third area was more open, allowing us to collect thorough GPR depth profiles. If a soil disturbance at depth is detected, and coupled with a cadaver dog flagged location, then Nampa Police detectives may have reason to use invasive investigation methods.

Wallen, Dakota, Andrew Frierson, Tiffany Fulkerson

Washington State University Archaeological Research at the Hart Mountain National Antelope Refuge, Lake County, Oregon

In 1967, students and faculty from Washington State University (WSU) conducted excavations at Rock Creek Shelter (35LK22) on the Hart Mountain National Antelope Refuge in Lake County, Oregon. This work revealed a robust archaeological record and provided evidence of human occupation ranging from ca. 8,300-780 cal B.P., thus demonstrating the potential for future research in an area that had received little archaeological attention. In the summer of 2017, students and faculty from WSU, along with staff from the U.S. Fish and Wildlife, revisited the Hart Mountain refuge as part of an ongoing Cooperative Ecosystem Studies Unit agreement to rehabilitate, document, and analyze archaeological materials from the Rock Creek Shelter and elsewhere on the refuge. The 2017 fieldwork identified six new precontact sites and resulted in 14 sites revisited. Many previously unrecorded cultural resources were identified, including petroglyphs, ground stone implements, and a multitude of diagnostic points such as Western Stemmed, Northern Side Notched, Elko, and Desert Side Notched. The 2017 fieldwork demonstrates that the Hart Mountain Refuge has vast potential to address many archaeological questions in the northern Great Basin.

Wang, Penglin

Cervidae Ethnonyms in Inner Asia

Included in the fauna of Inner Asia is a wide variety of deer, such as antelope, gazelle, roe deer, and elk or moose. This diverse cervid species serves as reservoir of food and fur supply. For millennia, early humans in Inner Asia had been chronic achievers in rock art. In Mongolia Altai and Inner Mongolia Yin mountain ranges there where rock drawings are found, there exists a long-standing connection between appreciably artistic gratifications and an animal motive. Rock artists took interest in representing animals including

deer and elk, reflecting people's zoographic fondness, which could feed into nomenclature. In this presentation I focus on the ethnonyms Qarta'an, Hart, and Bugu, which derived from Cervidae terminology. I argue that the names Hart, Harta, Hartar, Hartagin, and Qarta'an came from Old English heort 'hart,' which was in turn diffused into Manchu kandagan (<-- *karda-gan) and Mongolian qandaḡai 'Manchurian moose,' and Bugu or Pugu (僕骨) from Turkic and Mongolic buḡu and Manchu buhū 'deer,' which has an etymological connection with Sariqul (an eastern Iranian language) buḡui 'deer.'

Wardle, Weston

Archaeological Expectations Based Upon Resident Fisheries in the Owyhee River

There are dozens of native non-migratory fish species that could have been utilized by foragers in the Owyhee River of southeast Oregon and southwest Idaho during the Late Archaic. Using the approach of human behavioral ecology, with the assumption of Optimal Foraging Theory that foragers will maximize returns by either increasing energy consumed or decreasing time spent searching for and handling resources, variables such as caloric content and search time influence whether a resource is included in a diet breadth. One important factor that is often overlooked is predictability. How predictable were the resident fisheries of the Owyhee River and its tributaries? Variables that might cause fish to aggregate (e.g., spawning timing and location, feeding behavior, river configuration, river flow levels, etc.) are assessed to establish a predictive map of locations where resident fisheries might have been predictable enough to be utilized during temporary, seasonal foraging. This predictive map will then be tested with archaeological data during the summer of 2018 to assess whether site location or evidence of fishing technology correlate with the expected locations of temporarily predictable resident fisheries.

Welch, John R., Erin Hogg, Michael Klassen

An Online Professional Master's Program in Heritage Resource Management: Digital Bridges Across Disciplinary, Practical and Pedagogical Divides

Growth and diversification in heritage resource management (HRM) archaeology since the 1960s has created new demands for training the next generations of HRM leaders and for addressing persistent and counterproductive divisions between academic and applied archaeologies. The Simon Fraser University Department of Archaeology (SFU) has responded to these demands with an all-new, cohort-based, thesis-focused graduate program created by and for HRM professionals. The program's target audience is HRM practitioners who hold Bachelor's credentials, have initiated promising careers in HRM, and desire advanced, research-focused degrees to enable their upward mobility. The SFU program is structured and focused to provide intensive, predominantly online training in the four essential dimensions of HRM: law and policy, ethics and practice, business management, and research design and methods. The program has been successful through initial cohort cycles and in attracting HRM industry partners. Critical next steps in program development entail the identification of critical attributes of HRM futures desired by all or most HRM stakeholders and the collaborative pursuit of those desired futures. Industry-academic partnerships are effective in comparable circumstances in cognate disciplines but remain underdeveloped as bases for planning and delivering state-of-the-art training in applied archaeology and the broader field of HRM.

Whisenant, Idah

Archaeological Testing at an 1866 North Idaho Site and Subsequent Potential Activities of Blacksmithing, Hunting, Logging, Cement Making, Homesteading, WWII Training and Recreation

The specific area of research for my thesis and this presentation concentrates on Pen d'Oreille City located on a small spit of land at the south end of Lake Pend Oreille in Northern Idaho. Founded in 1866, Pen d'Oreille City is regarded as the second Euro-American settlement in North Idaho and a waypoint for

gold-seekers traveling east to Montana and British Columbia by steamboat. It has gained the interest of local historians, archaeologists, and the Kootenai County Historic Preservation Commission, resulting in archaeological efforts to assess the site's eligibility for nomination to the National Register of Historic Places. Presentation on this site explores frontier daily life at the settlement through historic research and the archaeological testing results from August 2017 that paint a fuller picture of subsequent land use previously unrecorded at the site. Activities employed for the archaeological testing project were tree coring, chemical analysis, feature recording, metal detection, two test units, artifact analysis, and surface survey. Additional information surfaced leading to tentative conclusions of activities associated with blacksmithing, hunting, logging, recreational periods, cement making, homesteading, and the WWII Farragut Naval Training Station. More research is suggested as several mysteries remain, including a large, unidentified depression measuring 50 yards in diameter. The results of this project clarifies the potential for intact subsurface feature remains and artifacts, what may have disturbed the remains of Pend'Oreille City, and how to proceed with future subsurface archaeological investigation.

Whistler, Emily L.

Searching for Diversity: A Detailed Zooarchaeological Analysis of Birds from San Juan Islands sites

Researchers in the Salish Sea have focused much of the zooarchaeological work on resource intensification. In recent years, a shift has occurred placing an emphasis on the diversity contained within faunal assemblages. This paper utilizes preliminary findings of research on the human-bird interactions as a representation of resource diversity. This analysis uses avian remains from three collections previously excavated from sites on the San Juan Islands. A total NISP of 471 was identified from three sites: Fisherman's Bay (45-SJ-254) and Mud Bay (45-SJ-278) located on Lopez Island, and English Camp (45-SJ-24), located on San Juan Island. Ducks were the most common taxa identified followed by gulls and alcids. Overall diversity and equitability will be addressed as well as the ecological information of the species present. This preliminary analysis addresses the information that birds can provide archaeologists with about human subsistence and past environmental exploitation.

Williams, Scott

Don't Believe Everything You Read: A Lesson in Historical Sources and The Power of the Internet for Good

In 1939, William Schurz published his seminal work on the Manila galleon trade between Manila and Acapulco. Schurz, the "dean of galleon studies" wrote in a brief passage (without reference) that the galleon Santo Cristo de Burgos burned in the western Pacific. That single passage was enough to persuade researchers for the next 70 years that the galleon could not be the source of the Beeswax Wreck in Oregon. However, archaeological data from the Beeswax Wreck research project suggested the Santo Cristo de Burgos was, instead, the most likely candidate for the wreck. A random encounter with a travel blog from the Philippines and a lucky interlibrary loan revealed that Schurz's statement was based on a satirical source he accepted at face value, rather than primary documents. This led to further research into the primary documents, which confirmed that rather than burning in the western Pacific, the galleon sailed east and was never seen again.

Wyatt, Noella, Elizabeth Armstrong, Patrick T. McCutcheon, Breann Stoner

Errors Across Lithic Analysts: How much is Enough Training? A Comparison Analysis of the Neely Collection

Dr. Robert C. Dunnell and Patrick T. McCutcheon first analyzed a sample (n=200) of the Neely lithic assemblage as part of McCutcheon's 1997 dissertation on stone tool heat treatment. The sample was

drawn randomly from a larger plow-zone surface collection (n=659). Recently, McCutcheon borrowed the collection and worked with three students with varying levels of lithic training to analyze the entire assemblage. The original purpose was to determine if the initial sub-sample was representative of the entire surface collection. After the analysis was finished, numerous errors in attribute identification were found when McCutcheon and two of the students reviewed a ten percent quality-control sample. Finding discrepancies between the original 1997 analysis and the quality control analysis begs the question “what are the factors that may cause variation in observations of flake attributes?” After receiving further training in lithic analysis, one of the students who partook in the spring 2017 student analysis conducted a new blind analysis on the quality-controlled lithics that were compared to the 1997 analysis, to determine if further training has caused a significant difference in their ability to correctly identify flake attributes. Percentage of correct observations from the 2017 and 2018 analyses were statistically tested for significant differences using the original 1997 analysis as the standard. This comparison of multiple analyses of the same lithic assemblage may provide information regarding the factors that drive variation in lithic attribute identification, even when using the same techniques. Possible causal factors range from experience to collection treatment.

Yu, Pei-Lin

Undergraduates Doing Research! Using the Binford Hunter-Gatherer Database to Explore Problems in Cultural Evolution.

Lewis R. Binford had a 50-year career in explorations of cultural change, with special focus on hunting and gathering peoples. Over three decades he worked with students and colleagues to create a database of environmental data and ethnographically derived hunting and gathering projections (Binford and Johnson 2014) with the aim of conceptualizing research questions and refining hypotheses. The database has been used in global research from Africa to Japan and China, as well as North and South America, but primarily among trained researchers and their graduate students. Boise State University undergraduates are now working with the Binford database to help develop and refine their own research problems.

Zentgraf, Diane

Mid-Nineteenth Century Clay Smoking Pipes from Fort Hoskins and Fort Yamhill, Oregon

Mid-Nineteenth Century Clay Smoking Pipes from Fort Hoskins and Fort Yamhill, Oregon
Soldiers stationed at two remote Pacific Northwest military forts, Fort Hoskins (1856-1865) and Fort Yamhill (1856-1866), Oregon, led a monotonous life in the wet, dreary western Oregon coastal mountain range. The repetitive nature of military life for these men was relieved by what was considered at the time a pleasure and a distraction, the smoking pipe. Fortunately for these soldiers it was the peak of European and American manufacture of clay smoking pipes in variety, quality and artistry. The focus of this comparative analysis and historical research is the interpretation of the wide range of clay smoking pipes recovered from the two forts for a better understanding and insight into the social and economic status of the forts soldiers. An additional benefit will be helping to date other archaeological and historical sites where clay smoking pipes are found.

Boise State University

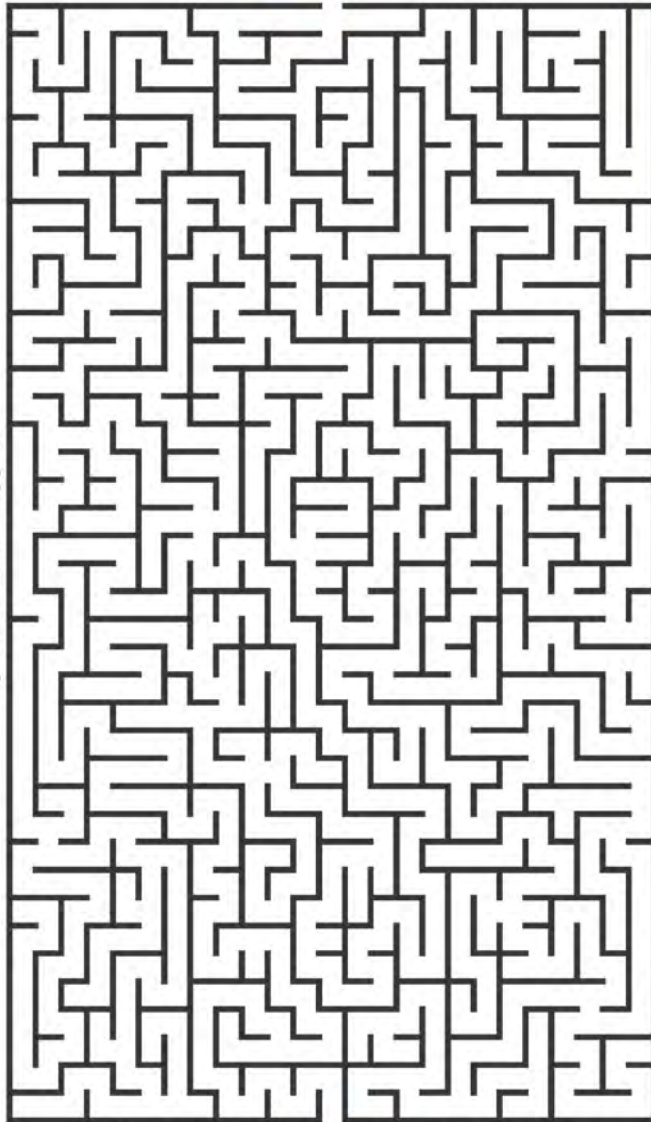
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The 2018 Cultural Resource Protection Summit marks our 11th gathering. Since its inception, the primary goal in organizing the annual Summit has been to facilitate amongst all affected parties an open, frank discussion about the intersection between cultural resources and land use.

This year, the Summit agenda includes an engaging array of cutting-edge topics that will encourage attendees to examine the benefits of a landscape approach and how it might inform workable solutions for today's most pressing challenges to effective cultural resource protection.

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SUMMIT HIGHLIGHTS:

Day #1 Keynote – Marion Werkheiser, Cultural Heritage Partners in D.C.

We welcome Marion Werkheiser, founding partner of Cultural Heritage Partners law firm, from the “other Washington” as she shares with us the very latest about the Federal legislative and regulatory landscape. Marion currently serves as Government Relations Strategist for both the Coalition for American Heritage and the American Cultural Resources Association (ACRA).

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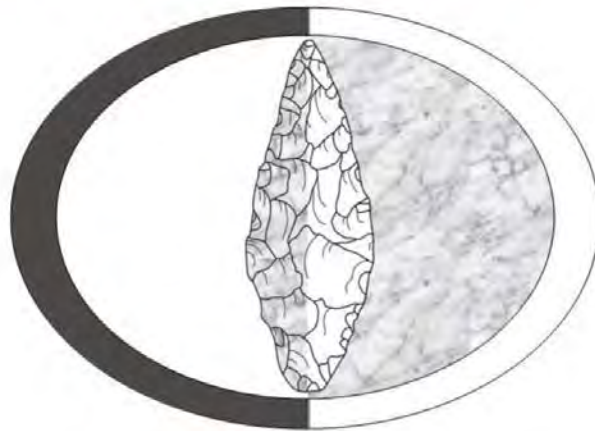
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