

**Quileute Traditional Ecological Knowledge
and Climate Change Documents Review**

Prepared by
Donald T. Shannon, M.A.
Robert Kopperl, Ph.D.
and
Stephenie Kramer, M.S.

September 28, 2016

Prepared for:
Quileute Tribe
La Push, Washington

Willamette Cultural Resources Associates, Ltd.

Portland and Seattle

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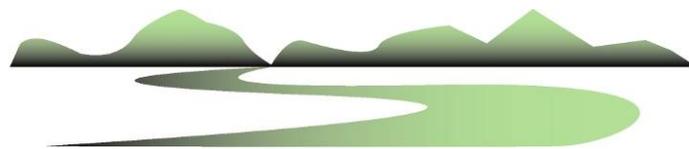
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Introduction

The Quileute Tribe's Natural Resources Department has prepared the Tribe's Climate Plan, which is a living document. The Tribe contracted with Willamette Cultural Resources Associates, Ltd. (WillametteCRA) to conduct a focused review of ethnohistoric and ethnographic literature provided by the Quileute Tribe, to identify and synthesize cultural use and cultural context of traditional resources and habitats, and adaptations to climate and other environmental changes. The results of the review are given in this Traditional Ecological Knowledge (TEK) report, which can contribute to the Tribe's Climate Plan. The Quileute also contracted with WillametteCRA to incorporate themes, responses, and concepts that will assist in building classroom curriculum about Traditional Ecological Knowledge and climate change in the future. The WillametteCRA review consisted of an inspection of ethnographic reports, interviews, field notes, legal testimony, archaeological reports, theses, agency documents and papers, and other records as provided by the Quileute Tribe; the creation of an annotated bibliography; a keyword search of the annotated bibliography; and the production of this report.

TEK has been defined in various ways, but in general encompasses a “cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment” (Berkes 2008:7). It has been increasingly recognized as a tool for investigating past ecological relationships and responses to environmental stress, as well as a framework for proposing policies and practices in the face of new environmental challenges. Native American Tribes are confronted by the effects of climate change, notably coastal communities directly impacted by changes in sea level and ocean temperature, with effects that can be seen within the span of a generation. The survey described in this report focuses on identifying the range of subsistence resources and habitats traditionally used by the Quileute and other Native residents of the northwest outer coast of Washington, and the extent to which adaptations to climate change can be seen in those records.

Natural and Cultural Setting

The Quileute Tribe of the Quileute Reservation (Quileute) is located at the mouth of the Quillayute River, on the northwest Washington Coast of the Pacific Ocean (Figure 1) [Since this map, selected for larger geographic purposes, new acreage-- doubling reservation size-- has been added to the reservation via PL 112-97 (see page 9)] . Their traditional territory is a place where several major, distinct environments come together in a landscape that has for millennia provided subsistence resources and raw materials for Quileute lifeways and transportation corridors that provided access to those natural resources and facilitated interaction with neighboring Tribes. The



Figure 1. Map of some archaeological sites and some landforms and rivers mentioned in the text.

major habitat zones that come together in Quileute territory – open ocean, nearshore marine waters, and the intertidal littoral zone; the coastal plains, prairies, and river valleys; and upland and alpine environments – are habitat to a wealth of animal resources that include marine, anadromous, and freshwater fish, sea mammals, terrestrial mammals, birds, and invertebrates. Specific to the nearshore and littoral environments, Shaffer et al. (2004) interviewed several elders from the Hoh, Quileute, Makah, Lower Elwha Klallam, and Jamestown S’Klallam Tribes to preserve their recollections of traditional resource use. Traditional plant resources across the spectrum of local habitats ranged from old-growth western red cedar to berries and roots to various kinds of seaweed. Some animals are available for subsistence year-round while others only on a seasonal basis. Some are abundant near human habitation, while others traditionally required longer journeys and a cooperative effort, such as whaling. Additionally, the abundance and distribution of some of these animals, such as sea otter and some species of invertebrates, have changed over time for reasons that may have included climate change.

Archaeological data from the Pacific Northwest suggest the presence of humans beginning after the last glacial retreat of the Ice Age. Archaeological sites identified in the uplands of the Olympic Peninsula are evidence of early Native American occupation of the Olympic Peninsula during the Late Pleistocene epoch. The Manis site (45CA218) near present-day Sequim, for example, has yielded the remains of at least one mastodon that may have been hunted by humans almost 14,000 years ago (Waters et al. 2011). As noted by Schalk (1988:89), the climate at the end of the Pleistocene was substantially different from today, which would have conditioned a very different set of human adaptations to this environment. Additionally, archaeological data that could inform us of early coastal land-use patterns would be located along a now-submerged former coastline closer to the continental shelf.

Although relative sea level stabilized near its present-day condition by about 5,000 years ago, it is primarily the past 1,000 years that are represented by the known archaeological record along the northwestern coast of the Olympic Peninsula. Shell midden deposits that dot the coast, some of them the thickest yet found in western Washington (Schalk and Powell 1997), demonstrate a strong marine subsistence and settlement orientation for at least a millennium before Euroamerican contact starting at the end of the 18th century. Land use clearly incorporated at least seasonal aspects of inland and upland subsistence; despite the sparse archaeological record of the interior of the Olympic Peninsula, plant and animal remains identified at some coastal middens include terrestrial mammals and plants found in a variety of inland settings.

The history of the Native groups of the northwest coast of Washington, our knowledge of which is reliant on oral tradition and archaeological data for the time before contact with European Americans, is augmented by historical records and ethnographic investigations following initial contact by foreign explorers near the end of the 18th century. This contact brought drastic

demographic and socio-cultural changes to the Native peoples of the Pacific Northwest. Despite their relative geographic isolation from the growing number of White settlements in the region, even the Quileute and their neighbors were affected by disease epidemics.

The Quileute are a Chimakuan language speaking Tribe whose traditional homeland is on the northwestern Olympic Peninsula, in the watersheds of the Dickey, Sol Duc, Calawah, and Bogachiel rivers, which join the Quillayute River and meet the Pacific Ocean at their ancestral village and modern administrative center of La Push (Powell 1990). The Quileute traditionally lived in permanent homes along numerous streams and rivers, as well as some in upland prairies, and were organized in sophisticated social structure that included hereditary chiefs. Initial sporadic contact in the late 18th century with European American explorers, traders, and settlers was followed by efforts by the territorial and federal governments to administer these lands. In July 1855, the Quileute were negotiating parties and signatories to the Treaty of Quinault River. The Treaty was finalized within a year as the Treaty of Olympia, in January 1856. A reservation of approximately one square-mile was formally established near La Push in 1889 by executive order of President Cleveland, onto which families were consolidated (Morganroth 2015). In 2012, the United State Congress provided for transfer of Olympic National Park lands and Quileute fee property into Tribal trust land for the Quileute Reservation, because the original reservation is vulnerable to tsunamis (Morganroth 2015; *see also* PL 112-97 of February 27, 2012). This brought the total reservation land to some 2,100 acres, nearly doubling it, although some of this land is wetlands and cannot be developed.

The Quileute people have lived in their traditional homeland since time immemorial. Their oral history indicates knowledge of the environment extending back to a time before human occupation, when animals had many of the characteristics of people. Their knowledge of their homeland is demonstrated in traditional stories, which explain many of its landforms:

Another site mentioned...was the site where Cleve Jackson's family lived regularly. It was named after a rock which is visible in low-tide and shaped like a whale. Harry explained that the Thunderbird had once carried off a whale in its claws but the talons had cut through the flesh of the back and the whale had dropped at this spot and become petrified. (Ray 1954:5-6)

The sophisticated traditional economy of the Quileute is based on intimate knowledge of the seasonal cycles of plants and animals, expressed in both economic terms – such as the annual subsistence round – as well as symbolic and mythological terms – such as place names that were often embedded with ecological meaning. The cycle has been studied and described in detail (Powell 1995: Appendix B-2), and consists of a combined use of fish, shellfish, marine and terrestrial mammals, birds, and plants. The traditional seasonal cycle was a continuous, year-round activity, based on integration of terrestrial and aquatic resources throughout all seasons. The Quileute fished

all year, with February to October being preferred times (Powell et al. 1996:I-16; Powell et al. 1998:B-26). While the traditional Quileute calendar was not divided into twelve months, the following is provided for reference, from Powell (Powell and Morgenroth (1998:3,4), who is clear that the Quileute cycle does not align with the Julian calendar. Nevertheless, he noted that fishing occurred in January, plants were mostly harvested from March to August, and hunting and fishing took place from February to November. The month of December, called *bask'alidix*, and known as "bad weather time," was when manufacture and repair of tools and equipment took place, as well as social events such as feasts, rituals, and trading. Tribal knowledge of the landscape is also demonstrated in the place names in their language for many of these landforms (e.g., Powell and Jensen 1976:61-67; Shaffer et al. 2004:64-71). For example, many of the rocks near LaPush have their own names (Frachtenberg 1916).

Many aspects of traditional hunting and fishing dramatically changed in the 1900s. Through these changes and new adaptations, ethnographers and government representatives who work with the Quileute have noted a high degree of cultural continuity from the time of earliest contact, exemplified by the celebration of a First Salmon Ceremony (e.g., Gunther 1926; Wray 1997:112). The Quileute fished and hunted on a regular basis in treaty times at least as far north as Cape Alava and at least as far south as the Queets River, and used offshore islands, as well¹ (Figure 2). Despite both political and economic changes, many Quileute people continue to live on their reservation at the mouth of the Quillayute River. It should be assumed that regardless of where they live, Quileute people continue to maintain a deep tie to their homeland and its constituent environments and plant and animal species.

Methods

Existing anthropological literature was reviewed as the basis for assessing Quileute Traditional Ecological Knowledge as it relates to climate change adaptation. Documents pertaining to archaeological and ethnographic data and historical accounts of traditional subsistence and other aspects of land use were provided by the Quileute Tribe, which has a wealth of material used in support of treaty litigation as well as through focused research by anthropologists such as Jay V. Powell. These were reviewed by WillametteCRA cultural anthropologist Don Shannon, M.A., and archaeologists Robert Kopperl, Ph.D., and Stephanie Kramer, M.S. The annotated bibliography attached to this report summarizes each of these documents.

¹ See also the July 8 and Sept. 3, 2016 federal court decisions regarding scope of Quileute fishing, available in Google Scholar on line at <http://www.wawd.uscourts.gov/sites/wawd/files/Makah09-01FFCLandMemorandum.pdf> and https://scholar.google.com/scholar_case?case=6861728881534294093, respectively.

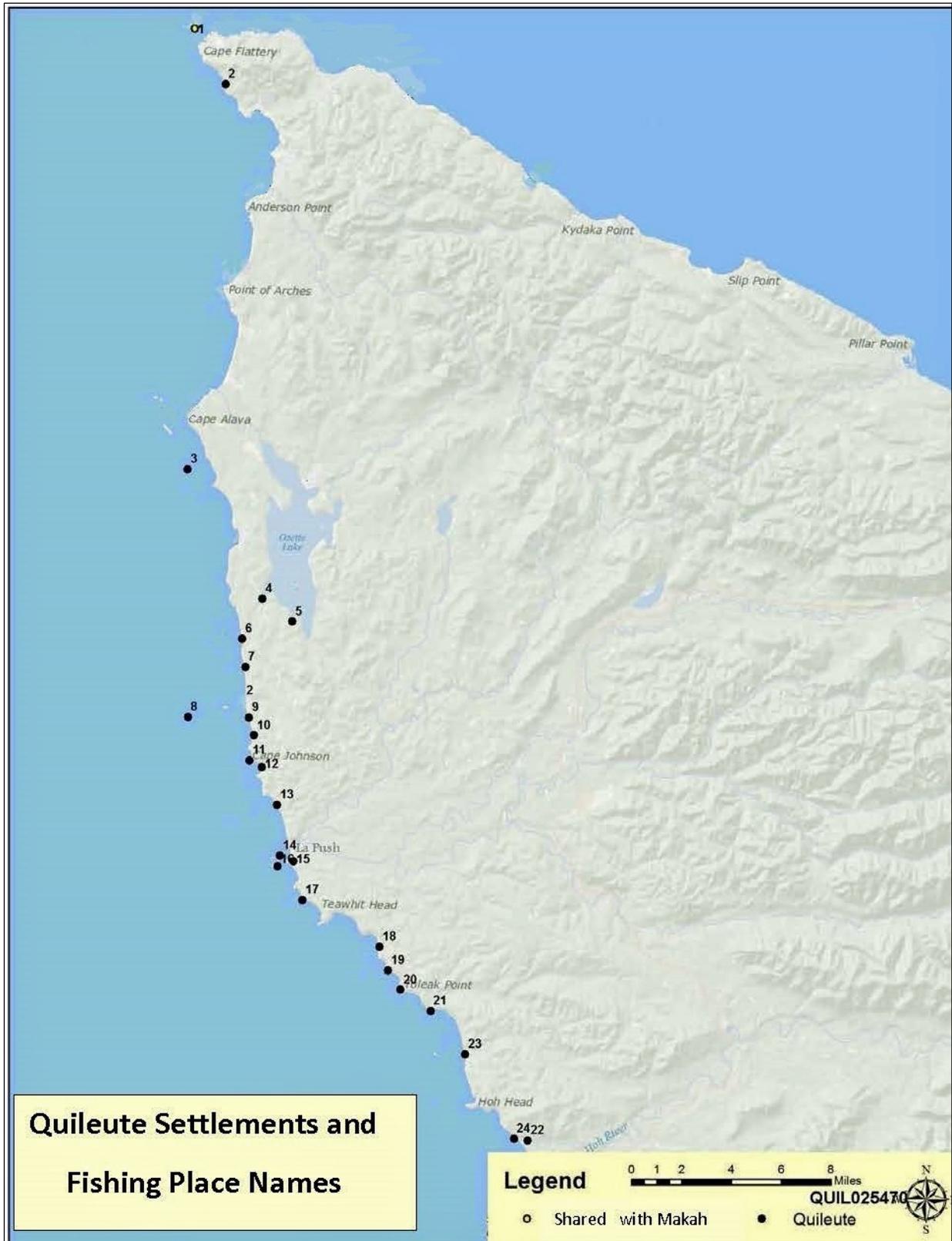


Figure 2. Some recorded Quileute settlement and fishing locations on Washington's outer coast. Key to these places is appended to this document.

Additional information from published sources, and unpublished records on the Department of Archaeology and Historic Preservation's (DAHP) Washington Information System for Architectural and Archaeological Records Data (WISAARD), were also consulted.

Data Sources

The anthropological studies and historical documentation reviewed here are informative of some, but not all, aspects of TEK as it is used in climate change studies and policy initiatives. In addition, these data sets have inherent gaps and biases as a product of their empirical records and the methodologies used to study them. However, their strengths when examined together – a diachronic record of traditional subsistence, land use, and environmental baseline data before and after European American contact – play a unique role in TEK considerations. Existing TEK studies for this region acknowledge their own limited time-depths (Shaffer et al. 2004:6), therefore consideration of earlier documentation and the archaeological record is an important supplement. This section provides a critical review of archaeological, ethnographic, and historical data that contribute to our knowledge of traditional resource and habitat use.

Archaeological Data

Archaeological data provide insight into certain aspects of Native American culture not normally conveyed in other sources such as oral tradition and ethnographic studies. The remnants of past human settlement and subsistence found at archaeological sites provide empirical data regarding the relationships between Native Americans and the plant and animal communities that supported them, as well as a dynamic record of landscape change over time. It is time, and specifically time-depth, that is perhaps the most significant contribution of archaeology to a synthetic approach in documenting TEK, as well as an often-times very fine-grained history of plant and animal use by the former occupants of an archaeological site.

In the right preservation conditions, an archaeological site may yield material with precise age estimates. If such material is associated with preserved remains of animals (usually in the form of bone, antler, and shell), then subsistence and by extension environment at a particular place and time can be known. Taxonomically detailed lists of food remains, artifacts that convey particular hunting, fishing, or gathering activities, and absolute dates obtained from archaeological sites are perhaps the most pertinent data of this kind to inform TEK studies. The results of activities of many individuals, hunting, fishing, and gathering both near and far from a site, are contained within its archaeological deposits, and often found to span decades if not centuries or millennia. Archaeological data have limitations as well that constrain their interpretive potential. The spatial distribution of the known archaeological record is biased – our knowledge of the past based on the archaeological record reflects where investigators have looked for archaeological sites, and where they have been preserved on the landscape. And perhaps mostly critically for TEK studies, archaeological analyses

of coastal sites, especially shell middens, tend to focus on animal remains instead of plant remains. This is partially due to poor preservation of plant remains relative to animal remains in shell midden deposits. In addition, the technology and material culture related to plant collection and processing represented is less abundant, and likely less recognized, in the archaeological record compared with the implements of hunting and fishing. Because of these limitations, archaeological data is best seen as a facet of TEK with strengths that complement other data sources.

Archaeological Data from the Northwest Coast of Washington

Published records of archaeological investigations along the coast and within the interior of Quileute traditional territory have been sporadic, beginning about 60 years ago with an early broad-scale cooperative survey effort by the National Park Service and University of Washington (Stallard and Denman 1956). The following decades were punctuated by occasional small-scale archaeological investigations prompted by development projects that required such assessment as part of regulatory compliance. An intensive research program by Washington State University in the late 1960s nearby to the north along the coast at Ozette resulted in an abundance of information about pre-contact traditional subsistence, settlement, technology, and ecology of important prey species (e.g., Gustafson 1968; Huelsbeck and Wessen 1994). Although a short distance north of the currently adjudicated fishing grounds of the Quileute, the Ozette site contains the best-preserved and most well-studied data set regarding pre-contact hunting, fishing, and gathering anywhere along the outer coast of Washington. The results of archaeological investigations at Ozette therefore provide general information about the availability of marine resources and the technology needed to harvest them by the broader group of marine-oriented Native cultures on the Washington coast, including the Quileute.

Within the heart of La Push, more limited test excavations were made in 1975 as part of the regulatory compliance process for a municipal sewer project by the University of Washington Office of Public Archaeology, resulting in a dataset much smaller but still informative of traditional hunting and fishing practices at the ancestral village for at least the past 800 years (Duncan 1981). Additional sampling by Schalk and Powell (1997) and Wessen (2006) confirmed the extraordinary depth and diversity of the archaeological deposits at La Push. Although there have been relatively few opportunities to gather archaeological data within Quileute traditional territory, a large-scale management study covering the entire Olympic Peninsula was developed for the National Park Service that synthesized existing archaeological data with a theory-based model of Native American land use since the end of the Ice Age (Schalk 1988). A more recent study compiles existing archaeological information about traditional offshore marine resource use (Schalk 2014).

Archaeological data speaks most directly to the definition of TEK practices in terms of which animals and plants were being harvested and/or processed at a particular location and at a particular

time. However, while the archaeological sites themselves are located in a specific place on the landscape, the resources found in them can represent subsistence from both local and distant procurement efforts. Although the preservation of wooden implements, watercraft, and structures has garnered the most attention at Ozette, analysis of plant remains also found that the range of vegetation and vegetation communities in the intertidal, coastal, forest, and prairie environments were accessed (Gill 1983). Detailed analyses of the Ozette fauna indicates that over the centuries leading up to and during initial Euroamerican contact there was a reliance primarily on locally available animal species, some of which are now locally extinct or greatly depleted – such as sea otter, pelican, and albatross (Huelsenbeck and Wessen 1994). Taxonomic breadth and diversity of animals identified at Ozette are remarkable: 90 species of invertebrates that include clams, gastropods, chitons, cephalopods, sea urchins, crabs and barnacles – but predominantly California mussel, littleneck clam, and Sitka periwinkle; 42 species of bird, primarily waterfowl taxa but most identified specimens of a single taxon were gull; 27 species of fish both marine and anadromous – predominantly greenling, lingcod, halibut and salmon; and 27 species of marine and terrestrial mammal – predominantly gray and humpback whales and northern fur seals, with lower quantities of sea lion, porpoise, and elk. The abundance of whale bones in the Ozette assemblage may reflect hunting summer-resident gray and humpbacked whale populations, and salmon bones may be remains of a rich Lake Ozette sockeye salmon population. The modern absence or rarity of some taxa present in the archaeological record, such as northern fur seal, may indicate habitat degradation or commercial over-exploitation (Gustafson 1968; Huelsenbeck and Wessen 1994). The paucity of others, such as herring and smelt, may reflect recovery bias caused by relatively limited fine-screen recovery. The remarkably well-preserved wood, shell, bone and stone tool assemblage from Ozette also gives an unprecedented view of Native technology, including implements used for hunting, fishing, and gathering resources.

Although based on smaller excavated volumes and assemblage sample size, analysis of the shell midden deposits at La Push identified a variety of marine mammals (northern fur seal, California sea lion, and whale – but no harbor seal), terrestrial mammals (beaver, deer and elk), birds (loon, falcon, thrush, robin, crow, goose, duck, scoter, pelican, cormorant, gull, tern, auk, puffin, fulmar, and petrel), and shellfish (primarily butter clam, California mussel, and native littleneck clam, with lesser numbers of barnacles, whelks, and gastropods). These taxa represent not only local food-gathering activities near the village at La Push, but also open-water forays within the usual and accustomed fishing grounds of the Quileute to obtain sea mammals as large as the blue whale (Reagan 1917; Trites and Robertson 2014). Fish remains are not differentiated in Duncan's published report, nor are plant remains mentioned, and the only quantification of the faunal remains is within the broad categories of Mammal, Fish, Bird, and Shell (Duncan 1981). This highlights the data gaps present in the archaeological record that are in all likelihood derived from excavation and sampling issues. In terms of the traditional technology present at the ancestral village at La Push, a variety of stone and

ground bone and antler artifacts were recovered from the project, some relating to fishing (net weights, bipoints, etc) and some to sea mammal hunting (harpoon valves). A more recent archaeological investigation within one portion of the site damaged by construction yielded a similar marine-oriented faunal assemblage, and the addition of harbor seal (Wessen 2006).

Ethnographic Data

Ethnographic research – the study of contemporary cultures through direct observation and analysis of historical documentation - is a cornerstone of TEK studies, whether conducted by non-Tribal anthropologists as has been done for over a century among the Quileute and their neighbors, or by the Tribal community itself, which has increasingly become the standard for these kinds of studies. Culture is adaptable and subject to change, and changing climate provides a framework for ethnographic study that results in a longitudinal perspective on the interaction between people and their environment. This helps contextualize TEK, given the multiple sources documenting relationships between people and environment, and a reflection of cultural values of the community. TEK is focused on the Tribal community and its relationship to its homeland, and how the members of that community perceive of and interact with subsistence resources and habitats. TEK is also a way to understand cultural transmission as it operates under environmental changes taking place in the span of single lifetimes and over the course of generations. TEK is critical to understanding traditional economies and subsistence cycles. A corollary of this perspective is the expectation that as climate changes, and with it the various ecological niches of the Quileute homeland, so will the TEK of the Quileute community.

Oral history documentation is a centerpiece of ethnographic data collection. The written European American historical record for North America, though at times a useful source of information, lacks the time depth of histories and traditions passed down through generations of Native peoples by the spoken word. In addition, because knowledge was shared orally from one generation to the next, rather than relying on written records, it has a different breadth and depth and therefore is an important complement to written histories. Written records tend to be selective and synchronic in what they document, while oral tradition was the primary source of conveying Native knowledge. Oral tradition also served the critical role of passing on generations of information and can therefore be more diachronic in scope.

As with inferences made from the archaeological record, there are both benefits and limitations of ethnographic data. Historically, one of the unique characteristics of cultural anthropology is that it is based on fieldwork by ethnographers, embedding themselves into a community and engaging in participant observation, and providing the perspective of the Tribal community. A benefit of ethnographic research is that, in addition to direct documentation of the relationship between a people, their homeland, and the various environments comprising the landscape around them, it also

emphasizes the intangible and non-quantifiable aspects of culture which are either absent in the archaeological record or require inferences based on often-scant proxy data. These non-material aspects of culture include language, place names, ritual and spiritual association with activities central to the traditional economy, and settings for traditional stories. These are impossible to obtain from anyone but a member of the Tribal community who is familiar with them, a fact that is now recognized by some federal and state governmental agencies as consultation with Tribes increasingly considers Traditional Cultural Properties and other kinds of cultural resources that do not fit into conventional classifications (e.g., archaeological sites and historic buildings). Even at its most basic level, ethnographic research is useful in that it documents human behavior, often including subsistence resources and utilized habitats. This information is usually applied for specific purposes depending on the ethnographer's research design, but may overlap when ethnographic data lend themselves to multiple lines of research, such as place name studies that help define territory and must also be considered by land managing agencies. Lastly, although it does not entail the millennial-scale time depth of the archaeological record, ethnographic work still provides a diachronic perspective on culture, beginning in the early contact period through the present.

Among the limitations of traditional ethnographic research is that it generates data usually derived from a few select informants, and relies on these few individuals to obtain information about an entire community. While these informants may provide extensive descriptions of a culture at the time of the fieldwork, such information may also be fraught with methodological problems and potential misrepresentations. Some informants and researchers may have personal, factional or professional biases, they can contradict themselves, and they can represent self-interests or career advancement. In the past, much ethnographic research was done without any, or at least any meaningful, consultation with a Tribal government, which had no input into who spoke for them or the information written about them, much less how information would be used. Given 2006's Executive Order 13175 and a followup memorandum from President Obama in 2009, the federal agencies have put forth more effort to develop consultation policies. The proactive role the Quileute Tribal government and community have taken has also played a major role over the past several decades to produce or support ethnographic research and other cultural studies.

Quileute Ethnographic Studies

Anthropological research conducted with Tribes on the Olympic Peninsula, including the Quileute, can be divided into roughly three kinds: heavily descriptive ethnographies conducted first as "salvage" studies by the federal government and then as part of broader academic research programs; studies prompted by court cases regarding traditional Tribal territory and fisheries; and studies tied to land and resource management by various government agencies, most notably the National Park Service. Initial ethnographic research was conducted under the auspices of the Bureau of American Ethnology (BAE) through the Smithsonian Institution, and is now referred to as

“salvage ethnography.” This was predicated on the perception that since the pre-contact economy of Tribes was being irrevocably altered as they were being brought into the dominant capitalist economy, their culture was doomed to extinction. Subsistence economies would be replaced by commercial and agricultural economies and languages would be lost as the English language and Christianity were forced upon Tribes throughout the country.

Beginning with Leo Frachtenberg, an anthropologist who worked for the BAE from 1913 to 1917, ethnographers working during this era sought to record as much of what they considered base-line “traditional” culture as they could, focusing primarily on detailed descriptions of various aspects of culture, and less on explanation of cultural processes and mechanisms. Their areas of study included aspects of the language, social and political organization, family relations, place names, residence patterns, male/female relations, oral history and mythology, spiritual and ceremonial life, the traditional economy, and defining traditional territory in terms of fishing, hunting and gathering. Albert Reagan, a professor at Brigham Young University, briefly lived among the Quileute as a schoolteacher in the early 20th century and wrote “Plants used by Hoh and Quileute Indians” (1934), which identified plants used for food, medicine, and material culture, as well as their harvest and any traditional stories associated with them. According to Pettitt (1950:30), Reagan also documented the names of 20 villages.

By the mid-20th century, anthropologists continued descriptive information-gathering fieldwork but also began recognizing the persistence of Tribal culture through adaptations to external post-contact social and economic pressures, as well as some of the inherent ethnocentrism of earlier attitudes by anthropologists. In addition, emphasis began being placed on explanations of various cultural processes they observed and the mechanisms behind the changes documented between pre- and post-contact times. While an anthropology student at the University of Washington, Ram Raj Singh documented traditional hunting and fishing of the Quileute and their neighbors, and studied in detail the concepts of individual and family property, both tangible and intangible. He published the results of his studies in 1966, as “*The Aboriginal Economic System of the Olympic Peninsula Indians of Western Washington.*”

One of the most prolific and notable ethnographers to work with the Quileute in the modern era is J. V. “Jay” Powell, who produced “Place Names of the Quileute Indians” (1972), which lists 134 place names in Quileute traditional homeland, with Quileute name, translation, and English name, and description of naming conventions. In “Quileute Exploitation and Maintenance of Prairies in Traditional Times” (2002), he discussed the cultural context of prairies in Quileute traditional territory, highlighting five major prairies and their traditional use by families, and concepts of ownership and prairies as the settings for traditional stories.

Information collected by anthropologists has been used in legal cases between Tribes and the State of Washington, and between Tribes and the Federal government. In the *United States v. Washington* case, some intertribal cases have arisen under that particular ongoing lawsuit, as well, regarding scope of treaty fishing. Much of the information pertinent to the legal cases was related to defining territory; early place names studies and descriptions of fishing areas and became evidence in court decisions regarding usual and accustomed fishing grounds. Some of the early research also covered hunting and gathering. There was a degree of overlap by some ethnographers who worked in the early “salvage era” and the later era of anthropological research. Most notable was Verne F. Ray, whose research among the Quileute in the mid-20th century while at the University of Washington spanned both periods and was influential in the Indian Claims Commission, especially his testimony regarding traditional exclusive territory and boundaries, trails and travels corridors, place names, settings for traditional stories, residence patterns, hunting, fishing and gathering (Ray 1956).

Anthropological research among the Quileute and their neighbors continued in the latter part of the 20th century through the present, sometimes driven by court cases regarding traditional fisheries. Barbara Lane’s 1977 “Traditional Marine Fisheries of the Quileute and Hoh Indians” was prepared during the legal proceedings over Washington’s traditional fisheries that gained national attention in the late 1970s, which relied heavily on anthropological evidence to establish the scope of the litigant Tribes’ respective treaty rights (e.g., Cohen 1986). This case remains in open status to continuously explore such rights, and anthropology continues to play a key role in the decisions. In the document, Lane discussed the seafaring renown of the Quileute, how their traditional economy was intricately linked to the ocean, which marine animals were harvested, what methods of whaling and sealing were used, and where coastal villages and place names were located. Daniel Boxberger compiled an exhaustive chronology of anthropological research that focused on maritime resources, and presented this in “An Ethnohistorical Analysis of the Quileute Indian Tribe Ocean Fishery” (2014). As the ethnohistorical counterpart to Schalk’s (2014) archaeological study noted above, this report contained a detailed history of contact, history of treaties, history of court cases, detailed discussion of fishing areas, and history of research conducted by ethnographers and linguists, a review of material culture, especially related to salt-water harvest of whales and seals and detailed discussion of method and ritual associated with sealing and whaling. James E. Hoard’s “On What ‘taking fish...in common with the all citizens’ in the Treaty of Olympia Meant to the Participants...” (2014) is a linguistic analysis focusing on the meaning of the word “fish,” as an animal that inhabits the water, in the context of Treaties.

Since the 1960s, and more extensively since the 1990s, Federal laws have been implemented that require consideration of cultural resources during planning of all federally funded or permitted undertakings. Ethnographic information has increasingly been integrated into broader planning and management documents intended to guide use of public lands. An early, local example is Powell et

al's "Sol Duc Pilot Watershed Analysis" (1995), produced for the Olympic National Forest. This document provided a detailed inventory of habitats and resources focused on the Sol Duc , and discussed Quileute Tribal cultural resources, including a list of 71 culturally significant places, settings of traditional stories, animals and plants used in the watershed, and prairies which were game habitat and maintained by burning. Studies were also produced under Tribal guidance and with Tribal input. Dr. Powell continued his ethnographic research with the Quileute and other Olympic Peninsula Tribes. For example, Powell and Morganroth's "Quileute Use of Trees & Plants, A Quileute Ethnobotany" (1998) was produced for the Quileute Tribe's Natural Resources Department and describes traditional knowledge of plants, their uses, harvest times and methods, and also considers the spiritual component of ethnobotany.

Regarding the marine ecosystem, Shaffer et al.'s "Native American Traditional and Contemporary Knowledge of the Northern Olympic Peninsula Nearshore" (2004) was produced for the Olympic Peninsula Intertribal Cultural Advisory Committee, and provides an overview of the use of marine resources by one or two representatives from each of five tribes on Olympic Peninsula. Peer-reviewed publications resulting from collaborations between Tribal and federal agency scientists have become much more common over the past two decades.

Traditionally Important Resources

The Quileute and their neighbors traditionally utilized a very broad array of marine and terrestrial animals and plants for food, medicine, and fuel, and as raw materials to manufacture their rich material culture. Some taxa are prominently noted in ethnohistoric accounts and ethnographic documentation. Other important animal and plant resources comprised the majority constituents of archaeological shell middens, reflecting their importance as well. A list of traditionally used resources inhabiting the nearshore marine environment is given by Shaffer et al. (2004:52-63). The social and ceremonial aspects of different kinds of subsistence activities were reflected in several "secret" societies historically maintained by the Quileute and their neighbors, which placed individual importance on the different specialized skill for different species of animals. Frachtenberg (1921) studied these societies and their rituals among the Quileute. Several technical reports of nearby archaeological investigations provide complementary data (e.g., Duncan 1981; Huelsbeck and Wessen 1994; Wessen 2006).

Invertebrates

Invertebrates, in consideration here as most frequently harvested include three scientific phyla: a) mollusks such as bivalves (e.g. clams and mussels), gastropods (e.g., snails, limpets, and abalone), cephalopods (octopi and squid), and chitons; b) arthropods, which include crabs, shrimp, and barnacles; and c) echinoderms such as sea urchins. The conventional term "shellfish" is a category that subsumes many of these taxa, regardless of the presence or kind of shell they bear, but is

avoided here given its different connotations when considered in scientific, socio-cultural, or commercial harvest contexts. Regardless, invertebrates have played a continuously important role in traditional Quileute subsistence extending back millennia. Their remains – the shells of mollusks (and their beaks, in the case of cephalopods) and arthropods, and the tests, spines, and other hard parts of sea urchins – comprise a substantial volume of archaeological middens along the coast, and are also found inland on former shorelines elevated by tectonic processes above modern sea level (Duncan 1981; Wessen 1994; Wessen and Huelsbeck 2015). Ethnohistoric observations and ethnographic studies indicate that invertebrates were an important part of the traditional diet and economy, consumed locally and processed for trade with other Tribes (Ray 1954), and retain importance to the Tribal community today. A tremendous amount of traditional knowledge supports historic and modern collecting of these animals, by directing gathering practices in the right seasons and with the right methods to help ensure safe and sustainable harvests (Shaffer et al. 2004:11-17).

The variety of traditionally harvested invertebrates mirrors their biogeographic diversity in the littoral, and to a lesser extent nearshore, environment. Most bivalves are sessile, or immobile, during most of their lifespan, and serve as a year-round, easily procured and nutritious resource. Other invertebrates such as crab and octopus move throughout the nearshore environment and supplemented the traditional diet as well. Although almost 100 distinct invertebrate taxa have been identified in the local archaeological record, both archaeological and ethnographic data indicate oysters, mussels, clams (especially littleneck, butter, and razor clams, as well as blue mussels), chitons, and octopus were the most intensively harvested invertebrate taxa in early times. Today crab is a major commercially harvested species by the Quileute.

Bivalves are extremely sensitive to habitat perturbations because they are primarily sessile animals that filter the sea water in which they live for sustenance. Shells from shell midden sites yield environmental proxies such as molecular isotopes in certain ratios and changing widths of growth rings in single individuals, making them valuable indicators of the environmental conditions of a shoreline at a specific point in time. Shell deposits, whether cultural middens or former natural death assemblages, found in places that are no longer active shorelines may reflect either gradual environmental change such as rising sea levels or abrupt changes such as tectonic uplift. Replacement of a substrate type (e.g., mud, sand, gravel) that a particular invertebrate taxon relies upon may occur as erosion increases or decreases, which may be tied to changes in sea level, wave fetch patterns, and/or sediment sources located elsewhere along the shoreline.

Some invertebrates are dependent upon lower intertidal kelp beds, particularly sea urchin whose health is directly connected to the health and abundance of kelp beds that are sensitive to sedimentation (Shaffer et al. 2004:14). A reduction in the abundance and individual size of blue mussels is attributed by Quileute elders to changes in nutrient availability, nor are certain kinds of

chiton seen at the same numbers as they were in the past (Shaffer et al. 2004:15). In some cases, non-Native recreational harvest of certain invertebrate taxa has also likely contributed to their decline, as in the case of littleneck and butter clams between La Push and the mouth of the Hoh River (Shaffer et al. 2004:16).

Given anticipated climate change over the coming decades that will entail changes in sea level, as well as temperature, salinity, and acidification of marine waters, this traditional resource will likely undergo negative biological impacts. Utilization of a diverse array of shellfish taxa and various invertebrate habitats has been a hallmark of traditional harvest, which may mitigate the effects of climate change to some extent.

Fish

Traditional use of fish by the Quileute includes species considered ecological keystones, such as salmon (chinook, coho, and sockeye; less so the steelhead in treaty times, although extensively today) and smelt (surf smelt and night smelt especially) (Powell et al. 1996:I-16; Powell et al. 1998:B-26), and other commercially important species such as halibut and black cod (sablefish). Other taxa that have received less attention by industry and fisheries scientists were still important sources of food and bait, such as sculpin and surfperch. The archaeological record, as seen at Ozette and La Push, suggests focus on harvesting fish in the open water. The small numbers of herring identified at Ozette and smelt at La Push indicate a recovery bias that likely does not reflect the importance of these small keystone species that were important prey for humans, as well as larger fish and sea mammals (Huelsbeck 1994a; Wessen 2006).

Ethnohistoric observations and ethnographic studies indicate that anadromous fish, principally salmon (primarily Chinook and coho), were an important component of the traditional economy. The places along rivers where fish were harvested were named and identified with specific families, with rapids being the focal fishing places. The traditional fishing practice included a variety of traps, tools, and nets. Fish were smoked for storage using vine maple or alder (Ray 1954). Other fish noted in ethnographic research include steelhead, halibut, flounder, cod, sturgeon, as well as silver eels (e.g., Ray 1954). Fish that were caught in the open ocean were harvested using a variety of different lines and hooks. Today, black cod and halibut are the most important open-water fish for Quileute commercial harvest. Although black cod bones have yet to be identified in shell midden remains along Washington's outer coast, recent analysis of fish remains elsewhere on the Olympic Peninsula indicate this may be a product of persistent mis-identification on the part of archaeologists (Nims 2016), and that local shell middens may indeed contain a record of pre-contact use of this fish.

Response of certain fish taxa to environmental change has been the focus of study by fisheries scientists for decades, although the progress made in understanding patterns such as salmonid return rates and climate forcing mechanisms has yet to be well understood in terms of these patterns'

effects on traditional fisheries. Pre-contact fishing patterns as seen in the archaeological record show general continuity through time in fishing patterns; with differences in fish bone assemblages between houses excavated at Ozette attributed to social differences and contemporaneous families harvesting in different family-owned fishing territories (Huelsbeck 1994a:86). Unpredictable weather makes fishing in the oceans more dangerous; fishermen report that glaciers and icefields on coastal mountain ranges were used as landmarks, and their decline has made traditional navigation more difficult (Papiez 2009).

Birds

Traditional use of birds in this region is known from relatively small but taxonomically diverse archaeological assemblages from Ozette and La Push, and passing mention in ethnographic notes. Although interpretations of archaeological data based on specimen counts and meat weight estimates suggest that bird hunting was secondary to sea mammal harvesting and fin-fishing in terms of importance in the seasonal subsistence cycle, their importance in terms of taste and non-food uses is highlighted in ethnohistoric observations (e.g., DePuydt 1994:249; Swan 1869). Pelagic birds, notably albatross, are relatively well-represented in pre-contact Quileute shell middens (Schalk 2014; Wessen 2006), and albatross is specifically mentioned by James Swan as a species given to him by a Quileute chief (Boxberger testimony, *US v Washington*, Subproceeding 09-1, 3/12 Tr. pp. 112:25-114:7). Because their traditional territory includes the major ecotone where open ocean meets the rivers, prairies, wetlands and uplands of the Olympic Peninsula, the Quileute had access to waterfowl and other resident birds available year-round as well as birds that usually spend their time well out over the open ocean or trans-continental migration routes. Bird species reported as prey include ducks (including shaggy ducks), geese, grouse, as well as gulls as sources of eggs. Migratory bird hunting began in May, and these were shot with arrows or snared, while gull eggs were collected in June, especially from the offshore islands.

The more local archaeological bird bone assemblages show a variety of species that served the needs for food, as well as bones, feathers, and other anatomical parts for making tools, clothing, and other items. However, these assemblages do not shed light on changes in bird procurement or the health of their populations over time (DePuydt 1994; Duncan 1981). Some bird taxa have historically become more abundant, but as a result of environmental change and not in a way that benefits traditional subsistence. For example, some Canada geese have become resident to the region as farmland has increased and provide a year-round source of food for the geese (Shaffer et al. 2004:27).

Marine Mammals

Marine mammals have always played a central role in traditional lifeways of the Quileute and other northern coastal Washington Tribes, setting these groups apart from other Native groups in

Washington and the southern Northwest Coast. Marine mammals, most notably whales and fur seals, are well-represented in both the local archaeological and ethnographic records, and have been the focus of modern fisheries biologists for several decades. For these reasons, the relationship between coastal Washington Native peoples and marine mammal resources is perhaps one of the most informative lines of evidence for traditional adaptations to environmental change.

Archaeological data sets provide insight into change over time in the methods and targets of traditional sea mammal harvest. The Ozette assemblage is the largest and most thoroughly studied archaeological assemblage of marine mammal bones in the region (e.g., Gustafson 1968; Huelsbeck 1994a), although the shell midden at La Push exhibits the same general taxonomic profile indicating a focus on marine mammals including fur seals and whales (Duncan 1981; Reagan 1917). Archaeological and ethnographic evidence demonstrates over 900 years of regular fur sealing up to 50 miles offshore by the Quileute people. Over 90% of the mammal bones in the La Push midden are fur seal bones (Wessen 2006). Fur seal biology demonstrates a centuries-old migratory path 30-60 miles offshore of the Washington coast (Trites and Roberson 2014).

Ethnohistoric observations and ethnographic studies indicate that the Quileute were a renowned whaling group, and that whaling was an extremely important activity in the traditional economy and “considered the highest occupation” (Andrade 1931; Frachtenberg 1916; Howeatt and Payne 1916). A diverse and technologically sophisticated material culture was used to harvest whales, including canoes, paddles, harpoons, and floats. One of the more iconic whale species along the coast of Washington, the gray whale, was traditionally hunted in May during the seasonal round. Other species, such as finback whales and humpback whales, were also traditionally hunted on an annual basis. The cultural significance of whaling was emphasized by the high degree of ritualized behavior associated with it, and the specific rules which determined the sharing of the meat with those who contributed to the hunt (Frachtenberg 1916; Singh 1966:44,79).

Alongside whaling, harvest of sea lions, hair seals, sea otters, and porpoises was an important part of the traditional economy (Singh 1966). They were usually harvested from March to July during the seasonal round. There was an important spiritual component to sealing, such as avoidance of certain foods on the part of the sealer, which was as important as mastery of equipment and skill in pursuing these prey.

Terrestrial Mammals

Harvesting of terrestrial mammals was an important part of the traditional economy of the Quileute and other Tribes on the Olympic Peninsula. Archaeological and ethnographic evidence suggest the importance of some of these species, such as elk, deer and bear, were seasonally hunted and interwoven within the social fabric of Quileute culture (Ray 1954). The presence of terrestrial mammal remains in archaeological shell midden deposits confirm hunting forays along the coast and

into the interior to capture mammals both large (bear, elk, and deer) and small (e.g., beaver, raccoon), but in much smaller proportions than marine mammals. As noted above, some of this may be from the various biases inherent in data only available from coastal shell midden deposits.

Ethnohistoric observations and ethnographic studies contribute additional insight on traditional use of land mammals. They indicate that elk were hunted with bows, traps, and were also driven, and their meat was dried. Deer hunting areas have been identified, and sometimes associated with specific families. Elk and blacktail deer were traditionally hunted from June to August using bows, arrows, drives, and snares (Singh 1966: 65), and elk hides were trade items and used to construct temporary hunting shelters. An effort was made to hunt elk near canoe landings, for ease of transport back to camps and villages. Mature elk were preferred for their higher quantities of fat; elk hunting required spiritual expertise and assistance. Deer and bear were also trapped, with specialized deadfalls designed for bear in the late fall (Singh 1966: 42). The meat of elk, deer, and bear was often wind- or sun-dried and sometimes smoked as well, with the fat cut away from the meat to dry separately. Beaver and land otters were speared and caught in creeks and streams in November, often using logs to block the flow of water. Rabbits were also hunted or snared, and their meat was usually eaten fresh.

Hunting in the interior for game such as deer and elk is a traditional lifeway that has persisted even as other subsistence pursuits such as fishing and marine mammal hunting have fluctuated over the past century under shifting federal regulations and reconciliation with treaty rights, as well as from highly visible environmental changes to habitats and prey populations. Still, terrestrial mammals are dependent on habitat stability, and climate change that alters vegetation communities and hydrography has the potential to affect the productivity and accessibility of certain taxa. Changes in forest- and brush-fire regimes, for example, can cause prairie habitats and their ecotonal margins near woodlands to expand or contract, which may attract browsing ungulates such as deer and elk if prairies expand, or make them less aggregated and harder to hunt when forests encroach upon prairies.

Plants

Most cultures south of the Arctic rely on plant resources in at least equal parts as on animals, and the the peoples of the outer coast of Washington are no exception. Plants have traditionally provided food, fuel, medicine, and (especially in the case of cedar) the raw material for making everything from houses and canoes to baskets and lengths of cordage. The importance of plant resources in the seasonal cycle is reflected in the traditional Quileute calendar, with some of the phases from March through early September named for particular plants (Powell and Morganroth 1998:3-4). As noted above, the archaeological record tends to underrepresent the importance of plants in Native subsistence, material culture, and other traditions. The Ozette site is an exceptional

archaeological case study, combining singular preservation conditions with a comprehensive analysis not only of subsistence plant remains but also the vast and sophisticated material culture made from wood and fibre (Gill 1983).

Ethnographic accounts provide a much richer picture of traditional plant use. The harvest of plants for food began in approximately March, which is called *xitsxits'alikitiy'at'*, or "skunk cabbage getting days."² Roots were harvested with a four-foot digging stick, often with a handle mounted to it; when sun-dried on mats, edible roots could be kept up to a year. The primary root was camas, which was harvested in the prairies in the spring, and then dried and sometimes traded (Wray 1997: 24). Ferns were also important and harvested from November to April, and included bracken, swordferns, ladyfems, woodfem, as well as licorice fern. Berries were harvested near prairies, including salmonberry, red huckleberry, blue huckleberry, salalberry, thimbleberry, strawberry, elderberries, lowbush cranberry, trailing blackberries, the introduced Himalayan blackberry, gooseberry, crabapples, stink currants, rose hips, and Oregon grape. Berries were eaten raw, cooked with other foods or by steaming in earth ovens covered with wet skunk cabbage, or by dried. Preserved berries were then stored in baskets of hemlock or cedar bark. Salalberries could be mashed into cakes and dried. Other plants traditionally eaten included clover roots, buttercup, tiger lily, horsetail, cattails, wild lettuces, and wild parsnip, and beargrass, Devil's club, Nootka rose, various mushrooms, and cascara. Skunk cabbage and cascara bark were used medicinally; the former also used as a means of cooking and serving food. Wild lily of the valley was used for an eye wash. Trees, most notably western red cedar, were an important source of wood for canoes and bark for shelter and clothing. The wood, bark, needles, and roots of hemlock, spruce and fir were also commonly used. Red alder was used to smoke meat and fish, and the flexible and usually straight branches of vine maple were ideal for many tools and traps (e.g., Ray 1954; Reagan 1934).

Plants, similar to many invertebrates and schooling fish such as herring and smelt, are an ecological foundation at the bottom of the food chain, providing sustenance to almost every kind of animal, including humans. Major changes in vegetation communities on the Olympic Peninsula since the end of the Ice Age have been inferred from a variety of paleoecological data, and hypothetical changes in human land use have been modeled from these reconstructions (e.g., Schalk 1988). Unfortunately, the archaeological data have yet to be generated with either the time-depth or resolution to meaningfully test this model.

² Coastal villages had different names for the times of the year (Powell and Erickson 1996:I-16). For example, the March timeframe is known as *yashabalktiyat* ("fur sealing time") (Powell 2011).

Traditionally Important Environments

Similar to general resource types, we classify into several broad types the environmental setting of traditional Quileute territory, which is a spectrum that includes starkly demarcated habitats such as the open ocean, as well as ecotones with transitional physical and biological characteristics, such as the coastal lowlands that host animals and plants that tolerate other habitats as well. At the other end of the range of habitats traditionally used are the meadows and headwaters of the Quillayute River in the alpine zone of the Olympic Range. Each general environmental category is characterized by a different suite of plants and animals, and is in turn differentially sensitive to environmental perturbations, both natural and anthropogenic.

Open Ocean

The deeper waters of the Pacific Ocean, near and beyond the edge of the continental shelf, host a variety of important traditional resources that were accessed by the Quileute, who expertly used watercraft and specialized gear to obtain whales and other sea mammals, as well as fin-fish such as halibut and ling-cod (e.g., Schalk 2014; Trites and Robertson 2014). Sea birds and other marine fish would have been accessible during these harvests as well.

Dr. Barbara Lane wrote that the Quileute “pursued whales, seals, sea lion, porpoise” (1977:1). Frachtenberg wrote “in the ocean they fished for smelt, bass, puggy, codfish, rock, red, lingcod, halibut, flatfish, bullheads, devil fish, shark, herring, sardines, sturgeon, seal, sea lion, porpoise, and whale (1916:49),” and he included field drawings of implements that the Quileute used for whaling and sealing embedded in his text. In addition to the work of ethnographers, Robert Lee, a Quileute born in 1878, reported on fur sealings to the Taholah Indian Agency in 1938. On several occasions he had been “out to the blue sea, reported to be 40 miles” (Lee 1938:1). Sealing continued into the 1930s and is documented in photographs (Kirwin 1936).

The sensitivity of the Pacific Ocean to cyclical weather change has been seen within our lifetime, retold by members of the past several generations. The increased frequency and severity of storms, changes in wind patterns, and increased damage from wave action are recounted by Quileute elders in recent interviews (Papiez 2009:47-48). These changes have been scientifically documented over the millennia in paleoecological record of the eastern North Pacific Ocean as well (e.g., Mann et al. 1998). Perturbations in the open ocean habitat that affect the marine resources that rely upon it include physical changes such as fluctuations in sea surface temperature, chemical changes such as salinity and acidification, biological changes such as large algae blooms, and combination effects such as shifts in nutrient upwelling patterns during ENSO events.

The range of environmental changes noted above can occur at different temporal scales: the Medieval Warming Period and Little Ice Age were changes in climate that occurred over centuries

from AD 900 to AD 1350 and from AD 1350 to AD 1900, respectively (Mann et al. 1998). Pacific-Decadal Oscillation (PDO) is a pattern of weather variability that tends to fluctuate, as the name implies, over the course of about 10 years on average. Changes at millennial, centennial, and decadal temporal scales have been correlated with salmon productivity in various parts of the eastern North Pacific Ocean (e.g., Finney et al. 2002; Mantua 2009; Rogers et al. 2013). Although the specific weather change signals and the different direct effects they have on plants and animals of the ocean are often difficult to parse out, the interconnectedness of the food web means that even small changes in one aspect of the Pacific Ocean's physical or biological character can have profound consequences on important traditional resources.

Nearshore Marine Waters

The nearshore marine waters offered, and so far continue to offer, greater productivity to coastal Washington Native communities, in terms of resources that can be harvested by traditional means, than deeper waters of the open ocean. Some whale species feed in these nearshore marine waters (Trites and Robertson 2014). Some pinnipeds prey on nearshore fish as well, and sea lions and harbor seals feed and haul out in safe places along nearshore marine water. Beds of eelgrass and kelp provide food and shelter for a wide array of fish and sea mammals (notably sea otters). Some species of mollusk and echinoderms, such as urchins, prefer the subtidal zone of nearshore water; although harder to gather, they were traditionally used for food and raw material. Some birds congregate along this zone, feeding on small fish and invertebrates. Kelp is a key indicator of the health of the nearshore habitat zone, supporting invertebrates, fish, sea mammal and bird populations as a keystone species; elders have noticed the loss of kelp beds in recent history (Shaffer et al. 2004:21-22). This loss might be due in part to human actions, such as two major oil spills and the intermittent influx of sediment from storms after timber harvest (personal communication, Krueger, 2016).

As the ecotonal extension of the Pacific Ocean into shallow water bordering dry land, the nearshore environment is subject to a similar set of changes over varying spatio-temporal scales. Living resources within the nearshore environment are perhaps more sensitive to some additional aspects of climate change. For example, plants and animals adapted to the shallower water of the nearshore environment would have less tolerance to changes in sea level, which would in turn affect the temperature of a much narrower water column. With less volume of water in the nearshore environment in contrast with the open ocean off the continental shelf, the effects of chemical changes such as increased acidification or decreased salinity would be more acute. Similarly, biological changes such as algae blooms and the combination effects that result from changes in nutrient upwelling are critical in this environmental zone.

Littoral

The ocean meets the land most abruptly along the intertidal zone of Washington's outer coastline. Substrates vary along the length of the littoral zone in areas of Quileute traditional usage, in turn hosting different communities of invertebrates. Blue mussels, barnacles, chitons, and limpets, for example, require rocky, high-energy habitats exposed at low tide, while some clams prefer to burrow within sandier, lower-energy beach substrates. Estuaries host littoral zones exhibiting a more subtle gradient of salinity, and often lower wave energy, where rivers and streams empty into tidewater, although the typical estuarine ecosystem is not prevalent within areas of Quileute usage. Lower-energy, muddy substrates favor certain kinds of clams. Some birds and mammals use the littoral zone as a place to forage as well as a thoroughfare.

Powell attributed a generational shift - from open local clam bed access earlier in the 20th century to more protective attitudes about knowledge of productive gathering grounds today – to the decreasing abundance of intertidal resources. Powell (2003 in Shaffer et al. [2004:12]) also quoted Fred Woodruff noting that, “there’s getting to be no wealth on the beach anymore,” meaning mollusks on the beach that were good for potchatching were also no longer as plentiful.

Similar to the marine environments of the open ocean and nearshore, littoral habitats are sensitive to oceanic climate change. The physical consequences of climate change are perhaps the most profound effects – even very small changes in relative sea level, as well as sea surface temperature change, can extirpate local populations of a particular animal or plant taxon that lives in the intertidal, where tolerances for specific temperatures, wave energy, and substrate are often very narrow. Chemical changes, particularly pH and salinity, have a profound effect on many invertebrates that incorporate the chemical composition of the surrounding water into their shells as they grow. Biological changes, such as algal blooms (often tied to changes in nutrient availability from upwelling, and changes in water temperature), periodically make local filter-feeding bivalve populations, and even visceral parts of crabs, unsafe for human consumption because of the levels of bioxins produced. The littoral zone is also particularly sensitive to catastrophic environmental change; specifically tectonic events along the Cascadia subduction zone that raise or subside beaches by many feet in a very short period of time.

Coastal Plains, Prairies, and Lowland River Valleys

The lowlands that front the Olympic Range on west side of the peninsula are a broader environmental transition zone than the narrow strip of lowlands that characterize the north and east sides of the peninsula. This zone provided the Quileute access to the myriad resources of the temperate rainforest – wood, bark, and roots of cedar and other trees, as well as an understory community rich in plants for food and medicine. Many terrestrial mammals would be found in this zone. Prairies within this zone provided complementary animal and plant resources, as did the

riparian areas buffering rivers and streams, many of which host spawning salmon populations and other anadromous and freshwater fish. Wetlands within this zone also provided habitat for birds and plant communities different from the lowland forests.

Prairies deserve particular attention as important places within this broader environmental zone, concentrating the productivity of both plants and animals in relatively well-defined areas that changed in distribution and composition with shifts in climate and level of management by humans (Powell 2002). Specific prairies were sometimes identified with individual families (Singh 1966) and were burned to encourage growth of culturally important plants and to facilitate hunting (Ray 1954). Prairies were the habitat for plants such as ferns and camas and a variety of berries, and for deer, which were hunted from June to September (Powell et al. 1995:14). Prescribed burning occurred to maintain access and habitat for plants and animals. People camped in temporary shelters while on the seasonal round, and there was a system of trails connecting and leading to prairies. Each prairie had its own place name, and their existence of prairies may be attributed to “Thunderbird pausing to rest in carrying whales back to his lair, and the thrashing of the whale in attempting to escape back to the sea knocked over the trees and caused the open areas” (Powell et al. 1995: 2.1-7). As individual, historically discrete, and named habitats, just some of the notable prairies and associations are listed here:

- The mouth of Bear Creek, *t'sixokwasok*, “high up prairie area.”
- The Sol Duc Valley including Tyee Prairie and Beaver Prairie, *t'axital*, “hot place.”
- Prairie near Maxfield Creek, *talaykila k'ikilti*, “old-time elks' house”. This was where the Elk killed the Wolves who preyed on them by inviting them to a potlatch and then burning down the house, and then going to live in the forest, returning regularly to visit their old home.
- Forks Prairie, *kit'layakwoken*, “the upstream prairie,” where an evil being tricked hunters and killed them, and was then killed by a powerful shaman.
- Little Quillayute Prairie, *k'wadl'yakm*, “the little prairie.” Also the site of events important in oral history related to a woman and her future husband, as well camas diggers who set fire to the prairie.
- Quillayute Prairie, *sat'a'yakm*, “the downstream prairie.” A place known for fern roots, and where the character *Dask'ija* had a home. It was also where Deer's wife was killed by his friend Wolf.

The biotic environment of the coastal plains and prairies is less sensitive to physical changes such as shifts in sea level and sea surface temperature that can dramatically affect nearshore and littoral environments. However, it is much more sensitive to changes in atmospheric temperature and rainfall patterns that affect vegetation communities and hydrography, as well as forest fire regimes. Both ecosystems are subject to invasive species threats that can displace and/or

outcompete native species. In addition, shifts in the health and extent of one habitat type may lead to converse changes in another within this broad environmental zone. For example, growth of prairies would cause a reduction in lowland forest, and vice versa. Prairie habitats would remain stable in size and productivity with continued maintenance by Native communities.

Uplands and Alpine

Upland and alpine environments offered a more limited but still very important set of traditional resources to coastal Native groups. Certain berries and other kinds of plants thrive above the closed-canopy forest that characterize the coastal plains. Some species of smaller terrestrial mammals and upland birds traditionally harvested for non-food use require higher elevation habitats, while other animals such as elk migrate to this zone on a seasonal basis depending on availability of plants for browse.

Plants and animals in this zone are likely to have a lower tolerance for shifts in temperature and rainfall. Upland and alpine habitats are therefore more sensitive than coastal plains to changes in atmospheric temperature and rainfall patterns. There is less fuel for forest fires above the tree-line, but changes in forest fire regimes would possibly have more severe impact given the sensitive nature of alpine vegetation.

The TEK Record and Response to Climate Change

Climate change will, by definition, have an impact on all environments, and therefore on all species inhabiting those environments. For example, increased global temperature will accelerate the melting of snowpack and glaciers in the Olympic Range, which will alter the volume and flow of glacial and snowpack-fed streams and rivers, as well as altering the course of rivers and salmon spawning gravel beds, in some cases washing them away due to increased flows. This will also affect the temperature and composition of estuaries. The melting of permafrost is going to release vast stores of methane, which in the presence of water breaks down into carbon dioxide, a component in acidification. Both increasing ocean temperature and acidification will impact anadromous fish, because it will either displace prey (latitudinal shifts) or even adversely impact prey survival (corrosion of larval invertebrate shells or carapaces). The impacts to fish runs will affect the Quileute Tribal community and the cultural role that anadromous fish occupy in Quileute culture, and these impacts have yet to be studied and understood, much less determined. Because of the profound ties between the Quileute people and their environments, it follows that any impacts to the environment will also impact the Quileute. It should be noted that not only anadromous fish depend on the location or availability of prey, but also all the other predator marine or nearshore species, be they invertebrate or vertebrate, and among the latter, fish, bird, or mammal. Plants may benefit from increased carbon dioxide, but may not all be tolerant of increases in temperature or changes in precipitation patterns.

Traditional Ecological Knowledge has been identified as a tool for both identifying past adaptations to climate change and implementing measures to mitigate present-day and anticipated future climate change impacts (Vinyeta and Lynn 2013). TEK is a framework of inquiry that benefits most from collaborative input by Indigenous practitioners and the scientific community, and those whose work crosses into both of those fields (e.g., Whyte 2013). This study identified resources and past adaptations that may help address future climate change, but it has also identified fundamental gaps in this record that may be more a product of how anthropologists and historians have gone about their studies as it about real gaps in the record itself. In this sense, including TEK in educational curricula is one way not only to transmit important cultural practices that may help lessen or mitigate the effects of climate change, but may also prepare new generations to find better ways of addressing the shortcomings of data on past traditional lifeways. Indigenous groups have increasingly requested that the science used by state and federal agencies to make environmental management decisions take into account traditional knowledge (e.g., Vinyeta and Lynn 2013:21). Educational opportunities exist at this intersection, where both ways of knowing contribute to the health of Native communities (e.g., Krohn and Segrest 2010).

The record of traditional use of subsistence resources and habitats by the Quileute and their neighbors is rich, and assists with identifying important resources and subsistence traditions. The archaeological record contributes time-depth to a picture of traditional subsistence that focused on marine, nearshore, and littoral animals and plants within a seasonal round that also incorporated terrestrial animals and plants. The ethnographic record provides a much more detailed, nuanced view of traditional subsistence and other aspects of land-use, especially the range of plants that were used but rarely preserved or recovered from archaeological sites. Trade networks connected the Quileute with other Tribes, which along with diversification of foods and utilized habitats, and storage of resources such as salmon and whale would help alleviate periodic food shortages. The Quileute traded seals for hunting and fishing implements made by other groups, such as the Natives of the west coast of Vancouver Island (Lee 1938). Salal berry cakes and crabapples were obtained from Puget Sound Tribes in exchange for non-food items such as drumheads, dentalium shells, and raw materials for basketry (Pettit 1950: 10, 12; Powell et al. 1998: 24, 27, 32). The historic record of Quileute trade begins with the earliest contact with European mariners (Pettit 1950: 21) and is also included in recent ethnographic interviews. Wray (1997:137) gives a 1934 quote from a Quileute man, Harry Hobucket, stating that the Quileute “made long journeys for purposes of war or trade and had many well-defined trails.” These various data sources provide a firm foundation of baseline TEK information - one of the important contributions of TEK to approaches that addresses climate change (Vinyeta and Lynn 2013:8). It is also important to take into account the simple yet true maxim that an absence of evidence is not evidence for absence – despite the gaps in our baseline data, other resources may have been used as well and known resources used in more or different ways than can be inferred from existing documentation, as noted by Shaffer et al. (2004:10).

TEK is also a source for climate history, another important foundation for this contribution to the issue of climate change. The archaeological, ethnographic, and historical records of traditional prey and habitats are by extension records of past environmental conditions. Changes in the use of particular plants or animals documented over time indirectly point to potential changes in climate, as well as more direct observations and oral tradition that give accounts of environmental changes. Although such changes may be inferred from these records in a relatively straightforward manner if sufficient data are present, changes in traditional use of particular resources or places are still very difficult to explain in terms of the specific roles climate change or anthropogenic factors play, including climate change as a cause. Furthermore, the ways in which people adapted to inferred climate change can only be speculative, given the weaknesses of the empirical/archaeological and historical records.

This survey has highlighted several kinds of adaptations by Indigenous groups of the coast of Northwest Washington to changes in abundance of, and access to, important resources. Much of this information is indirect, however, and must be inferred from proxy evidence in the archaeological record, or interpreted from interviews given by TEK practitioners to both Native and non-Native researchers. Changes can be inferred from the archaeological record, in terms of shifts in the relative taxonomic abundance of particular resources represented in shell midden sites. Quileute methods of harvesting and processing traditional resources, as well as the ways in which these resources were distributed, stored, and consumed, changed in the 1900s following increased contact with European Americans. However, the causes of these changes - natural climate fluctuations, socio-political pressures of new governmental control and the advent of commercial fisheries, or combinations of natural and human factors – are difficult to tease apart in the available literature. Trade between families within villages and communities, as well as between neighboring villages and linguistic groups and even farther afield, is demonstrated in the archaeological record and is also well-documented in the anthropological literature. Although it is not framed specifically as a response to climate change in these data sets, trade was clearly an important mechanism to ensure that the members of a community had enough to eat year-round and to respond to periodic emergencies.

Although this study primarily identified static baseline data regarding the kinds of resources traditionally harvested from the available literature and legal testimony during pre-contact history and the early written historic period, Tribal members also identify changes in the environment and distribution of plants and animals in the life histories of themselves, their parents and grandparents (Papiez 2009). The limitations of these data highlight the gaps that need to be addressed to more fully incorporate TEK into climate change initiatives. Educational outreach opportunities are generated from these needs, and have the long-term potential to increase the quality and quantity of data that can be brought to bear on the challenges of climate change in the Quileute community.

Future Directions and Educational Opportunities

Along with the work of Jay Powell, Shaffer et al. (2004) is, to date, the most direct local effort to incorporate TEK and climate change. Using direct testimony from interviews with members of several Olympic Peninsula tribes, this excellent study merges two professional approaches to explain and highlight the connection between cultural knowledge and biological resources. The importance of traditional knowledge about biological resources in the nearshore environment is the focus of the study, successfully demonstrated despite time and funding constraints, and a set of interviewees limited to just one to two members of five Peninsula Tribes, on the Pacific coast and Strait of Juan de Fuca. Despite these limitations, this document provides a rich and detailed commentary on specific nearshore resources and their uses, in some cases differently by different Tribes, and observations on how availability has changed during the lifetimes of the participants. We recommend this project be expanded to a larger set of participants/informants and resources as time, funding, and staffing allow.

Expanding school curricula is one way to educate not only about the natural environment, but also about a community's knowledge of it. Although limited by time and expertise, we present here some ideas for themes and concepts and activities that could be formulated into formal curricula by educators with background in curriculum development.

- Themes:** Knowledge. Knowing landscape, knowing timing, knowing how and what resources to use and not use, how to harvest them, when, and how to prepare them.
- Responses:** When and how to modify subsistence and land-use behavior when the need arises, and how to make the most of modified choices and options based on circumstances such as access and sustainable management.
- Concepts:** Knowledge, adaptation, resiliency, strength, “big picture” understanding of landscape, ecosystem interrelatedness

Curriculum topics and lesson opportunities may be found in the biological sciences, anthropology, and Traditional practice, especially where they overlap. These topics are conducive to age- and grade-appropriate activities at all education levels. Students can be tasked to learn what TEK is and why this holistic body of knowledge is important, as an evolving set of practices passed down through generations that inform on the relationships of living beings to their environment, landscape, resources, ecosystem, rivers and ocean. In the process, students will learn about different kinds of knowledge at a more general level – empirical data from the present, diachronic data that provides proxy information about past environmental change, oral histories, how to go about gathering each of these kinds of data in an accurate and responsible manner, etc. Most local students regardless of grade could engage with this topic by crafting responses to hypothetical environmental

changes as a result of broader climate change patterns. For example, what would you do if your family traditionally gathered berries in the spring or mushrooms in the fall and, as a result of climate change (such as warmer weather or more or less rainfall causes habitat change), those plants no longer grew in your treaty area or only grew higher up in the mountains, where land ownership was different? How would that affect your family's diet, or other aspects of your family's life? Would you have to travel farther for the same foods? Would these plants no longer be available in public access areas? The same study could be transferred to gathering mollusks on the coastline at low tide, and the Shaffer et al. (2004) study is an ideal resource for such a project.

Activities and projects that can be implemented under such curricula are not just basic TEK learning opportunities, but also allow students to actively participate in the documentation and perpetuation of TEK. Oral knowledge-gathering activities that involve interviewing grandparents or parents about a certain type of resource gathering or use that they have done would entail asking the full range of How, What, Where, When, and Why questions, allowing students to compare past traditions, present practices, and future options. Data gathering activities could include assisting Tribal fish biologists to collect fish or shellfish data, and/or measure and analyze environmental variables such as water temperature, turbidity, pH, and salinity.

The goals and practices of archaeology could be introduced to students if opportunities arise for them to work with archaeologists, either in the study of existing collections of faunal remains and artifacts from previously investigated sites, or in the event that new archaeological excavations take place on Quileute land. The published results of previous excavations can be treated as both cultural and environmental case-studies in curricula without the need to further disturb the archaeological record with new excavations. Conversely, the next time ground is disturbed when the Tribe builds its new village for the Move to Higher Ground, there may be an opportunity to introduce students to the process of archaeological survey and excavation. In sum, when biologists or archeologists can work with students to introduce them to the protocols and practices of their professions, such hands-on opportunities would generate interest as well as simultaneously educate the students.

The examples above are provided as a means of starting conversations about the ways in which TEK can be incorporated in Quileute educational curricula. Taken individually, particular lesson plans, activities, and educational opportunities will obviously not directly mitigate the effects of climate change. Establishing an important role for TEK within the educational system of the Quileute Tribe will, however, allow the lessons learned from previous generations to be carried forward with the challenges presented by climate change kept in mind.

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Quileute use of ocean fisheries for use in a court case. Presents evidence why Quileute and Hoh are essentially the same people (pp. 2-3).

“The Quileute’s usual and accustomed ocean fishing grounds and stations extend from north of Tatoosh Island to the Canadian border and westward upwards of fifty miles from shore” (p. 4).

Contains detailed history of treaties, history of contact, history of court cases, detailed discussion of limits of fishing area, and history of research conducted by ethnographers and linguists.

Review of material culture, especially related to salt-water hunting of whales and seals, including Native language names of hooks, etc. Detailed discussion of method and ritual associated with sealing and whaling, whaling took place from June to October, citing primary sources.

Table of Fish, Sea Mammals, Shellfish used.

Discussion of place names; Ray, Powell & Penn, etc. Quileute used kelp line as rope for deep sea fishing, detailed discussion of chronology of accounts of open ocean fishing for whales and seals, including history of whaling and sealing post-treaty and in historic times.

“ethnographic and historic accounts, along with contemporary knowledge regarding the above species’ migratory paths and general availability offshore of the Quileute territory, support that the Quileute usually and customarily fished whales, porpoise, fish, and seals upwards of fifty miles from shore in treaty times” (p. 88).

Chischilly, Lynn, Preston Hardison, Joel Hostler, Kathy Lynn, and Kyle P. White

2014 *The Role of Traditional Knowledges in Climate Change Initiatives*. Powerpoint Presentation on file at the Quileute Tribe, La Push, Washington.

Conceptions and Understandings of Traditional Knowledges, and role in climate change initiatives.

Indigenous Rights and Sharing Traditional Knowledges: Tribes and knowledge holders have the right to participate or NOT participate in federal collaborations involving TKs. Examples of publications that address TEK and climate.

Duncan, Mary Ann

1981 *Archaeological Investigations at La Push, Clallam County, Washington*. Office of Public Archaeology. University of Washington, Seattle.

This report of archaeological survey and testing at La Push in 1975 was done in conjunction with a town sewer project, specifically at 45CA23 which was previously identified by Richard Daugherty in

1947 as an extensive shell midden with abundant whalebone. Stallard and Denman (1956) corroborated the deposits but didn't investigate further during their survey. Following a review of the tribal historical background that cites Reagan, Frachtenberg, Pettitt, Singh, and others, Duncan reviews settlement and subsistence information gleaned from early historic accounts (e.g., Swan and Reagan) as well as more recent ethnographic studies (Singh) and more regional ethnographic studies (Gunther and Suttles). For previous archaeological work, they cite Newman's 1959 MA thesis on a 1,000-year old shell midden at Toleak Point, Guinn's 1963 report of excavation at White Rock Village just south of Cape Alava that yielded recent (<400 BP) radiocarbon age depth, and Daugherty's work at Ozette. The OPA's fieldwork included reconnaissance, construction monitoring, and excavation of one 1x2 meter test pit (nice map of the pit, monitored trenches, and the existing town plan) to a depth of about 2.7 meters without reaching the basal cultural layers. Marine mammal bone recovered from the unit included northern fur seal, California sea lion, and whale (but no harbor seal); terrestrial mammal taxa included beaver, deer and elk. Bird taxa included loon, falcon, thrush, robin, crow, goose, duck, scoter, pelican, cormorant, gull, tern, auk, puffin, fulmar, and petrel. Shellfish remains included primarily butter clam, California mussel, and native littleneck clam, with lesser numbers of barnacles, whelks, and gastropods. Fish remains aren't mentioned in the report. A variety of stone and ground bone and antler artifacts were recovered, some relating to fishing (net weights, bipoints, etc) and some to sea mammal hunting (harpoon valves). Radiocarbon dating of midden strata from the unit and trenches nearby indicate deposits as much as three meters deep dated within about the past 800 years.

Frachtenberg, Leo J.

1916 Quileute Ethnology: LaPush, Washington. Vol. VII. Field Notes and Manuscript No. 30 on file, American Philosophical Society Library, Philadelphia, Pennsylvania.

Very detailed treatise on ceremonials spiritual sickness and healing, behavior and protocol during these events. Social structure and social divisions, with restrictions for slaves, details on spirits, songs, healers, feasts, animal identities of guardian spirits, roles of medicine men. Mention of adoption of Shaker religion. Great detail on Guardian spirits, inheritance, how they were obtained, etc., and each walk of life had its guardian spirit. Discussion of the nature of the soul, detailed discussion of shamans. Detailed description of whale hunting, harpoons and other technology, sharing the meat, and Quileutes were known as the best of the whale hunters. Seals and porpoises were also hunted. Discussion of relations and trade (hides, shell, slaves, meat, berries) with Quinault, Hoh, Makah, Clallam, other Tribes. Description of warfare and weapons used in war, as well as weapons and traps used to hunt. "A good hunter having a good bow and arrow could shoot 200 yards at distance or and. hit the mark."

Discussion (based on Howeattle) of fishing, traps, nets, places, names for technology, also different lines and hooks for ocean fish (cod, halibut), word list related to fishing. Discussion of sealing, and its importance, as well as medicinal and social association.

Name of spiritual entities and what they were known for, sample of some traditional stories (Origin of Wind). Many rocks near LaPush have their own names. List of spiritual beings, also Moon and Stars, who were people. "The Country of Souls."

Discussion of food taboos, marriages, which were often arranged between families, various forms of marriages, including “bride grabbing” and the marriage of slaves, eligible partners, custody of children, polygyny common.

Burial practices discussed in detail, including disposal of goods owned by deceased. Man’s slaves were only killed if they themselves wished it. Relatives of deceased cut their hair.

Gustafson, Carl E.

1968 Prehistoric Use of Fur Seals: Evidence from the Olympic Coast of Washington. *Science* 161:49-51.

In this peer-review journal article, Gustafson presents his initial review of archaeological data from the Ozette Site (45CA24), specifically the very large northern fur seal (*Callorhinus ursinus*) faunal assemblage. Marine mammals comprise the majority of the assemblage, and of these the northern fur seal is most dominant in layers dating both before and after Euroamerican contact. This consistency implies that the northern fur seal was an important subsistence resource even after contact when Native fur seal hunting was conducted largely as a pelagic, open-water commercial effort for fur harvest. The archaeological data also contrast with historic documentation that imply that fur seals were not a focus of harvest prior to contact. In addition, Gustafson notes the demographic profile of fur seals in the assemblage does show change, but between past (before and after contact) and modern (circa 1960s) fur seal populations – adult males comprise a large portion of the Ozette assemblage, while they are almost never present in contemporary populations that migrate past Cape Alava. He notes that the change appears to correlate with the end of pelagic fur sealing but doesn’t speculate on the change – presumably from climate change or harvest pressure.

Hoard, James E.

2014 *On What “taking fish ... in common with the all citizens” in the Treaty of Olympia Meant to the Participants, and Linguistic Considerations in Determining the Offshore Extent of the Quinault Nation and Quileute Tribe’s Usual and Accustomed Fishing Grounds*. On file, Quileute Natural Resources, Quileute Nation, LaPush, Washington.

Meaning of “fish” (an animal that inhabits the water) in context of Treaties.

“The folk taxonomy of Quileute has no word that means approximately what English fish currently means. They use the word /ʔaálitaʔ/ to refer broadly to food or aquatic creatures generally” (p. 5), in the context of the changing meaning of the term “fish” in the English language, however, the meaning of “fishery” has remained unchanged.

“So far as is known, in 1856 not a single member of either tribe spoke English. Hence, the terms of the treaty were communicated to the tribal members in Chinook Jargon at the meetings at the Quinault River (on July 1, 1855) and at Olympia (on January 25, 1856). The question is, then, how did the Quileutes and Quinaults understand what was conveyed to them in Chinook Jargon concerning the terms of the treaty?”

According to the text titled “The advent of the Whites,” collected by Leo Frachtenberg in 1915-16 and edited and printed in Quileute Texts, at the time the treaty was completed the only member of the Quileute tribe who could speak Chinook Jargon was “Howiyalh.”¹³ He is listed at the end of the treaty as “How-yat’l, Head Chief of the Quilley-yute tribe” (p. 8).

Following is very specific detail about the meaning of words in the treaty, particularly those covering edible sea life, including words in Chinook language and extensive analysis of the meanings of the words used in the treaty.

Discussion of method of fur sealing, including use of gasoline motors for safety dating from 1920s. Harvest of whales and seals were understood to be part of treaty, as “Willoughby was aware that the Quileutes were harvesting whales and seals, he did not admonish them or inform the Commissioner that the Quileutes were violating their treaty. Instead, he encouraged them to continue those “fisheries” and offered assistance in procuring seal spears and whale harpoons (p. 20).” The importance of sealing was also documented by Leo Frachtenberg (1916). Extensive discussion of the history of sealing by tribes on Olympic Peninsula (pp. 20-26).

Hostler, Joe

2014 *Utilizing Yurok Traditional Ecological Knowledge to Inform Climate Change Priorities: Case Study of One Way to Gather TEK*. PowerPoint document, on file, Quileute Natural Resources, Quileute Nation, LaPush, Washington.

“How to do TEK research with a Tribe, and this is how we did it.”

- Utilizing Yurok Traditional Ecological Knowledge to Inform Climate Change Priorities.
- Traditional Knowledge in Yurok Society not freely shared or sharable with everyone equally.
- Access to TEK is protected, proprietary and considered intellectual property. Elders were concerned with confidentiality and protection of cultural information.
- Information collected through public scoping and elder interviews which were done in coordination with Tribal government to ensure confidentiality.
- List of resources provided.

Howeattle, Arthur

1916 Travel, Transportation, and Trade. In unpublished field notes and manuscript, Quileute Ethnology. Vol. III, pg. 127. Manuscript 7590 on file, National Anthropological Archives, Smithsonian Institution, Washington, D.C. and Manuscript on file, American Philosophical Society Library, Philadelphia, Pennsylvania.

Description of travel; undertaken on foot or by dugout canoe into rivers (as far as possible upstream) or the ocean (20-30 miles), by paddle and sometimes sail. Different canoes for rivers and ocean. Also used snowshoes and toboggans. Oceangoing canoes had sails and large paddles. Canoes paddled far up inland, and detailed description of canoes and canoe technology and use.

Howeattle, Arthur, and Tommy Payne

1916 Social Organization and Festivals: Social Organization. In an unpublished field notes and manuscript, Quileute Ethnology. Manuscript on file, American Philosophical Society Library, Philadelphia, Pennsylvania.

Discusses lack of clans, village of ku'le'eyut', 2400 men "5 generations ago." Mentions The Flood took place before their removal to the island. (p. 1) but provides no context for this flood. Village is divided into "house groups" made up of people related by blood. Each family had its own privileges and rights related to fishing, trapping, and hunting. Crests were carved of protector spirits of families, shown during Potlatches.

Castes or classes did not exist, but slaves were owned. Whaling was considered the highest occupation, next came fishing, and then hunting, and sons often followed their father's careers. Further discussion of intra-family relations; parents and siblings. Chieftainship and political power were consensual, and there were chiefs and headmen of families. Blood feuds and killings occurred, and could be settled with payments. Names were hereditary and passed down through families. Patrilocality practiced, as well as levirate. The majority of inheritance was focused on father's line. Hunting and fishing areas were under family corporate ownership, including approx. three miles out into the ocean, after which, open ocean was considered a commons. Brief description of current hunting and fishing areas.

Huelsbeck, David R. and Gary C. Wessen

1994 Twenty-Five Years of Faunal Analysis at Ozette. In, *Ozette Archaeological Project Research Reports, Volume II, Fauna*, edited by S. Samuels, pp. 1-16. Department of Anthropology Reports of Investigation 66. Washington State University, Pullman, Washington.

This is the introductory chapter in the faunal analysis volume of Ozette site (45CA24) technical archaeological reports. It describes the collection and sampling methods used during the excavation in the mid-1960s, a summary of cultural stratigraphy and analytic units, and processing and zooarchaeological analysis methods for the faunal remains. The remainder of the volume goes into much greater detail on the results of the analysis, but this chapter does provide a very concise summary of the animal resources that were identified in the assemblage and their implications. The authors note that most of the animals represented in the assemblage were locally available but some that were common in the assemblage – such as sea otter, pelican, and albatross – are now locally extinct or greatly depleted. They note the abundance of whale bones in the assemblage and surmise the possibility of summer-resident gray and humpbacked whale populations. They also infer a rich Lake Ozette sockeye salmon population. They attribute the lack of these taxa as contemporary local populations to habitat degradation and commercial over-exploitation. They cite Gustafson's (1968) observation of abundant adult male northern fur seal in the assemblage, along with oral testimony of Makah sealers at the end of the 19th century, as another indicator of environmental change. In terms of traditional diet just in terms of animals, the authors note great breadth: 90 species of invertebrates that include clams, gastropods, chitons, cephalopods, sea urchin, crabs and barnacles – but predominantly California mussel, littleneck clam, and Sitka periwinkle; 42 species of bird, mostly waterfowl taxa but most identified specimens were gull; 27 species of fish both marine and anadromous – predominantly greenling, lingcod, halibut and salmon; and 27 species of marine and terrestrial mammal –

predominantly gray and humpback whales and northern fur seals, with lower quantities of sea lion, porpoise, and elk. The authors compare James Swan's ethnographic notes on the Makah with Ozette archaeological data, highlighting his assertion that whales were their most important staple but also that it wasn't central to their diet at the time of his stay in Neah Bay. Swan also did not note fur seal as an important resource despite its importance in the Ozette archaeological assemblage. Huelsbeck and Wessen consider Swan's observations broadly aligned with their archaeological data, but also incomplete. They also note his over-simplified view of seasonal mobility between summer and winter villages; he noted Ozette as a "winter village" but much of the faunal remains they identified at the site represent spring and summer subsistence activities.

ICC (Indian Claims Commission)

1954-1956 Ethnological and Historical Evidence. Before the Indian Claims Commission, Docket No. 155, The Quileute Tribe of Indians v. The United States of America and Docket No. 242, The Quinaielt [sic] Tribe of Indians v. The United States of America.

Map of western Olympic Peninsula Tribal territories and place names, 59 for the Quileute.

Lane, Barbara

1977 *Traditional Marine Fisheries of the Quileute and Hoh Indians. Prepared for the Quileute Tribe.* On file, Quileute Natural Resources, Quileute Nation, LaPush, Washington.

(data from this incorporated in Boxberger's later court statement).

Quileute and Hoh known for seafaring ways, traditional economies intricately linked to the ocean.

Points out isolation and late contact (1890s) with Euroamericans.

List of sea animals hunted and fished, including previous descriptions regarding details of whaling, as well as sealing.

List provided of coastal villages and place names (pp. 16-17).

Morganroth III, Chris, with contributions by Katie Krueger

2015 Quileute. In *Native Peoples of the Olympic Peninsula: Who We Are.* By the Olympia Peninsula Intertribal Cultural Advisory Committee and Edited by Jacilee Wray, Second Edition. University of Oklahoma Press, Norman, Oklahoma.

This is a chapter in a collaborative book by all of the Olympia Peninsula Tribes. This chapter describes the Quileute creation story, and notes that it is not a "myth" or "legend," but a way to explain historic events. The world always existed, at the time of beginnings, The Changer went around transforming features of the landscape and living things into the current forms. The stories explain the creation of the rivers, hot springs, the headlands, the beach, monster battles, etc. And the change of the wolves into Quileute people. There is a flood story which caused some Quileutes to live upriver and some coastal. The flood was responsible for some Quileutes living in Chemakum and some in LaPush, as both groups speak the same language. Quileute's used upriver and coastal resources: fishing, hunting, root digging, berrying, gathering for food, textiles recreation and ceremony. People fish in the rivers and ocean. This chapter has a Quileute moons table, listing upriver and saltwater resources that were

utilized, time of year, and names of the time period, or moons. Sealing and whaling, and associated spiritual requirements are described. Fishing styles changed with contact. Whaling ceased in 1904. The fish trap became preferred after contact. Fish traps were owned by families but folks could and did share access. Quileutes also picked hops, traveling to Tacoma to do so. Quileute practiced the seasonal round (p 152), and potlatches. They maintained prairies by burning, for plants but also to draw animals. The chapter explains how prairies originated, involving a battle between Killer Whale and Thunderbird, who's flapping wings shook the mountains and stripped timber, and tore the trees out of the ground. Each time they fought, trees were ripped up, and a new prairie formed in that location. Eventually Whale went to the ocean (from Reagan and Walters 1933:321). Families camped on prairies in temporary huts and gathered Bracken fern, sword fern, licorice fern and wood fern, clover, silverweed, horsetail, parsnip, thistle and tiger lily, camas. Camas was replaced early during contact during with carrots and potatoes. Other plants and uses are described. The history of the treaty negotiations and reservation establishment is described. Modern Quileute government, community, heritage and language programs are described.

Papiez, Chelsie

2009 Climate Change Implications for the Quileute and Hoh Tribes of Washington: A Multidisciplinary Approach to Assessing Climatic Disruptions to Coastal Indigenous Communities. Unpublished Master's thesis, Department of Environmental Studies, Evergreen State College, Olympia, Washington.

In response to climate change and impact on their homeland, both tribes are requesting higher land within the Olympic National Park for village relocation.

This MA Thesis describes the current and future impacts of global warming on the Quileute, especially since so much of the reservation is at sea level and vulnerable to rising ocean levels, which may force the people to relocate, as well as impact the ecosystem, for example, affecting salmon reproduction if water levels are too low and too warm.

A major contribution of TEK is incorporating people's knowledge of their environment, including their perceptions, which can aid in developing management goals.

Quileute and Hoh are looking at specific impacts to their local coastline.

Specific impacts for PNW coasts include (CIG, 2008):

- Sea level rise (associated with El Niño events);
- Increased risk of coastal erosion;
- Increased winter precipitation (associated with La Niña events) increase the risk of coastal riverine flooding and of landslides Southeastern winter storms (associated with El Niño events) increase risk of coastal erosion; and
- Co-occurrence of all these conditions increases the likelihood of large, damaging coastal erosion and flooding events.

Given the Quileute's one square mile location on the Washington coast, sea level rise will have an adverse impact on their homeland, including but not limited to; "family homes, preschool through middle school facilities, Natural Resource Office, Tribal Office, Personnel Office, Marina, Health Services, Riverside Restaurant, High Tide Seafood Company, Community Center, United States Coast Guard station and Oceanside Resort and campground—all just above current sea level" (pp. 32-33).

This MA also gives a thorough overview of how global warming will affect water supplies, and therefore the fish that are so important to the Tribes.

Results of interviews indicate that people identify:

- Increasingly frequent and intense storms;
- Increasing storms impede fishing and other subsistence activity;
- Change in wind patterns;
- Increased rainfall, but inconsistent and not seasonal like before, which affects salmon;
- Declining snowfall, reducing water in rivers; and
- Increased river flow and flooding, which negatively affect salmon runs (destroying beds) and floods the community.

Warming ocean temperatures cause previously present species to leave, such as sturgeon, and are introducing new species of birds and sea life (brown pelican and Humboldt squid) (pp. 87-89).

In response to global warming, Tribes are requesting higher land within the Olympic National Park for village relocation.

Powell, Jay V.

n.d. Quileute Traditional Hunting Territories and Land Ownership at Treaty Times. Manuscript on file, Quileute Natural Resources, Quileute Nation, LaPush, Washington.

Discussion of land use by Quileute at time of Treaties, especially "open and unclaimed" as well as hunting by non-Quileute in their traditional homeland. Points out that Quileutes were living very traditionally, with little contact or interaction with Europeans, until time of treaties in 1855 and 1856. Review of literature of Olympic Peninsula Tribes indicates that most of the upland was open to hunting to anyone, and not exclusively owned by a person or group which excluded others. Extensive and detailed discussion of land use, which ridges separating watersheds recognized as boundaries for the Quileute. Permission was asked of Tribes to hunt on their land, and access could be granted through intermarriage.

2002 Quileute Exploitation and Maintenance of Prairies in Traditional Times. Manuscript on file, Quileute Natural Resources, Quileute Nation, LaPush, Washington.

Discussion of cultural context of prairies in Quileute traditional territory (prairies are called *yaqm*). Five major prairies identified:

1. Forks Prairie (*qit 'layaqm*, "upriver prairie").

-
2. Quillayute Prairie (*sat'ayaqw*, “downriver prairie” or *chiknyaqw*, “the large prairie”) and adjacent Little Quillayute Prairie (q *wadiyaqw*, “little prairie”).
 3. Maxfield Creek Prairie (*lwaqq 'at 'sit yaqw*, “prairie at the comer” or *k 'ikiLi*, “Elk’s home.”)
 4. The Soleduck Valley (*'sixwoqwsogw*, “the upstream prairie area, or possibly *'axital*, “hot area”).
 5. The camas prairie (*t'lot'lopa yaqw*, “lots of blue things prairie”) south of Forks on the east side of the Highway.

Discussion of traditional use by families, and of concepts of ownership, with analysis of Frachtenberg’s descriptions. Demonstrates that, based on the Quileute language, ownership is indeed possible, but that prairies were open to Tribal members and that people are stewards of the prairies. Discussion of taboos, ritual, prayer and their causal relationship to natural phenomena.

Appendix of documents from Swan, Reagan, Curtis, Frachtenberg, Pettit, Singh, that discuss prairie use, as well as Tribal members Big Bill Penn, Mattie Howeattle, Harold George, Sarah Ward Woodruff Hines, Johnny Jackson. Last Appendix includes prairies as the settings for traditional stories.

Powell, Jay V. and Deanne Hobson, Chris Morgenroth III, and Jill Hines (Quileute Tribal Members) 1995 *Sol Duc Pilot Watershed Analysis*. U.S. Department of Agriculture, Forest Service, Olympic National Forest,.

Appendix B-2, The Quileute Annual Cycle. Detailed inventory of habitats and resources (based on data in Singh), focused on the Dickey River. Discussion of Quileute Tribal Cultural Resources, including list of 71 culturally significant places, named places, places that are the settings of traditional stories. Detailed discussion of Sol Duc River, including animals and plants used in the watershed, as well as prairies which were game habitat and maintained by burning. Sol Duc river and watershed remains important to contemporary Quileute community.

a. Appendix 2.1 Cultural Resources Data

i. Table 2.1A. List of Quileute traditionally used plants in Sol Duc Watershed. Also list of references used.

ii.2.1 Part II. List of non-Tribal cultural resource data, organized thematically.

Appendix B is a list of recreation use within Sol Duc Watershed; developed sites, fishing sites, trails.

Powell, Jay (University of British Columbia), Molly Erickson (Olympic National Forest, Soleduck Ranger District), and Arthur Howeattle, Leila Fisher, Sarah Hines, Harvey James, Josie Kuklinks, Lilian Pullen, Fred Woodruff, Herb Fisher, Willam Hudson, Hal George, Eleanor Kaikaka, William Penn, Nancy Williams and Sixtis Ward (Quileute Tribal Members).

1996 North Fork Calawah Watershed. *Module I Cultural Resources Assessment*.

Definition of Calawah watershed, including its geography and Native name, and includes a holistic definition of cultural resources, including; Mythic sites and place names, trails, archaeological deposits, campsites, village sites, and ritual sites, and lastly, current source-locations of traditional key resources.

Includes a list of 19 distinct places of cultural significance. Also includes discussion of animals, birds, and fish as cultural resources and use.

Also discusses non-Tribal cultural resources, oriented towards recreation.

Includes three Appendices: Appendix 1-1-Map, Appendix 1-2-Ethnobotany Chart, Appendix 1-3-Quileute Annual Cycle.

Powell, Jay V., and Chris Morganroth III

1998 *Quileute Use of Trees & Plants: A Quileute Ethnobotany*. Prepared for Quileute Natural Resources, LaPush, Washington.

Description of Quileute knowledge of plants, their uses, harvest times and methods, also considers the spiritual component of ethnobotany. Discussion of prairies, use of fire, methods of preparation.

Discussion of various uses of trees; cedar, hemlock, fir, spruce, yew, white pine, cottonwood, vine maple, broadleaf maple, alder, dogwood, cascara, arbutus, and mountain juniper. Also a list of the ferns, grasses, sedges, and rushes used, as well as a list of berries. Finishes with list of assorted plants used for technology, medicine, or food.

Powell, Jay V., and William Penn

1972 Place Names of the Quileute Indians. *The Pacific Northwest Quarterly* 3:104-112.

134 place names in Quileute traditional homeland, with Quileute name, translation, and English name, and description of naming conventions.

Quileute Natural Resources

n.d. Makah and Quileute Settlements and Fishing Place Names Map. On file, Quileute Natural Resources, Quileute Nation, LaPush, Washington.

List of 73 place names and use areas, including details about residence, types of fish and game, species of plants harvested, trails, etc.

n.d. Quileute Cultural Locations Map and Key. On file, Quileute Natural Resources, Quileute Nation, LaPush, Washington.

Quileute Cultural Locations. Map of rivers, numbered places, no key.

Powell, J.V., Bonita Cleveland, Katie Krueger, Deanna Hobson, Chris Morganroth III and Edwin Poulin

1998 *E/W Dickey Watershed Analysis, Module B – Cultural Resources Assessment*.

Defines Dickey River watershed and inclusive definition of cultural resources. Identification and definition of various cultural resources and discussion of types of impacts. List of 12 places on mainstem of the Dickey, 6 on East Dickey, 5 on West Dickey, 2 on Middle Dickey and Dickey Lake. Discussion of animals and birds as cultural resources, including as spiritual entities. Discussion of fish in Dickey watershed, discussion of plants in Dickey watershed. List of unpublished and published sources for area. Includes appendices on; orthography, seasonal cycle, and Quileute Ethnobotany (Appendix B-3), comprehensive list of plants used; trees, ferns, grasses/reeds, berries, other plants used for food, technology, medicine.

Powell, J.V., and Arthur Howeattle, Hal George, William Hudson, Eleanor Kaikaka, William Penn, Sixtis Ward, Stanley Gray, Sarah Ward Woodruff Hines, Harvey James, Chris Morgenroth III, Lilian Pullen, Fred Woodruff (Quileute Tribal Members)

1998 *Cultural Resources Module in Sitkum and South Fork Calawah Watershed Analysis*. Olympic National Forest, Olympia, WA.

Definition of the Calawah River, including mainstem and south fork as central to Quileute. Holistic definition of cultural resources. 4 types of resources; named places, mythic sites, archaeological sites, plant/animal/fish habitats, and possible impacts. List of 15 places. Discussion of animals/birds as cultural resources. Discussion of hunting, fish/fishing, plant use. List of references.

- a. Appendix A. Quileute Annual Cycle.
- b. Appendix B. Quileute Ethnobotany.
- c. Appendix C. Orthography.

Ray, Verne F.

n.d. Copy of unpublished field notes on the Quileute. On file, Quileute Natural Resources, Quileute Nation, LaPush, Washington.

Notes on “kinds of land holdings,” hunting and fishing areas, place names, traditional use areas. Types of game caught in different areas; bear, deer, elk, wildcats, rabbits, beaver, ducks, fish, hunting of seals, grouse, geese, ducks, razor clams, rock oysters, etc.

List of place names.

Hoh and Quileute closely intertwined; spoke same language, shared festivals, intermarried, hunted together. Verne Ray thinks they are actually the same people, separated only by geography.

People who lived on salt water focused on marine resources, but Ray thinks 70% of people depended on fish runs and game, and no division between “coastal” and “inland” Quileute.

Ray didn’t think the treaty signers were properly informed of terms of treaty, that translations were inadequate, and not clear that the Quileute ever agreed to relinquish their land.

This also includes notes by Ram Raj Singh.

Discusses land used. Believes that Hoh and Quileute are same tribe because their language was similar and the degree of inter-relationship and intermarriage was so high, as well as joint hunting. Prairies were important resource areas for baskets, cedar bark for clothing, rope material, food plants, and game.

1954 Manuscript Fieldnotes on the Quinault and Quileute taken by Verne Ray at Tahola and LaPush, Washington in 1954. On file, Quileute Natural Resources, Quileute Nation, LaPush, Washington.

Brief biographical notes on informants.

Purpose of interviews was to understand land use, esp as it relates to hunting deer, bear and elk at headwaters of Quinault Lake and mountains, where meat was shared among people. Elk was the preferred quarry, as well as beaver. Salmon fishing was a summer activity, fish were smoked for storage using vine maple or alder. August and September went to mountains for roots and berries, gathered these in mountain prairies. Women in group mentioned camas were steamed and baked, also used fern roots for flour for “bread.”

“Francis McCCorey put in that Indians conserved resources, burned the land to keep it clear for berries and other plants to grow weal. Horton added now you can’t light a match in the woods and we have underbrush all over.”

Fish caught; Black Salmon, Silver, Dog, steelhead, flounder, sturgeon, also silver eels, clams (horse and razor). Rapids focal as fishing places. “Horton said that river changed its course, villages moved, or old sites were no longer on the river.”

Plants listed by informants; yellow water lily, cattails, cedar, kinnickinik (for smoking), spruce roots, vine maple, ferns, camas, blueberries, salmonberry, wild crabapple, elderberries, huckleberries, salal, cranberries, watercress, rhubarb, wild celery. Skunk cabbage used medicinally. Wild lily of the valley was used for an eye wash.

Mountain tops were the boundaries (for hunting territory). Prairies were burned for the health of soils, better for berries and cleared for hunting.

People lived in large houses made of cedars along the rivers, polygamy was practiced, and families were land hunters or sea hunters (whales and seals).

Gull and shaggy duck eggs were gathered. Clams and venison were dried, elk were preferred. Other game included deer, bear, beaver, raccoon, wild cat, caught using a variety of weapons and traps. “Fish traps extended from one bank of the river to the other.”

Discussion of ethnohistoric era of children going to school. Slaves were owned but not allowed to be married to free people. Multiple wives for men were common. There were “two groups, but all of them were Quileute. Some of them lived all the time at the mouth of the Quileute River and were whale hunters. The rest lived all up and down the river, had their permanent homes there,” where their fish traps were.

Traditional boundaries between Quinault, Queets, Klallam, boundaries defined by creeks and other natural features. Quileute were enemies with Makah and Neah Bay. People identified hot springs on a map for Ray, and Ray collected numerous place names and traditional use areas.

“Another site mentioned and pointed out July 21 was the site where Cleve Jackson’s family lived regularly. It was named after a rock which is visible in low-tide and shaped like a whale. Harry

explained that the Thunderbird had once carried off a whale in its claws but the talons had cut through the flesh of the back and the whale had dropped at this spot and become petrified.”

1956 *The Quileute Tribe of Indians, Docket No. 155 before the Indian Claims Commission*. In *American Indian Ethnohistory: Indians of the Northwest*, edited by D. A. Horr. Garland Press, New York.

Only those 24 place names in the northwestern portion of Quilleute territory are listed here, (24).

Also contains discussion of trails, fishing in Ozette Lake, discussion of fishing and hunting areas.

Reagan, Albert B.

n.d. *Ethnological Studies of the Hoh and Quileute Indians, the Sole Survivors of the Chiumakuan Linguistic Family*. Manuscript No. 1802 on file, National Anthropological Archives, Smithsonian Institution, Washington, D.C.

Ethnological Studies of the Hoh and Quileute Indians, the sole survivors of the Chiumakuan Linguistic family.

List of Quileute 20 place names/residences.

1934 *Plants Used by the Hoh and Quileute Indians*. *Transactions of Kansas Academy of Science* 37: 55-70.

Fieldwork done in 1905-1909 & 1928. 80 Plants identified used for;

- Food
- Medicine
- Material culture

List with descriptions begins on pg. 55, includes Linnaean name, description of use, and when available, traditional stories associated.

Schalk, Randall F.

1988 *The Evolution and Diversification of Native Land Use Systems on the Olympic Peninsula: A Research Design*. Report prepared for the National Park Service, Pacific Northwest Region.

This is a management document for Olympic National Park with recommendations regarding dividing the park into management units, based on the archaeological record, and proposed research questions that could be used to guide future research and management of archaeological resources. Although a limited archaeological reconnaissance was conducted for one of the management units, the document is mainly conceptual and theoretically focused, most pertinently in terms of an ecological and Native subsistence-based approach. The bulk of the document is Schalk's pre-contact land-use model of hypothetical Olympic peninsula hunter-gatherer focus from the end of the Ice Age until about 6000 years ago on winter elk hunting and supplementary spring/summer fishing and marine resource use, then a greater emphasis on riverine and marine resources as forest canopy closed and terrestrial mammal productivity decreased by the mid-Holocene. Human population gradually increased, and as storage of these resources (instead of immediate consumption) became necessary, a shift by 3000 BP to an intensive salmon-based subsistence round occurred. The developmental trajectory on the coast

continued towards an intensive marine-oriented economy by about 1000 BP. In Chapter 8, Management Zones and Archaeological Expectations, Schalk defines the coastal margin of Quileute territory as straddling Zone Ib (Central Outer Coast) and Ic (Northern Outer Coast), and also Zone IIa in the interior (West Slope, River Valleys and Lowlands). He gives hypothetical archaeological expectations, based primarily on environmental factors and paleoenvironmental reconstructions, for each zone (e.g., rocky islets in zones Ib and Ic compared with Ia; streams with relatively higher salmon productivity in Ib compared with Ic). For inland areas, identifying former prairie habitats in archaeological survey is important.

2014 *Archaeological Evidence for Offshore Marine Resource Usage in Quileute and Quinault Tribal Territories*. Cascadia Archaeology, Seattle, Washington.

This report reviews archaeological data, mainly from faunal remains, pertaining to marine subsistence resources based on excavations within traditional Quileute, Hoh, and Quinault territories – from the coast west of Ozette Lake south to the Minard Site near present-day Ocean Shores. Schalk reviews previous archaeological investigations from Reagan’s work in the early 1900s to mid-century surveys to CRM-related work in the 1990s and 2000s, then describes in more detail the faunal and artifact data from several sites within this area that underwent more intensive investigation that generated subsistence and procurement technology information: White Rock Village (45CA30) near Cape Alava, the nearby Sand Point site (45CA201), La Push (45CA23), Toleak Point (45JE9), Destruction Island (45JE113/114), and the Minard site (45GH15). Common to most of these assemblage are remains of mammals, fish, and birds that would have been harvested in nearshore and off-shore marine habitats – fur seal, sea lion, whale, rockfish, halibut, lingcod, and albatross in particular. Artifacts such as harpoon points and toggle valves also reflect the technology used to harvest these resources. The Minard site was included to add coverage lacking near the southern edge of the study area, and mammal and fish remains are perhaps the least reflective of marine subsistence. Schalk concludes from this evidence that offshore marine resources were important to the ancestors of these modern Tribal communities, and had been since well before contact, and these resources were a diverse suite of mammals, birds, and fish.

Shaffer, Anne, Wray, Jacilee, Beatrice Charles, Vince Cooke, Elaine Grinnell, Chris Morganroth III, Lela Mae Morganroth, Melissa Peterson, Viola Riebe, and Adeline Smith

2004 *Native American Traditional and Contemporary Knowledge of the Northern Olympia Peninsula Nearshore*. A Cooperative Study by the Olympic Peninsula Intertribal Cultural Advisory Committee and the Coastal Watershed Institute.

This study reports on the use of marines resources by members of the five tribes of the Olympia Peninsula. It is a mini-TEK study in itself. Resource change is a specific question the authors attempted to address. Tribal members were interviewed. The results were reported in two different reports, due to differences in biology and anthropology approach and reporting styles. Topics included marine species availability, use and the location of species and changes to those, as well as how those resources had been traditionally used. It is quite descriptive of fishing practices, stories and memories. Informants describe how availability and location may be different now than in their childhoods, and sometimes offer an explanation. Specific changes that were mentioned by the informants include: deterioration of

the foreshore in terms of resource wealth; blue mussels are now too small to eat (infers habitat and water quality change of some kind); fewer clams on Hoh; difficult to find kelp and seaweed now, reason unclear; ling cod used to be popular and plentiful, no longer; more pearls in mussels today; *dentalium* or *antbailius* are “all gone” now; red tide is more recent event; decline in littlenecks at Sooes; decline in seafood at Ediz Hook, after rip rap added; Sea otter was gone by before World War II. Seal oil availability declined after 1972; attributed to Marine Mammal Act. Canada geese reported to be present all year now; which was not the case before. This was attributed to the presence of farms, where the bird can feed, by the informants. The biologists summarize numerous stock declines and loss of access. Even when the declines are attributed to habitat degradation or change (as opposed to access restrictions), climate change as a specific causal factor is unclear. Powell’s report in 1972 that resources bases must have shifted enough that people started keeping their harvesting locations more secret. This paper also has good descriptions of habitats and how they were used by humans for harvest and travel.

Shippentower, Cheryl

2014 *Confederated Tribes of Umatilla Indian Reservation: Climate Change Impacts on Traditional Foods*. PowerPoint document, on file, Quileute Natural Resources, Quileute Nation, LaPush, Washington.

Tribal Natural Resources Dept. Mission statement is to protect, restore, and enhance First Foods of Water, Salmon, Deer, Cous, and huckleberry, using TEK and science. Identifies “Women’s Food”; berries and roots. Impacts to traditional foods; habitat loss, loss of access to land, climate change. Discussion of cultural context of food; First Food Celebrations. Traditional knowledge and its contribution is described, examples used of huckleberries, flowering, length of gathering seasons. Working with land managing agencies such as BLM to access traditional foods. Using GIS to map traditional food locations and development of a management plan for huckleberries.

Singh, Ram Raj Prasad

1966 *Aboriginal Economic System of the Olympic Peninsula Indians, Western Washington*. The Sacramento Anthropological Society, Sacramento State College, Sacramento, Californian.

Hunting of sea lions, hair seals, fur seals, porpoises, often as far as three miles offshore. Sea otters hunted near shore.

Elk were hunted with bows and traps, and were also driven. Other quarry included beavers, otters, birds.

“The Indians regarded technological and supernatural means is of equal importance in production of some of the principal items in their economy” (p. 43). All activities were conducted with a “supernatural” component.

Contains great details on ritualistic and spiritual aspects of hunting, whaling, etc., and how “violation of taboos adversely affected resources and production” (p. 45).

“Supernatural sanctions, ritual acts, and prayers were based on the belief that the fish, whales, seals, elk, and bears had human-like intelligence, carefully noted the activities and intentions of hunters, and evaded them if not treated appropriately” (p. 46).

Detailed description of concept of property, both tangible and intangible property, individual and family property.

“The hunting and fishing grounds were owned by the family or by the household.” (p. 112).

“There were some other kinds of property which were owned by the individual family. The prairies were such examples.” (p. 112).

“Hunting grounds usually consisted of the watershed of the streams of valleys well-enclosed by hills or high mountains.” (p. 112).

“Among the Quileute and Makah beach property was owned by different families in the manner previously discussed, however, their ownership was limited. Individual or family ownership did not mean exclusive right to use, but a sort of stewardship, and the right to direct exploitation of the economic tract by the local group” (p. 113).

“Three kinds of non-material possessions were recognized by the Indians: (p. 1) powers which one acquired directly from the supernaturals and which may be called “earned possessions,” (p. 2) knowledge which one learned from parents or from fellow men, or “learned possessions,” and (p. 3) rights which one inherited from ancestors, or “inherited possessions” (p. 114).

Detailed description of rules of material and intellectual property.

Stallard, Bruce and Clayton Denman

1956 An Archaeological Site Survey on the Coast of Western Washington. Manuscript on file at the Quileute Tribe, La Push, Washington.

This is a report of an archaeological survey conducted by University of Washington between June and August of 1955. In the background sections at the beginning of the report, the authors note little previous investigation on the geology of the outer coast, but quote some pertinent information by Albert Reagan in a 1908 article that the shoreline in La Push had encroached 300 yards inland over the previous 4 years, inundating a former village site, and Stallard and Denman acknowledge the more widespread phenomenon of archaeological and ethnographic sites disappearing through erosion. Regarding their field methods, they noted no effort was made to “test the middens for their artifact content” given terrain and time constraints (p. 10), but describe the few artifacts collected, including a bone projectile point, bone halibut hook, slate fish knife, and a sandstone fishing net sinker. Most of the rest of the document are brief site descriptions from Cape Alava/Ozette to the Queets River, including at least 22 (the map is poor quality) numbered sites within what the authors consider Quileute territory (south of the Swedish shipwreck memorial) and along rivers inland about 7 miles. They note coastal shell middens interpreted as temporary campsites, a now-eroded house site just south of Cape

Johnson with only midden remaining (45CA32), a thick shell midden on James Island (45CA33) – 15 feet as reported earlier by Reagan – atop which evidence of gardening and root cellars were observed. The island is associated with the ethnographically documented village of *A-Kab-Lot* and a defensive location. The authors note that in the past the island may have been part of the mainland. La Push Village (45CA23) underlay the modern townsite of La Push, with a ¼-mile long midden containing abundant whalebone. 45CA34 was notable as a site identified inland, at the confluence of the Soleduck and Bogachiel Rivers, and historically hosting three houses. 45CA35 is the remains of an inland Quileute group about 2 miles from Forks, including a thin midden with elk bone. Toleak Point, 45JE9, was ethnographically an important Quileute village and whaling station. Two houses noted here in the 19th century were eroded by the time of this survey. Sites to the south, in Hoh territory, are also described with only minimal information about midden contents, and exhibiting similar site erosion characteristics. The authors attempted to find middens associated with prairies, without luck, but note the ethnographic accounts of inland prairies, their maintenance by fire, harvest of bracken fern roots, and reversion to woodlands if routine burning was stopped. Although not archaeological data, the authors in an appendix note the importance of trails in traditional mobility and land use, which tended to get overlooked by outsiders compared with canoe travel.

Trites, Andrew, and Frances Robertson

2014 *Distributions and Likely Availability of Whales, Dolphins, Porpoises and Fur Seals in the Offshore Waters of Washington State in the 1850s*. Marine Mammal Research Unit, Fisheries Center, University of British Columbia, Vancouver, B.C. Prepared for The Quileute Indian Tribe, LaPush, Washington and Foster Pepper PLLC, Seattle, Washington and Nielsen Broman & Koch PLLC, Seattle, Washington.

Definition and description of marine environment and geography, review of the distribution of “12 dominant species of marine mammals species” “thought to have been available further than 20 miles offshore” (p. 6), based on modern (scientific) and historical hunting records.

Detailed discussion of each of the 12 species and their range and role as prey species both aboriginally and commercially.

United States District Court Western District of Washington at [in] Seattle

2015 United States of America, et al. v. the State of Washington, et al. Quinault Indian Nation’s Post-Trial Brief [No. C70-9213RSM, Subproceeding No. 09-1]. (transcript).

Post-trial brief submitted by Quinault Indian Nation on whether the taking of sea mammals before and at treaty time are considered in determining reserved treaty fishing rights under the Treaty of Olympia, and the location of the western boundary of its ocean usual and accustomed fishing area.

Determined that “the negotiators believed that it never could have been the intention of Congress that the Indians should be excluded from their ancient fisheries” in their U&A. Conclusion is that the western boundary of Quinault’s ocean usual and accustomed fishing area at treaty time was no less than 30 miles offshore, and that more likely than not the probable location was 45 miles or more offshore.

White, (unknown)

n.d. Traditional Knowledge Webinar. PowerPoint document, on file, Quileute Natural Resources, Quileute Nation, LaPush, Washington.

Powerpoint, pointing out importance of traditional knowledge, re-emphasizing information in primary sources.

- Offer observations and interpretations at a much finer spatial scale and with better temporal depth.
- Emphasizes importance of ‘culture.’
- These ways of knowing and living have been accrued over thousands of years of experience.

Appendix:
Place Names for Figure 2.

Named Settlements and Fishing Places

Tribe	No.	Translation	Modern Name	Notes	Source
Quileute	1	N/A	Tatoosh Island		Powell, October 2012 Talking Raven
Quileute	2	Good beach	Archawat Creek and Beach		Powell and Penn Map 1: Place Names of the Quileute Indians. Site 14
Quileute	3	Hair seal-skin float	White Rock		Powell and Penn Map 1: Place Names of the Quileute Indians. Site 23
Quileute	4	N/A	Allen Bay	A fishing village	ICC Docket, Map exhibit 73: Village Sites and Fish Traps. Site 3
Quileute	5	N/A	Bernestol Point	A fishing village	ICC Docket, Map exhibit 73: Village Sites and Fish Traps. Site 2
Quileute	6	N/A	N/A	Settlement used as a whaling station	ICC Docket, Map exhibit 73: Village Sites and Fish Traps. Site 4
Quileute	7	N/A	N/A	Fishing/Hair sealing site	ICC Docket, Map exhibit 73: Village Sites and Fish Traps. Site 5
Quileute	8	Sea lion hunting place	Sea Lion Rock		Powell and Penn Map 1: Place Names of the Quileute Indians. Site 31
Quileute	9	N/A	N/A	1A whaling village	ICC Docket, Map exhibit 73: Village Sites and Fish Traps. Site 6
Quileute	10	N/A	N/A	A fishing village	ICC Docket, Map exhibit 73: Village Sites and Fish Traps. Site 7
Quileute	11	"Short Beach"	North side of Cape Johnson	A village used for whaling	ICC Docket, Map exhibit 73: Village Sites and Fish Traps. Site 8

Tribe	No.	Translation	Modern Name	Notes	Source
Quileute	12	N/A	N/A	This site was noted for whaling	ICC Docket, Map exhibit 73: Village Sites and Fish Traps. Site 9
Quileute	13	N/A	N/A	A fishing village	ICC Docket, Map exhibit 73: Village Sites and Fish Traps. Site 10
Quileute	14	Mussel gathering place	Island at the mouth of the Quillayute River		Powell and Penn Map 1: Place Names of the Quileute Indians. Site 38
Quileute	15	Quileute	La Push	Largest Quileute Village	ICC Docket, Map exhibit 73: Village Sites and Fish Traps. Site 14
Quileute	16	N/A	James Island	Formerly a very large settlement	ICC Docket, Map exhibit 73: Village Sites and Fish Traps. Site 13
Quileute	17	Canoe landing place	Cakesosta		Powell and Penn Map 1: Place Names of the Quileute Indians. Site 107
Quileute	18	"Cut short"	Mouth of Scott Creek		ICC Docket, Map exhibit 73: Village Sites and Fish Traps. Site 44
Quileute	19	N/A	Strawberry Point	A small settlement at Strawberry Point	ICC Docket, Map exhibit 73: Village Sites and Fish Traps. Site 45
Quileute	20	N/A	N/A	Noted whaling base	ICC Docket, Map exhibit 73: Village Sites and Fish Traps. Site 46
Quileute	21	N/A	Near the mouth of Goodman Creek	Used as a base for land and sea hunting	ICC Docket, Map exhibit 73: Village Sites and Fish Traps. Site 47
Quileute	22	N/A	Hoh River	Fish trap	ICC Docket, Map exhibit 73: Village Sites and Fish Traps. Site 50

Tribe	No.	Translation	Modern Name	Notes	Source
Quileute	23	N/A	N/A	A permanent settlement	ICC Docket, Map exhibit 73: Village Sites and Fish Traps. Site 48
Quileute	24	N/A	Mouth of the Hoh River	A village location	ICC Docket, Map exhibit 73: Village Sites and Fish Traps. Site 49