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ABORIGINAL ECONOMY AND POLITY OF THE LAKES (SENIJEXTEE) INDIANS

Verne F. Ray (1905–2003)

with an Explanatory Endnote by Madilane Perry[1]

ABSTRACT

Verne F. Ray, University of Washington anthropologist, prepared a manuscript on the aboriginal economy and polity of the Lakes (Senijextee) Indians in 1947. For unknown reasons, the manuscript and companion culture element distribution list were never published. Communication that began in the late 1980s with Madilane Perry, an anthropology graduate student from the University of Idaho, eventually led to the sharing of the documents and permission to publish. The Lakes manuscript is published in its entirety as originally prepared. Details concerning the communications between Ray and Perry are provided in an endnote.

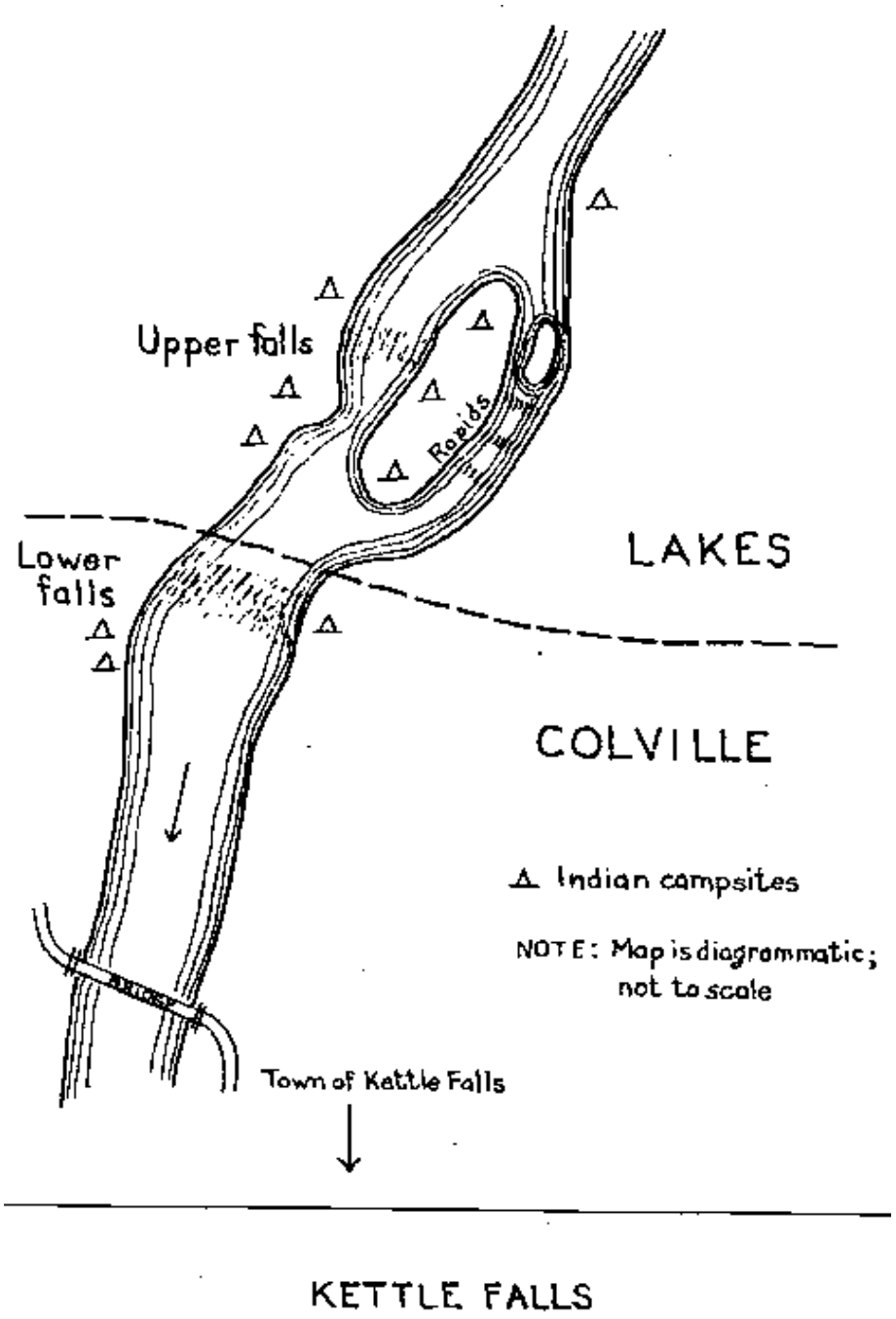
Note: this article is formatted as it was originally prepared in 1947.

ECONOMY

Territory. The dividing line between the Lakes Indians and the Colville Indians was very precisely drawn at the point where it crossed the Columbia River. Kettle Falls proper was in the territory of the Colville, but the large island to the north and the adjacent rapids belonged to the Lakes. The line of demarcation crossed the River just below the southern tip of the large island. This island was named kusu'nq^{u}. The small island between the latter and the east bank of the River was named kpɑluwi'xtɑn. Ordinarily islands of the small proportions of these two did not have distinctive names but were merely known as "small island" (tcsu'sunqun) or "island" (tcusu'nqun). It was the great importance of these islands in the large scale fishing activities which took place here which led to them being distinctively named. (See map.)

Fishing. Salmon was not only the most important fish obtained by the Lakes in their economic pursuits, but it was also the staple food. Of the various species the Chinook was most important; the Dog salmon was utilized to a limited degree. The Sockeye species was not found in this territory.

The physical character of Kettle Falls made it a fishing site of the first importance. No other fisheries north of The Dalles compared with it in terms of productivity and utilization. It was a formidable barrier to the salmon which were fighting in great numbers to get up stream and spawn. They collected below the Falls in great numbers as they jumped time and again in an effort to overcome the falls but failed. Large basket traps were manipulated by fishermen who perched on the rocky outcroppings adjacent to the rapids falls. Others used the smaller dip nets and still others employed the spear in adjacent backwaters, eddies and other areas of disturbed but relatively smooth water.



The few salmon that managed to get over the Falls generally spawned in the Slocan River. After the fishing season had terminated at Kettle Falls some persons went to the Slocan River to obtain the salmon that were to be found there. These were of very poor quality, however, since most of them were near death from the exhaustion of the up-river struggle and the spawning activity. However, this fishery did provide a small supply of relatively fresh salmon until late in the autumn season.

At various places in the Columbia River itself and in its tributaries, above the Falls, it was possible to obtain some salmon in rather better condition by spearing. These salmon spearing stations were fixed at known localities but no platforms were built for the purpose. The fishermen simply waded into the stream or wielded the spear from a canoe. No traps or weirs were used above Kettle Fa1ls.

Salmon first appear at Kettle Falls in June (this description relates to pre-1941, before Coulee Dam was completed). At first they are only to be seen jumping the Falls; then, about a week later, they are visible from the bank. The first species to appear is the Chinook (ntiti' x); second, the Silver salmon (?); and finally the Humpback or dog salmon (xoni'na').

The first of the large basket traps was installed at Kettle Falls about the middle of July. The fishermen and their families remained here for at least a month; some stayed until the end of September. The basket trap could be used with some success until this late date. Even later than this it was possible to spear salmon from platforms which were erected in the rocks that confined the Falls.

The favorite camping place during the fishing season was the large island. Most of the Lakes Indians camped here. Visitors erected their shelters on the shore or banks of the River. The island was an attractive site from all points of view. The large basket traps were immediately adjacent; platforms for spearing were built with ease at various points on the banks of the island; there were points at which simple pole bridges could be built to the mainland. The latter were used for reaching the mainland and also as spearing stations.

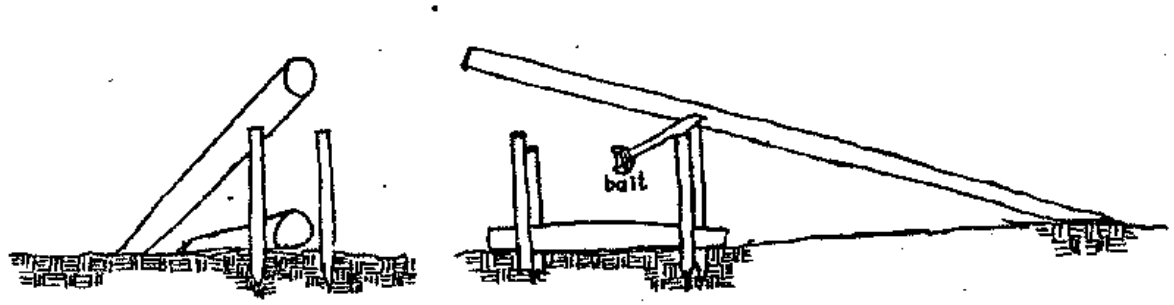
The huge basket trap used between the large island and the bank was recognized by all as belonging to the Lakes Indians. In the use of the trap, however, people of other tribes, particularly the Colville and Spokane, assisted in its handling and manipulation. They also participated in the distribution of the fish which were taken in this manner. The visitors were permitted to assist in the handling of the trap only if they were very expert fishermen. The hazards of this type of fishing were very great and novices were not permitted to endanger their lives. On the other hand, it was considered a very great privilege to take part in the manipulation of the trap. It was a recognition by the community of the ability of the fisherman, it was an honor, and it was considered a very keen sport. The distribution of fish to the visitors was in no sense a payment for their services at the trap. They would have received a part of any large catch regardless of whether they participated or not. The system of distribution of the catch from the large trap was similar to that of the distribution by the Sanpoil of fish obtained in the communal weirs.

At the same time that the center of activity was the large basket trap, many fishermen were engaged in spear fishing in the vicinity. Line fishing was also employed at this time. Salmon caught by line or spear were the personal property of the individual fisherman. However, a man who had reasonable success always distributed a portion of his catch to other persons. An interesting phrasing was given by an informant: "A good honest man would distribute to everybody, and sometimes not keep any for himself."

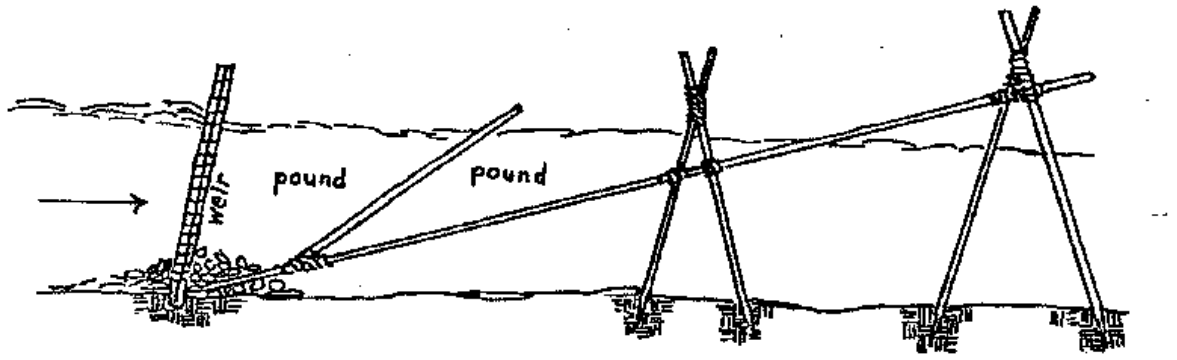
Before describing the ritual practices and religious beliefs associated with salmon fishing at Kettle Falls, it may be well to give attention to the magnitude of the catch as recorded by early observers and fisheries scientists.

In 1814, fur trader Ross Cox visited the Kettle Falls area and spoke of the friendly manner in which he was received and the "abundance of roast and boiled salmon" that the people gave his party to eat. He commented on the "vast quantities" of salmon taken and explained that the catch was partly eaten fresh but mostly dried for use during the winter and spring months.

In 1853, Dr. George Suckley, of the staff of Governor Isaac I. Stevens, visited Kettle Falls and declared that the Indians "'kill hundreds of thousands of these fish by spearing them." Presumably, Suckley was referring to the catch of each season. He observed that "The myriads of salmon that ascend the rivers of the Pacific Coast are almost incredible. In many places the water appears alive with them . . ."



Deadfall



Weir with Double Impound Areas
(used on tributary streams)

Lieutenant Johnson, of Captain Wilkes' staff of the United States Exploring Expedition, spent three days in the vicinity of Kettle Falls in 1841. In describing the taking of salmon by the Indians, he wrote that hauls were made three times a day and "each haul, not infrequently, contains three hundred fine fish." In a Bureau of Fisheries report by ichthyologists Joseph A. Craig and Robert L. Hacker reference is made to Johnson's observations and his figure of 900 fish each day. They then comment that "The run at Kettle Falls extends over a period of at least 60 days, so if 500 fish per day was their average catch, the Indians would have been taking some 600,000 pounds of fish annually in that location" inasmuch as the "salmon taken at Kettle Falls average some 20 pounds in weight."

In the book issued in 1947 by the Bureau of Reclamation and titled The Columbia River, it is estimated that the annual catch at all of the great fishing sites of the Indians of the Northwest was as great as 18,000,000 pounds. In these terms, the catch at Kettle Falls was about one-thirtieth of the total.

It is interesting to note that Craig and Hacker emphasized the fact that the aboriginal harvest by the Indians "did not represent as great a proportional strain on the spawning population as its relationship to the present catch would indicate because under present conditions many miles of spawning streams have been cut off by dams so that they are no longer available to the migratory fish."

Turning, now, to the religious sphere, we find many ritual practices associated with the taking of salmon by the Lakes Indians. These were generally consistent with the cultural patterns regionally. A "salmon chief" was in charge of the large communal traps. He presided over the distribution of the fish which, at Kettle Falls, occurred twice a day, at noon and at sunset. This double daily distribution was not, however, a ritual feature but was due to the fact that in hot weather fish would not keep fresh throughout the whole day. The salmon were laid out on fir boughs and distributed usually to the men. Women were permitted to be present but not to touch the fish until they had been removed from the place of distribution. It was also tabu for women to go near the platforms or traps where fish were being taken. They were required to get water below the site of such activities; indeed, this restriction applied to men also. A violation would result in a falling off of the fish run. The more rigid restrictions applicable to women was not due to their sex per se but rather to the fact that they might be menstruating at the time. The general tabu insured against any menstruating women being present.

If a salmon run dropped off unexpectedly or inexplicably it was interpreted as due to the breaking of a salmon tabu. At such a time the old men would congregate and select one of their number whose guardian spirit was salmon or some other fish or river power to counteract the ill-effects of' the breach. Such an individual proceeded much as did the "salmon chief" of the Sanpoil under similar circumstances. If his efforts met with no success he would report failure and request that someone else be chosen for the task. His procedure was to sit some distance from the trap, alone, smoking and singing. The songs that he sang were "like the sound of the rapids. If his efforts are successful, the salmon will start jumping up the falls even while he is singing. Then he returns to the people and says 'now perhaps we shall be more lucky.' He causes a few salmon, just one or two, to appear on the first day and then gradually he wills it that more and more shall come. The people know that if one or two appear on the first day all will be well."

In 1930 a man was selected to officiate in this manner but failed. James Bernard stated that the fish run had become smaller and smaller from1890 to 1927 due to the activities of white fishermen in the 1ower reaches of the river. But that from 1927 to 1930 the quantity had increased somewhat.

The salmon chief was generally chosen from one of the visiting tribes, probably because they were considered to have more "power" than the local men.

A ceremony was held at the appearance of the first salmon in the spring. This First-Salmon ceremony was a modification of that practised by surrounding tribes. The appearance of the first salmon or the first few fish was a signal for the ritual. The rite was held for the first fish only, not for each subsequently appearing species. The regular trap was used for purposes of obtaining the first fish, not a specially built one. The trap was not decorated or in any way distinguished for this purpose. The ceremony, while for the advantage of the group as a whole, was performed by the salmon chief individually. He sat on the bank of the stream watching, singing and praying for the coming of the salmon in great numbers. There was no dancing or other type of social recognition either at the site of the trap or elsewhere. The first salmon taken in the trap were prepared by the women, sometimes the younger women, and served to all persons present at the trap location at that time. Simple procedures marked the preparation of the fish. The stomach was removed and discarded, the head, tail and backbone were separated. The fish was then cut lengthwise and boiled or roasted for serving. A soup was prepared of the usual parts used for that purpose. The bones of the fish were ceremonially thrown into the river. Sometimes special songs were sung at the time of the eating of the fish.

The generosity in the distribution of fish to visitors from outside tribes, mentioned earlier, was not due to the abundance of salmon available in Lakes territory. It was rather a feature of the general social and economic pattern of the area and was shared by such tribes as the Colville and the Sanpoil.

The equality of distribution was not carried to the same extreme as among Sanpoil, however. Fish were never cut up for distribution but were given out just as they came from the trap or the spear. The productivity of the fishery at the falls during the height of the season is indicated by the fact that some of the fish taken rotted before it was possible to preserve them.

The aspect of private property characterized the catch obtained from a funnel trap somewhat more than the return from other methods of fishing. Perhaps this was due to the fact that a privately owned funnel trap indicated that the fisherman had extended a great deal of effort in the construction of the fish-catching device. If a man found only a relatively few fish in such a trap he might keep all of them for himself. Otherwise there would be the usual type of distribution.

Box-type traps varied in size. Small ones were owned by a single individual; larger ones were usually the property of two or more fishermen.

Fishing stages for spearing purposes were individually built and owned. However, when such a staging was not in use it was the privilege of anyone else to take advantage of it. The rights to such stations were not held from year to year. The person who first built a staging at a particular site in the spring of the year was the one who held the rights for that season.

Hunting. As usual in this general area the most important game animal was the deer. Of secondary importance, but extensively utilized, were the caribou, elk, moose and the brown bear. Grizzly bears were also frequently taken as game animals. The antelope was not found in this region. Both mountain goat and mountain sheep were numerous in the mountainous northern regions and were taken in considerable numbers for food purposes and for their hides and horns. Beaver were plentiful in the numerous streams and were taken in considerable numbers. Rabbits were also of economic importance. The bison was not found here nor were distant areas visited for

the purpose of hunting bison frequently enough to be of economic significance. Geese and ducks were extensively utilized but swans were only infrequently hunted. The principal areas for deer hunting were the hilly regions between the Columbia River and the Pend Oreille River in the southern part of Lakes territory, and the extensive and more mountainous areas of the headwaters of the Kettle River. Elk were quite scarce but sometimes wandered into Lakes territory from the more frequented areas of northern Idaho and northwestern Montana. Bears, black and brown, were found sporadically distributed throughout the territory but were hunted particularly in the regions of lakes and in the mountain meadows where food was to be found, particularly berries. The grizzly bear was found in the mountainous regions above the lakes; caribou in the plains around the lakes. Mountain sheep and mountain goat frequented all of the craggy areas of the mountains.

Deer hunting. (ski·´x^{u}). Hill deer were not easy to kill with the bow and arrow. Therefore, highly developed special techniques of hunting were generally utilized, especially variations of the surrounding technique. Having selected a particular area for the hunting activities, one man was sent ahead to take up a post at a predetermined spot. The remaining hunters distributed themselves so as to cover a rather wide area with a general fan-shaped formation. Each man moved at a practiced pace toward the selected destination. As deer were encountered the first attempt was to dispatch them with arrows immediately but, failing that, they were driven toward the destination. The bunter who had been stationed at that point attempted to kill the deer as they approached but before long he was simply one of a number of hunters forming a surround, all attempting to shoot their arrows effectively before the frightened deer managed to escape between their ranks.

Another technique, used exclusively in the autumn, required the selection of a cliff at the edge of a plateau as the destination. Leading toward this bluff a rude runway was constructed. On one side a sort of fence was built up of stakes, saplings which were bent over, and the like. Its chief virtue in directing the deer was not its impassibility but rather the scent which had been 1eft on the stakes and trees by the hunters, a most effective deterrent to moving beyond the line. A line of hunters was placed on the opposite side of the narrow valley. The remaining men moved slowly down this runway driving the deer toward the bluff. When near the destination, all the hunters would close in and drive the deer over the edge.

Companies of hunters would also organize so as to drive deer through narrow passes where they could be more easily be shot, into the water, or onto thin ice. Dogs were never used in hunting deer except to drive them into lakes or rivers. Hunters would station themselves at a regular deer crossing. Usually one man occupied a canoe at a critical point. The remaining hunters, aided by their dogs, ferreted out the deer and drove them into the water. From there they were killed by the man in the canoe using his bow and arrows. Occasionally women were assigned the duty in the canoe. In this case the woman used a spear to dispatch the deer. Women never employed the bow and arrow.

Group hunting activities were always supervised by a leader selected from the group by common consent. It was he who selected the hunting area, the point at which to station the advance guard, and the portion of the area which would be assigned to the individual hunters. Such a man was naturally selected because of his ability in hunting and his knowledge of the habits of game. The initiation of a hunting party was, however, the privi1ege of any person. Women accompanied the hunters if they were to be absent for more than two or three days. A party of considerable size was required for hunting activities such as those described above. However, more modest hunting ventures, particularly those of the winter months, were carried out by parties of from three to six persons. Ordinarily hunting trips lasted for one or two weeks.

Preliminary preparation was quite complete, requiring three or four days of planning. Both during this preliminary period of preparation and during the course of the hunting activities, men slept apart from their wives. Violation of this tabu was felt to make a man vulnerable to attack by a grizzly bear with fatal results. Temporary sweat houses were constructed at each hunting camp and the hunters bathed here every day, rubbing themselves with plants selected to eliminate odors the game might detect. Their clothing was likewise rubbed with such herbs. Sometimes the clothing was washed in a decoction of these herbs; likewise the bows and arrows to be used in the hunt. A further alternative was the drinking of such a decoction.

Snares were used for deer during the autumn migration period at which time they moved from north to south over definite trails. On such trails the snare would be set so as to form a loop designed to engage the leg of the deer. The free end of the rope forming the snare was strung over a high limb and fastened to a heavy piece of timber which was delicately balanced so as to fall when the noose was closed by the deer's movements. The captive animal was therefore not only held by the snare and the heavy weight but was also hoisted up or at least held relatively immobile by the falling of the log. Slightly in advance of the position of the snare a small log was laid across the trail which would cause the deer to step rather high in getting over it and thus more likely step into the noose. The rope of the snare was constructed of Indian hemp.

Individual hunters sought the bear. Bear meat was prized above that of the deer and the hides were more highly valued, since they made excellent robes. In the spring, deadfalls were used for bear. Four large logs were set solidly in the ground in a rectangular pattern with one long and one narrow dimension. Lying on the ground between these posts was a large log which extended somewhat beyond each end as formed by the pairs of posts. Lodged at the top of the posts on one end was a long log which lay diagonally from the ground. A pivot stick was placed under this long log and to it the bait was attached. When the bear took the bait the long and heavy log would fall on the top of its neck pinning the lower part against the log on the ground.

Fish or venison was used as bait. Another type of deadfall which was constructed essentially the same used a vertical pivot stick between the ground log and the sloping raised timber. The bait was attached to this pivot stick in a position on the opposite side from that which would be approached by the game.

Informants stated that game were not taken in pitfalls, nor driven into nets or run down in the brush. They were, however, run down on the snow by hunters on snowshoes, and animals other than deer, for example the mountain sheep, were taken by being driven over a cliff. Animals of various kinds were frequently hunted by stalking with bows and arrows or with a spear but not with a club. Night stalking was practiced but infrequently. Torches were not used and game were not driven into the water at night. Hunters lay in wait at salt licks during the night and also during the daytime but not particularly at daybreak. Sometimes a post in a tree over a salt lick was selected. The game were shot from this position. Leaf whistles were used as deer calls. Deer taken by stalking in the snow were sometimes killed by breaking their necks. Hibernating bears were dragged out of their holes but they were never smoked out. A hunter would crawl in after the bear and retrieve it if unsuccessful in attempts to drive the animal out. A rope was fastened to the bear's head for retrieval; the technique of using a split stick twisted into the bear's hide was not known. Rabbits were also dragged out of their holes but this was an unimportant technique. Ground hogs were taken by drowning out.

The unimportant activity of bison hunting in foreign territory was always a group venture but never a tribal venture. The hunters traveled either on foot or on horseback under the

supervision of a selected leader. Meat and hides were evenly divided among participants in the hunt. Hides were tanned on the spot.

Beaver were snared or taken with a deadfall. They were not taken with club or spear, nor were their dams destroyed. Gaff hooks and nets were also unknown. The musk was utilized as a perfume.

The spring pole snare was used for various animals including the deer but for the latter was not as important as the log-weighted snare described above. Blinds were not used with snares but a kind of enclosure was sometimes built beyond the snare.

Rabbit snares were made of bark cord or sinew and were, possibly, surrounded by a fence built in an arc. Snares were also used for land fowl such as the grouse and prairie chicken; infrequently for eagles. The snare was constructed of sinew or apocynum on the trail where the fowl were known to gather to caper or prance, for example on a log or at the top of a knoll. A brush fencing was used in connection with the snare in some instances. The snare was anchored fast, never held in the hand. Sometimes the snare was set up on the snow.

Geese and swan were likewise taken with snares of the same type. Floating logs were not used.

The snare described for the deer was used also for caribou. Fencing was not employed in connection with snares or deer surrounds.

A tule shooting blind may have been used for waterfowl. A disguise made of tule was sometimes worn in hunting waterfowl but no other type of disguise for hunting was employed. Decoys and lures were unknown.

Elk and moose, not deer or rabbits, were called with a whistle of the tubular type made from the stem of the elderberry or rhubarb plant. The same animals were called by whistles made of a leaf.

Miscellaneous hunting devices included a figure four slat trap and the clubbing of waterfowl, sometimes at moulting time. Slingshots, multiple pointed spears and enclosures were not used for hunting fowl, except for the blind—not an enclosure—mentioned for waterfowl.

Hunters characteristically bathed before going after game of any kind but did not remove clothing to reduce the danger of detection from body odors.

POLITY

Chieftainship. The Lakes Indians recognized one chief as head of the tribe, with succession normally based on descent. However, upon the death or withdrawal of a ruling chief, the people were empowered to break the line and select any person of their choice. A meeting of all adult tribal members was always held on such an occasion and the first business of the assemblage was the discussion of the qualifications of the kin eligible for the office. Generally, the sons, if any, were the first to receive attention. Any one of them might be chosen. If none was considered worthy, other relatives were discussed, including daughters, brothers, sisters, and even more remote kin. This latitude was merely an aspect of the basic freedom of the people to choose anyone they wanted as leader.

As indicated, women were eligible for the chieftainship (and, of course, for the tribal assembly, as well). In the 1930's, the Lakes Indians were in general agreement that the greatest chief that could be remembered was a woman. Reputedly, she was born very early in the l800's and presumably assumed the chieftainship early in the century. Her name was not remembered but she was the mother of Gregory, who succeeded her as chief. Gregory served for many years but there was no successor from his family. His sons had died before him, or were unwilling to take the office; recollections differ. A more distant relative, Orpahken (oˈɤaxən) was given the position and gained a notable reputation as a leader able to maintain peace. He was characterized as a severe disciplinarian but one who used his power in the interests of the people. However, in later years he became inactive because of disinterest or senility. For years—some say few, some say many—the people were essentially without a chief. Bernard declared that Orpahken had "resigned." Then, by tribal action, in assembly, the people chose James Bernard as their chief.

This was assumed to be another break in the hereditary succession and the election of a new man. However, Bernard did have remote ties with Orpahken and Gregory, and so did his wife.

When this action was taken, Orpahken became angry and declared that he had never relinquished the position. Although Bernard emphatically disagreed, he called a meeting of the tribal members and announced that he wanted to avoid dissension and would therefore defer to the old chief by serving him merely as an aide while he lived. "He has been ineffective," Bernard told the people, "because he is old. He needs a helper—a younger man to do the traveling and carry out the chief's orders. I will do that." The people willingly agreed and Bernard filled that role for the ten years that the old chief lived. Thereafter, he served as the only chief for the tribe and in 1931 he had held the position for about twenty-five years.

Bernard's role as aide to the chief was not unusual. In earlier days it had been customary for the tribal leader to have one, two, or even three assistants—services that were not needed in Bernard's time with the United States having usurped so many of the earlier powers. These chiefly assistants were selected by the chief and themselves held no power. The most important aide was the one who served as spokesman for the chief at meetings and other gatherings. The power of the chief was said to be absolute but this was a concept, not a fact. At the assemblies, every adult man and woman was permitted to express his opinion on any subject and strongly to urge conformance. The apparent power of the chief was considerably the consequence of his listening and following the will of the majority. It is, nevertheless, true that the chief engendered a degree of fear on the part of his people, a result in part of the respect for the office and in part the unpleasantness that could come when the chief was not obeyed. This last derived largely from the fact that it was the duty of the chief, perhaps his most important duty beyond the keeping of intertribal peace, to supervise the punishment of those guilty of transgressions against other tribal members.

This punishment was usually in the form of lashing and sometimes it was severe. The blows were struck with anything from an ordinary stick to a thong of braided rawhide. The whip was wielded by one of the district headmen, presumably from the village of the miscreant. Such punishment was always administered publically, with the chief as overseer of the affair. At the same time, he admonished the wrongdoer and lectured the onlookers. It is said that grown men were whipped more severely than youths but also that there was no predetermined number of lashes—the whipping continued until the victim said he had "had enough."

In the days of the Hudson's Bay Company and the missions, the lashings were more severe. It is asserted that this greater severity was the consequence of demands by the Company officials

and the missionaries. A most formidable weapon was described to me as characterizing that period, and I was told that it was used by direction of, and with the approval of, the Company and the missionaries. A pole of small diameter and about four feet long was wrapped with green hide and the hide sewed on. When dry, the pole was removed and the cylindrical opening was filled with sand. To this a short handle was securely attached. I was told that another weapon of the period was made of rawhide with three or four strands.

Lashing was said to be the punishment for fighting, assault, and rape; also, stealing and lying. The latter two transgressions were so punished only after the coming of the fur traders and the missionaries, it seems certain.

The consequences of murder were quite different. Here the chief was first required to determine whether self-defense was involved and, if so, to counsel with the parties and attempt to avoid retaliation of like kind. Alternatives involved the payment of goods and the admission of guilt. Indeed, it is said that if the transgressor was sufficiently contrite he usually was forgiven; this seems questionable. In aggravated cases it is probable that the murderer nearly always fled to a distant settlement, even out of the tribal territory. Some may never have returned. For those who returned later, the consequences were less severe, it appears, the longer the absence had been.

Thus, the chief's responsibility for leadership was exactingly tested when a murder had occurred and he was required to serve both as judge and executive, with no real power in either role. If he succeeded, the peace was kept but if he failed the result was usually another killing because punishment in such instances was at the hands of the injured family. The influence and authority of the chief were sufficient to control in lesser crimes but as an official he was almost helpless in homocides.

Indeed, the authority of the chief in any case was meager and the successful leader was usually one who lead mainly through the strength of his own personality. As one prominent tribal member expressed it: "The Lakes people recognized a chief of the tribe, and other leaders, all right, but it was the feeling of the people that determined the outcome of any affair."

We know but very vaguely how public opinion functioned in the affairs of the tribe, and now (1947) it is too late to find out. Certainly there was a great deal of talking done and then, as now, it was true that as long as people talked they did not fight. We also know that, despite his lack of real authority, the chief was usually a very effective official, and that he was a very hard working man. He had the prestige of being assisted by one or more aides, and most of the physical labor or running his household and providing for his family was done by others. Also, he usually had two wives—seldom more—whereas other men rarely had more than one, except for great hunters and talented gamblers.

The tribal assembly and the council. Reference has been made to the tribal assembly and its functioning. It was quite an informal mechanism but it provided all adult members of the tribe an equal voice in all consequential affairs of the political group. Discussions were carried on at great length and decisions were made, by acclamation, only when the question under discussion had been thoroughly examined. The frequency with which the assembly met was determined wholly by the business that needed to be transacted and when tribal affairs were running smoothly there were long periods without any meetings.

The membership of the assembly was automatically determined by the adult membership of the tribe. The council, on the other hand, was largely an instrumentality of the chieftainship and

its size and membership was determined by him. It was a small group of men, sometimes including women, moderately stable in membership, with the sole function of advising the chief. Before this body, he brought all routine and non-critical matters when he wanted to test the alignment of public opinion, or simply to get advice from others whose judgment he respected.

LAKES VILLAGES

1. npəpkolå´t'skin ("place where many pəpkolıt's [a species of bull head, *Ameiurus* sp.?] are found").

This was the lowermost Lakes village on the Columbia river, located about two miles below the present town of Marcus. It was a relatively small settlement, usually numbering about seven to ten camps. Though more populous in winter than in summer it was well occupied until late in the spring. It was the site of the shinny grounds where games between the Colvilles and the Lakes were played, and was a popular meeting place for Colvilles, Lakes, and Kalispels. It served as a base for camas gathering in the nearby Selkirk mountains.

After the establishment of the Hudson's Bay post about three quarters of a mile upriver this village increased in size and became the center of considerable trading.

2. kıxkı´us ("open place in a cottonwood grove").

This village was located about one mile below Marcus where the Dobson ferry formerly crossed. The site was below the high water line of the Columbia river and had to be evacuated before the rise of the water in the spring.

It was the largest winter village of the Lakes with an average population of about 200. As a trading center during the days of the Hudson's Bay post it was even more popular than npkəpkolå´t'skın (1).

3. nt´sılt'sıli'tkᵘ ("trees in the water").

This settlement was at the present site of Marcus.

4. åtstləktst'cın ("large grove of cottonwood [?] trees near the river").

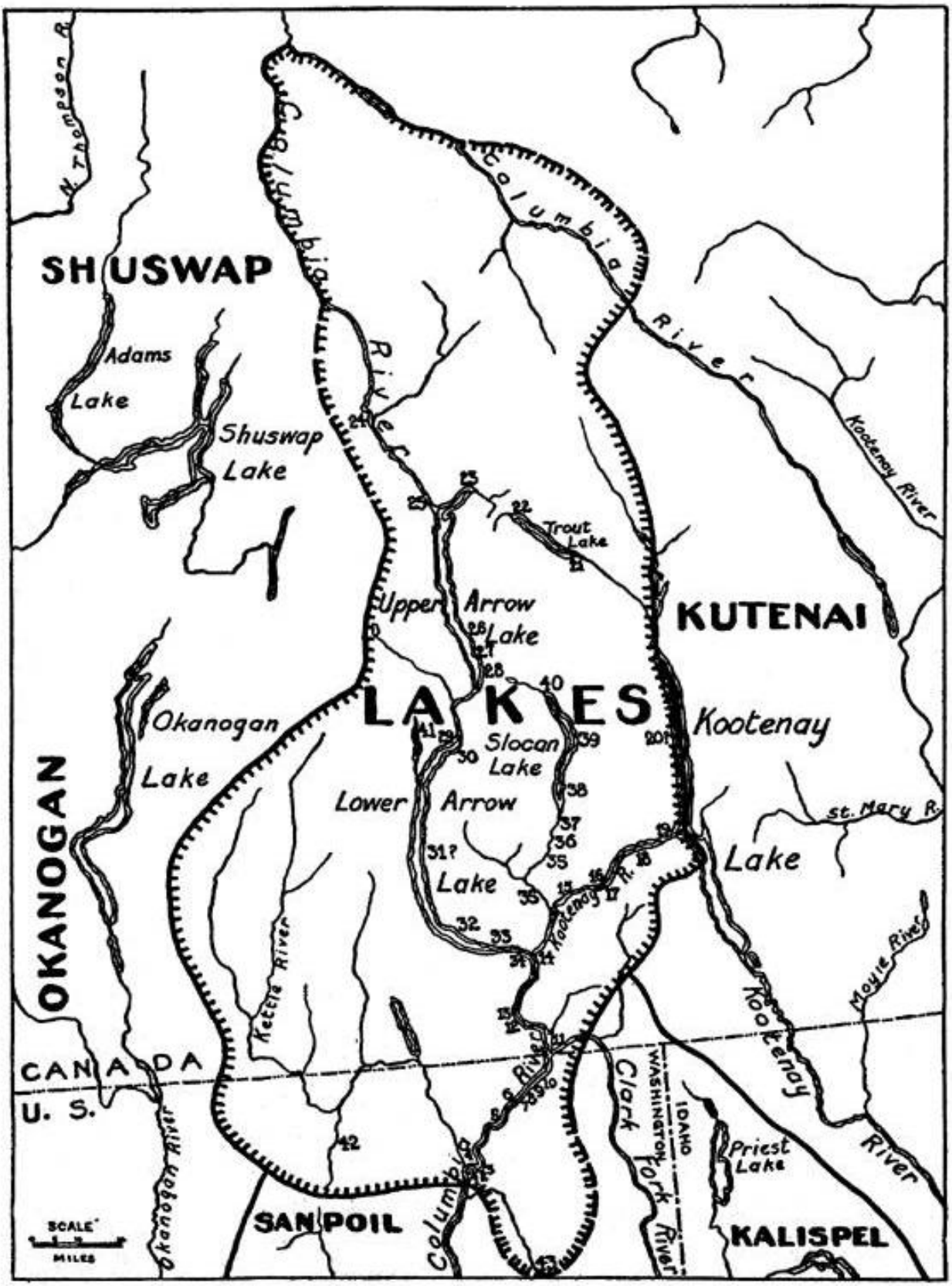
This village was located directly across the river from Marcus on the first bench above the river. Occupation here extended from December to February, with a population of about 150. Four or five families usually remained throughout the summer.

5. sıntkılxuwe´ltən ("at the foot of the hill").

This was a hunting camp on the north side of the Columbia river directly opposite the present town of Bossburg. It was occupied as a base for deer hunting during February. From here a trail led into the hills to the north.

6. tłitko´s ("basin in the river bench").

This camp, located between Bossburg and Northport was occupied during March as a base for root digging.


N. Thompson R.
Columbia River
SHUSWAP
Adams Lake
Shuswap Lake
Columbia River
Kootenay River
Trout Lake
Upper Arrow Lake
KUTENAI
LAKES
Okanogan Lake
Slocan Lake
Kootenay Lake
Lower Arrow Lake
St. Mary R.
OKANOGAN
Kettle River
Kootenay R.
Moyie River
CANADA
U. S.
Columbia River
Clark Fork River
IDAHO
WASHINGTON
Priest Lake
Kootenay River
Okanogan River
SAN POIL
KALISPEL
SCALE
MILES

7. stce´x̣ələk^{u}.

On the Columbia below Northport.

8. ntsətserri´sem.

At or very near Northport.

9. sınqi´lt ("above country," "on an elevation").

A settlement at the present site of Northport; formerly the home of the Lakes chief.

10. sn'ȧkewi´lten ("portage").

An encampment at Northport.

11. nquli´la'.

This village, located on the Columbia river about a mile above the present village of Waneta, numbered four or five families throughout the year. The berry fields and salmon grounds of Northport were conveniently near at hand.

12. tcɷlxi·´t'sȧ.

This camp was located on the west side of the Columbia river at the site of the present town of Trail. Hunters used the site for a few days at a time as a base for deer hunting.

13. snskəkəle´um.

At a creek on the west side of the Columbia river close to Trail.

14. kupi´tɬks ("rubbing the chest").

This was a settlement at the confluence of the Kootenay and Columbia rivers, used as a temporary base for root digging. Travelers coming or going from the Kootenay or upper Columbia river valleys usually camped here for a week or two, visiting and gambling with friends and using the sweat houses. To a limited extent it also served as a hunting base.

15. ntıkuli´tk^{u} ("much river food").

This encampment was on the north side of the Kootenay river about a mile above the mouth of the Slocan (slo´kȧn) river. Trout pools were numerous in the river at this point making it a popular fishing center. Women used the site as a base for berry picking while men found it convenient for hunting bear. Parties usually stayed here a week or two, most often during April just before the river began to rise. Later they moved to the north for caribou hunting, some travelling Slocan river route, some choosing the Kootenay river.

16. nx̣a·x̣a´tsən ("cave in the rocks").

This camp was the Kootenay river, opposite Nelson, at the edge of the caribou hunting area. Line fishing for trout was also profitable here.

17. k’iyȧ´mlupᵘ · (Kutenai word?).

A settlement at the site of the present town of Nelson.

18. yakskukəni´’ ("where many kukeni" [a small red fish] are found").

Located about six or seven miles above Nelson on the Kootenay river. Root gathering, bear and caribou hunting and trout fishing were all profitable.

19. ktca´ukuł ("spliced trousers").

This encampment was near the present town of Balfour (?) on Kootenay lake. It was used as a temporary base during May and June.

20. na·x̣spoȧ´lk’en ("rocky bank made by spoȧ1k'en [mythological character]").

On the west shore of upper Kootenay lake, exact location uncertain. Temporary camp.

21. sia'uks qa·li´su ("where the water flows outward" probably referring to the drainage of Troutlake into Kootenay 1ake).

This was a caribou hunting and fishing camp located at the lower end of Trout lake at the site of the present town of Gerrard. Drying racks for fish were erected here and travellers sometimes remained for several weeks.

22. sınpətł’rme·´p ("upper end of lake").

This encampment at the upper end of Trout lake was at the site of the present Trout Lake City. From here a portage usually was made to the end of Upper Arrow lake.

23. nk’umȧ'puluks ("end of the water").

This important camp was situated at the uppermost end of Upper Arrow lake near the site of the present town Compalix. It was a popular meeting place and a productive fishing, hunting, and berrying center. The camp was most populous in May and June.

24. skəx̣ikəntən.

A settlement opposite Revelstoke.

25. kospi´tsa ("buffalo robe").

At the site of the present town of Arrowhead. (T no. 3)

26. ku´sx̣əna´ks.

On Upper Arrow lake. Now called Kooskanax. (T no. 4)

27. neqo´sp ("having buffalo").

Now called Nakusp.

28. tci´uken.

A little below Nakusp.

29. sneχai'tsətsəm.

Near the upper end of Lower Arrow lake, opposite Burton City.

30. χaie´kən.

At a creek below Burton City.

31. məmatsi´ntɪn ("log leaning outside a cave").

A village on Lower Arrow lake, exact location uncertain. It was a center for hunting mountain goat in March and April.

32. plu´meʾ.

This was a temporary camp on the east side of Lower Arrow lake near the site of the present Deer Park. It marked the lower end of the hunting and fishing territory.

33. sm·a´ipʾ ("large log leaning against a tree").

A temporary camping place at the foot of Lower Arrow lake.

34. A settlement at the site of the present town of Castlegar, near the fork of the Kootenay river and Lower Arrow lake, was important for both spear and line fishing. There was a rapids here, which aided the fisherman.

35. sketu´kəlôx.

On lower Slocan river.

36. nkweɪo´xtən.

On Slocan river above no. 35.

37. ka·ntca·´k.

On Slocan river below the lake.

38. sihwi·´ləχ.

On the lower part of Slocan lake.

39. takələχaitcəkst ("trout ascend"?).

On Slocan lake, below no. 40.

40. snkəmi´p ("base, root, or bottom").

At upper end of Slocan lake.

41. nəmi·´məltəm.

On Caribou lake, to the west of the narrows between the Arrow lakes.

42. stɪxtɪɬu´stən ("first in line," "leader").

This was a small settlement at the present town of Malo, Washington, about four miles northeast or Curlew lake. It was a permanent camp where trapping, hunting, and trap fishing were possible.

43. skwȧ´rəxən ("crane").

This was reputedly a Lakes settlement at the present site of Addy Washington.

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[1]ENDNOTE

Madilane Perry
Curlew Lake

The ethnography presented above was completed by Dr. Verne F. Ray in 1947. The ethnography focuses on the Lakes (Senijextee) Indians of northeastern Washington State. When material by a major regional ethnographer appears in print 69 years after its creation (and 13 years following his passing)—and submitted for publication by a non-ethnographer—some explanation is in order.

My introduction to Dr. Verne Frederick Ray was similar to that of most Anthropology undergraduates in the Northwest in the 1960s. I knew him as the author of at least two items of required reading for anyone interested in Plateau ethnography or archaeology (Ray 1936, 1939) and the compiler of the culture element list for the Plateau (Ray 1942). As one of the graduate students that Dr. Alfred Kroeber sent out in the 1930s to do the "salvage ethnography" that produced the culture element lists, Ray is regarded as a pioneer in the area.

I was particularly interested in his *The Sanpoil and Nespelem: Salishan Peoples of Northeast Washington* (Ray 1933) and *Native Villages and Groupings of the Columbia Basin* (Ray 1936) because the family-owned fishing and hunting resort where I spent my childhood is located on a lake near the headwaters of the Sanpoil River. I was disappointed, however, to find that, in Ray's work, my home fell in the ethnographically blank space between the northernmost settlement of the Sanpoil and the southernmost Lakes settlement.

Following graduation from Washington State University (WSU) with a bachelor's degree in 1969, I spent a number of years as an archaeological "dig bum" and sometime Registered Nurse before returning to graduate school at the University of Idaho for a Master's in Anthropology. My

thesis, *An Archaeological Assessment of Curlew Lake* (Perry 1989), focused on the "blank spot" between the territories of the San Poil and Lakes peoples.

In researching the ethnographic background for my thesis area, I cited Dr. Ray's work, but was frustrated by my inability to find much data on the Lakes people. Hoping to find more information, I wrote to Dr. Ray in 1987 on the possibility that he might have additional, unpublished material. Soon thereafter, Dr. Ray sent some related material to a mutual friend to forward to me. I received a photocopy of a letter from Dr. Ray to photographer Mary Randlett; and a note from Randlett, accompanied by three pages of ethnographic material and excerpts from the *Indian Claims Commission Docket No. 181*-C (Ray 1954b) and a similar paper, "*Fisheries of the Confederated Tribes of the Colville Reservation*" dated 1972. The three-page enclosure was titled "The Nez Perce Tribe A Preliminary Report on Columbia River Salmon Fishing" (1954a). Unfortunately, none of it was directly applicable to my thesis work.

In 1990, I found myself attending a Forest Service training session at Ft. Worden in Port Townsend, Washington. Knowing that Dr. Ray also lived there, and thinking that I might have the opportunity to meet him, I called him.

His wife, Dorothy Jean, answered the telephone and informed me that Dr. Ray was too ill to come to the phone, but would be interested in seeing a copy of my thesis when he was feeling better. Once home, I packed up a copy of the thesis and sent it to him.

Sometime later, I was surprised to receive a letter from Dr. Ray. He commended me on my thesis, written on an area "full of voids and ambiguities" (Ray 1993a). I had noted in the thesis that "Information on the Lakes people … is more scattered" (Perry 1989:24). He added that I might as well have said "nonexistent" (Ray 1993a) and explained why the Lakes were left out of his work. I think it's worthwhile to quote his explanation in full:

> Now I want to refer to the massive ethnographic salvage project conceived by A. L. Kroeber and carried out under his sponsorship. You are acquainted, of course, with the many volumes printed by the University of California under the heading Culture Element Distributions, including the several lists included in my volume (No. xxii) of that series. I covered fifteen Plateau tribes (including the Sanpoil) [Ray 1942]. Why not the Lakes? Simple answer: I did cover the Lakes but not until the very end of the project and the money ran out before publication. (Ray 1993a)

His concluding paragraph surprised me, and began the long process that has resulted in the present publication:

> I wonder if you would be interested in seeing the Lakes list? I would be happy to send it to you for perusal. And for transformation into a compact textual ethnography—it would be simple to do—if you would care to do so. (I wonder why you didn't not include data from the comprehensive volume in your thesis.) I'll await your response. But be assured that I am not urging you. A long letter, after all! But you have waited a long time for it. (Ray 1993a)

Unfortunately, I no longer have copies of letters that I wrote to Dr. Ray, but I must have expressed interest. The next two letters from Ray discussed various aspects of preparing his material for publication. I ventured the opinion that the culture element list for the Lakes should be published by itself and that I could probably find a publisher. Dr. Ray expressed skepticism that anyone would be interested in publication at this late date and that it would be "a lot of copying."

There was some understandable vacillation between maintaining control of his material and turning it over to me completely. My suggestion that I might consult with present-day tribal members was not well received. At one point in 1994 he requested that the material be returned. That was resolved by my agreeing to restrict communication regarding the data.

In a letter from Dr. Ray dated August 24, 1993, he cites a letter from him dated August 10 in which he stated "This project, ‘If and when you start work on it becomes solely your project; not mine, nor any other second party's …’ . And your write-up, after publication is yours and mine and not any second party's" (Ray 1993b).

In the same letter he indicated what he had in mind for the publication "…it consists mainly of the original wording plus ‘ands’ and therefores, "as with other tribes of the area," and so forth (But you must do it your way.)"

Dr. Ray wrote on September 3, 1993 forbidding

> …any interference by any "editor" with any phrasing in the element list or in my textual copy (enclosed). And I emphasize that none of my phonetic transcriptions of native words—place names, etc.—may be changed or omitted. In the whole of my professional career not one word of my writing for publication has been changed, omitted, or in any other manner distributed by any "editor" and I won't accept any interference starting now. (With respect to your writing, of course, you must make your own decision even though the source data are mine.) (Ray 1993c)

Later that month I received the Lakes culture element list. The Lakes manuscript (published in its entirety above) and a copy of the map and place names from *Native Settlements* were enclosed. The list consisted of the published list for the Plateau with the Lakes data appearing as faint pencil marks to the right of the list and to the left of the column for the Lower Chinook data. The letter also contained a "Grant of Right" to "Copy, revise, and utilize the ethnological data for the Lakes (Senijextee) Indians entered in penciled form in the left hand columns of Culture Element Distributions: XXII Plateau"… "Permission is also given for the use of the contents of the unpublished paper Aboriginal Economy and Polity of the Lakes (Sinijextee) Indians …" (Ray 1993c).

In order to produce the "compact textual ethnography" envisioned by Ray, it was my intention to transcribe the element list, note the items that could be used to enlarge the manuscript and annotate the manuscript indicating where items from the culture element list should be inserted and items in the text that could be added to the list. I also intended to take a trip through Lakes territory, visiting museums and talking to local people in order to fill in what appeared to me to be gaps or unlikely statements in the list. I began working on transcribing the list and noting items to be added to the manuscript and my correspondence with Dr. Ray continued.

Unfortunately, the project was larger than I originally envisioned, and progress slowed. Communications with the Rays however, continued, including short, hand written notes, holiday greetings, birthday cards and discussions of medical matters (mostly his) and frequent changes in employment (mine), the weather, recipes, and Dorothy Jean's garden. I visited the Rays in the fall of 1995 and soon began receiving the annual *Ray Review*, a holiday letter containing several pages of personal news and oddities from letters, the press, and friends, compiled by Dorothy Jean.

While intending to publish the augmented ethnography eventually, I chose to transcribe the cultural element list first because of its rather fragile form. It seemed to me that the faint marginal pencil marks that comprised the list were more likely to be lost prior to publication than the

manuscript which was essentially ready to be published. In transcribing the cultural element list, I became so involved in its rather confusing structure that progress was very slow. It slowed even more due to work and family demands on my time and eventually stopped for several years. The cultural element still remains to be completed and will be published separately.

In his letter of September 3, 1993, in answer to questions regarding the sources of his information, Ray wrote:

> Concerning informants: the bulk of my information was supplied by James Bernard, chief from the early 1900s to the 1940s and beyond. I also worked with Joe Adolph, an intelligent and well informed man; my last contact was in July 1953. In that year Jerome Nichols also furnished information. Also, from the 1930s to 1953 various other Lakes men and women served briefly as informants. (Ray 1993c)

I assume that this referred to sources for the Lakes manuscript as well as the culture element list.

Given that Dr. Ray did not publish the material in forty years and that I have not managed to publish it with the desired additions in twenty, I concluded that getting the material into print, even in its present, unimproved form, was preferable to risking its being discarded or buried in an archive. The Lakes manuscript is published above. It is not the expanded version that Dr. Ray and I had envisioned. It is, instead, just what he wrote in 1947, with no additions from the associated cultural element list for the Lakes.

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ABOUT THE AUTHOR

Verne Ray (1905–2003)

Verne Frederick Ray, '31, '33, a UW anthropology professor who helped dozens of Northwest tribes win tribal land-claim settlements, died Sept. 28. He was 98.

One of the first anthropologists at the UW, Ray served as head of the Department of Anthropology and as associate dean of the Graduate School from 1948 to 1954. He was director of the U.S. Interior Dept.'s Emergency Conservation Program on the Colville and the Spokane Indian reservations during the 1930s.

Ray helped pioneer ethnohistory, merging anthropology with history and historical documentation. When Congress passed the Indian Claims Commission Act in 1946, Ray's professional papers and books in the 1930s and 1940s became models of research for the numerous Indian land claims.

Originally interested in law before deciding on anthropology, Ray became immersed in years of legal proceedings following his retirement in 1966, serving as an expert witness and consultant for 53 Indian land-claim cases. Because of his long anthropological interest going back to the 1930s, Ray was hugely influential in those cases.

Through the early 1970s, he represented 44 tribes in 53 cases before the Claims Commission and other courts. By establishing the history and land of the tribes, Ray won them millions of dollars for the government's wrongful taking of their lands. The Cowlitz tribe, which gained federal recognition with Ray's help, voted Ray an honorary member in 2000.

Tribal members who did not personally know Ray remember his valuable works such as *Lower Chinook Ethnographic Notes* (1938) and *Handbook of Cowlitz Indians* (1974). "He recorded a lot of important information that the Cowlitz and the Chinook will be grateful to have recorded," Chinook Tribal Chairman Gary Johnson said.

Born in Illinois and raised in Washington, Ray earned his B.A. and M.A. in anthropology from the UW and his Ph.D. from Yale in 1937. His anthropological interests covered the Middle East and the Valley of Mexico in addition to the Indian tribes of the Pacific Northwest. Ray remained an active researcher until just a few years ago.

He is survived by his wife of 48 years, Dorothy Jean, his stepson, Eric S. Thompson, three grandsons, and two great grandsons.

-*Lydia Ratna*, 2004. *Columns, the University of Washington Alumni Magazine*.

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BERKELEY ROCKSHELTER LITHICS: UNDERSTANDING THE LATE HOLOCENE USE OF THE MOUNT RAINIER AREA

Bradford W. Andrews, Kipp O. Godfrey, and Greg C. Burtchard

ABSTRACT

Berkeley Rockshelter is a Late Holocene period (2500 B.P. to contact) shelter located in the northeast quadrant of Mount Rainier National Park. This article applies the site-type classification used in Binford's (1980) forager-collector model to infer the function of Berkeley Rockshelter. The debitage and projectile points support the inference that late-stage flaking for shaping and reworking projectile points and preforms was a prominent activity at the site. Evidence also indicates the reduction of a local, poor quality source of jasper, which made it an even more attractive stop for mobile hunter-gatherers. These interpretations suggest that, consistent with Binford's model, this site functioned primarily as a hunting field camp.

Introduction

Reconstructing the nature and temporal dynamics of prehistoric settlement and subsistence in the Pacific Northwest has been a longstanding research issue (Schalk 1978, 1981, 1988; Baxter 1986; Mierendorf 1986; Uebelacker 1986; Burtchard 1987, 1998). The use of high elevation areas in the region, however, has only recently been widely acknowledged (Reimer 2000; Burtchard 2007:3). The present article contributes to this research by exploring the function of the Berkeley Rockshelter (45-PI-0303), a Late Holocene period (2500 B.P. to contact) site located at 5,640 ft. in the northeast quadrant of Mount Rainier National Park in Washington State. To this end, the article applies the theoretical framework of Lewis Binford's (1980) forager-collector model to infer how the site functioned as part of an overall settlement and subsistence system.

In this study, besides the general topographic setting of the site, the site's function is inferred based on our analysis of its flaked stone artifact assemblage (N = 1,709). These data are analyzed and interpreted using the analytical approach of lithic technology (Sheets 1975), which enables the reconstruction of tool production and consumption activities that can then be used to support inferences about prehistoric socioeconomic behavior (Sheets 1975; Flenniken 1989; Hirth, Andrews, and Flenniken 2006).

The following discussion is divided into six sections. The first section describes Berkeley Rockshelter and the archaeological work that has been done at the site. The second section reviews Binford's (1980) forager-collector model and how it is applied to evaluate the prehistory of the region in general and the use of Berkeley Rockshelter in particular; this section outlines what the assemblage should look like given different site types in Binford's model. The third section describes the methods used to analyze the debitage and the flaked stone tools. The fourth section describes the data, which are subsequently interpreted and discussed in the fifth section. The

concluding section summarizes the results and implications of the study for understanding Late Holocene use of the Mount Rainer area.

The Berkeley Rockshelter

Berkeley Rockshelter is situated in the subalpine parkland of Berkeley Park on the northern flank of Mount Rainier (locational information is intentionally vague to protect the site; Fig. 1). It consists of two sheltered areas underneath three massive blocks of diorite situated at the base of a large scree slope (Bergland 1988:2). These diorite blocks were dislodged from their original proveniences above the site as a result of a post-Pleistocene seismic event. The site is strategically located at the ecotone between closed forest and the upper alpine parkland, a zone characterized as one of patchy subalpine meadows interspersed with small stands of trees. Hence, its location is ecologically optimal in that it provides shelter and easy access to two major eco-zones; the upper subalpine parkland zone is the most resource rich (principally ungulates and a broader array of economically useful plant and animal species), at least during the summer months.

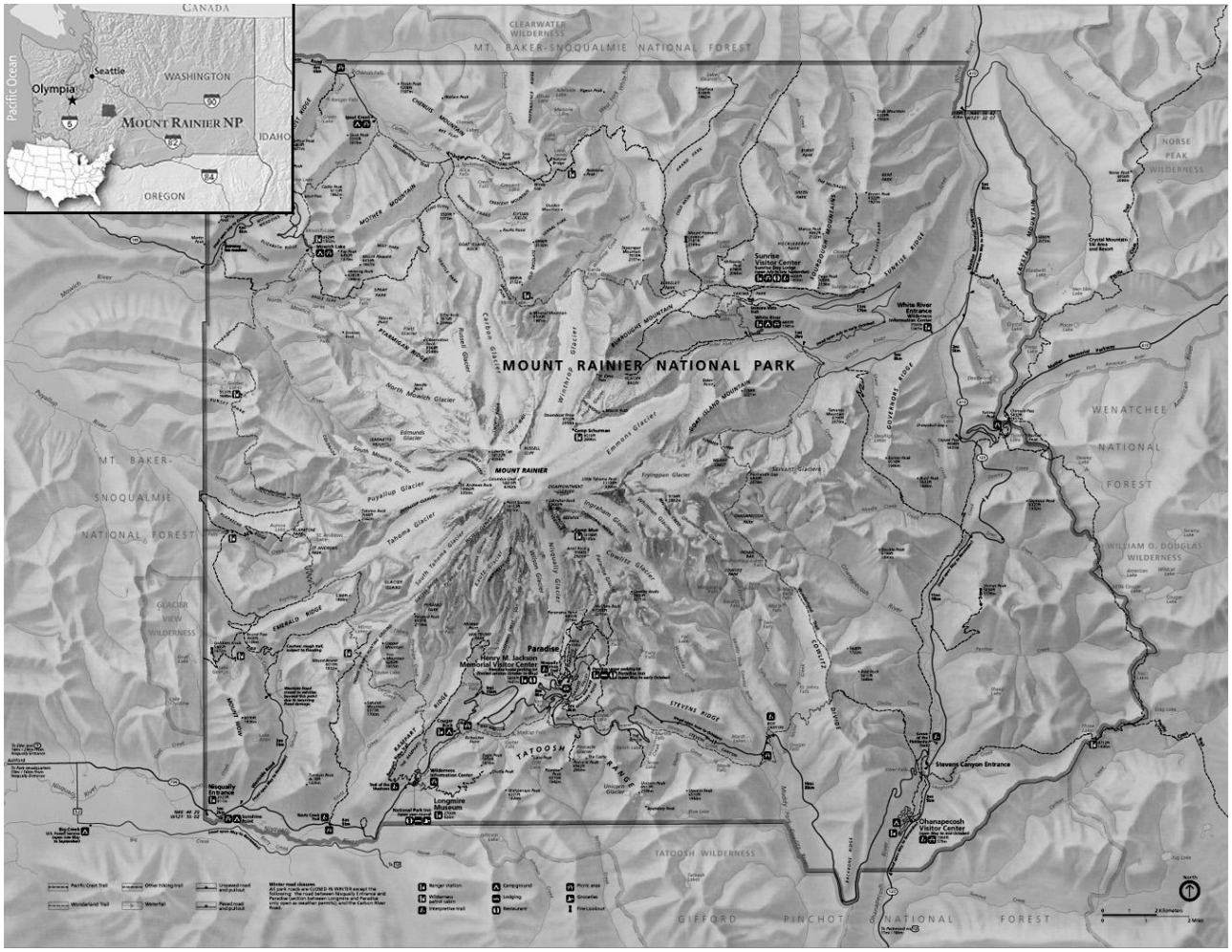

Fig. 1. Map showing location of Mount Rainier National Park in Washington State.

The two shelters, one slightly higher in elevation than the other, have roughly parallel, north-south trending interiors, and are referred to as the lower and upper shelters (Figs. 2 and 3). Although the lower shelter has slightly more overhanging cover than its upper counterpart, the useable interior space of each shelter does not exceed 20 m^2. Archaeological work at the site consists of test excavations conducted by Eric Bergland and Greg Burtchard. Bergland in 1987 excavated a 1 x 1 m unit to a depth of 60 cm in the lower shelter and a 0.5 x 0.5 m unit to a depth of 40 cm in the upper shelter (Bergland 1988). In 2002, Burtchard and seasonal archaeologist Adam Nickels, excavated an additional 1 x 0.5 m unit in the lower shelter, flush with the eastern extent of Bergland's original unit. Bergland screened test excavated fill through 1/4 inch hardware cloth. Burtchard used 1/8 inch mesh.

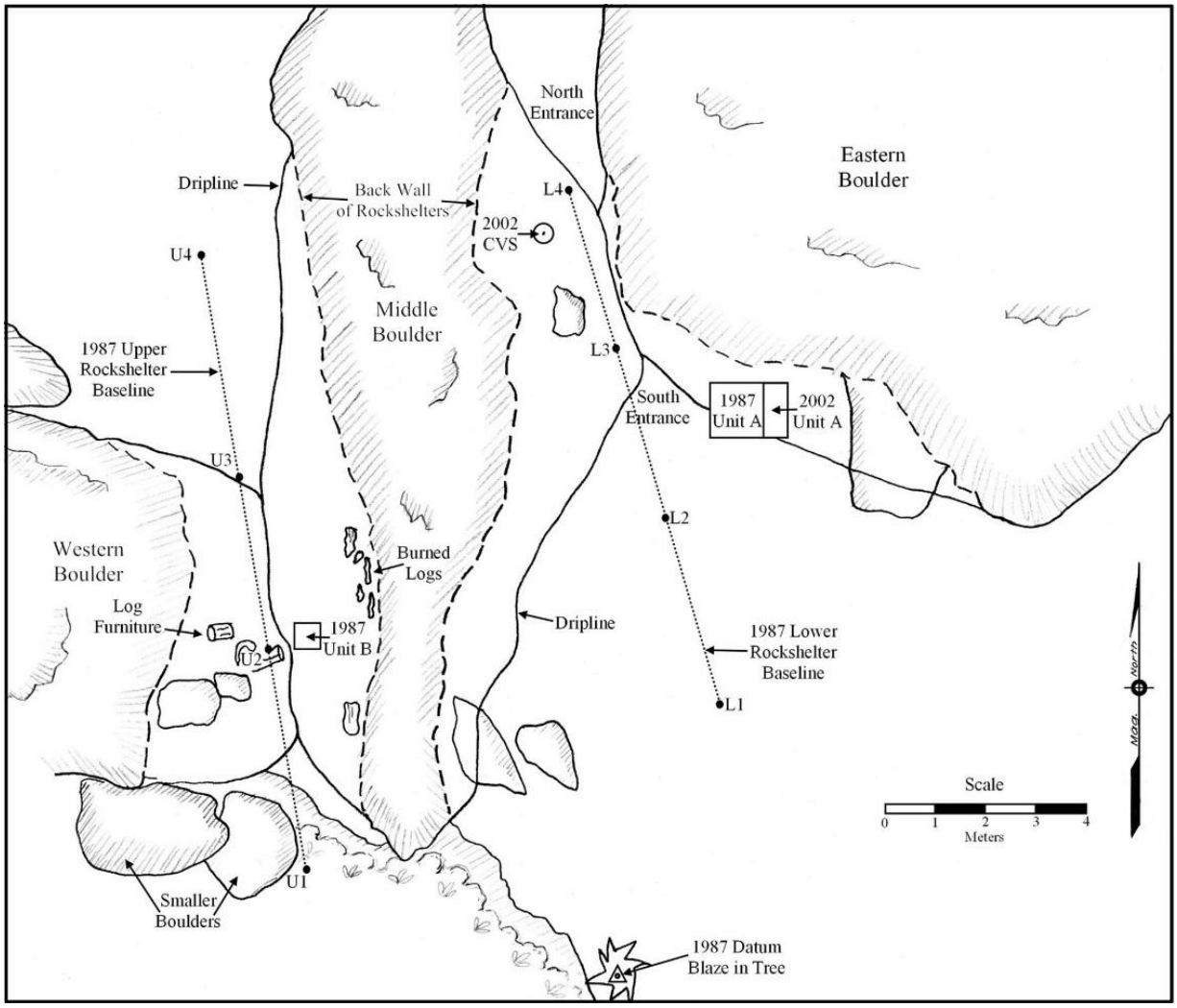

Fig. 2. Map of the Berkeley Rockshelter and location of the excavation units. (Map drawn by Greg Burtchard; drafted by Eric Gleason and Jacqueline Cheung)

Besides the flaked stone artifacts, historic trash (mostly on the surface), large mammal bone, charcoal, and macro-botanical remains were recovered (Bergland 1988). The large mammal

bone was highly fragmented and degraded, and therefore, unidentifiable to specific genera or species (Bergland 1988:57–59). The macrobotanical remains indicated a limited, although significant amount of charred geophyte material suggesting that plant foods may have been consumed at the site (Gahr 2015). Unfortunately, it is unclear whether these remains were from edible plants because, similar to the mammal bone, they are taxonomically unidentifiable. All of the cultural materials were found overlying the Mount Rainier C tephra, a volcanic ash layer that was deposited when the mountain erupted ca. 2300 radiocarbon years B.P. Three charcoal samples from Unit A (see Fig. 2) in the lower rockshelter provided dates consistent with this stratigraphic observation. The deepest sample was retrieved from a charcoal lens immediately atop the Mount Rainier C tephra layer, another from the lowest cultural stratum in the unit (ca. 39 cm), and the third was a composite sample recovered between 0–10 cm below the surface. Collectively, these samples indicate that the Berkeley Rockshelter was intermittently occupied during the Late Holocene, specifically between 1970 B.P. and 290 B.P. (Burtchard 2007).

Fig. 3. Photograph of the lower Berkeley Rockshelter overhang. (Photo by Laura Johnson, 2008)

Forager-Collector Model

The Berkeley Rockshelter data, in addition to the site's setting and temporal affiliation, are evaluated to infer how it fits into Binford's forager-collector model. Representing a general model for understanding hunter-gather organizational variation, Binford's (1980) seminal article *Willow Smoke and Dogs Tails* characterizes two contrasting settlement/subsistence patterns—*foragers* and *collectors*—as systems exhibiting a combination of five different site types. It is important to acknowledge that these site types are ideal, and that real sites rarely fit neatly into the model as theoretically derived (i.e., some sites have overlapping functions). This model, developed a number of years ago, logically assumes that human groups interact with their environments and respond to, or are constrained by, local ecological variables (Burtchard 1998). Its explanatory power also lies in its ability to account for the basic organizational variability evident in ethnographically documented hunting and gathering societies, and its predictions are amenable to archaeological testing (Burtchard 1998:128).

Binford (1980) originally formulated the model to highlight the basic organizational contrast between hunter-gatherer groups in low versus high latitudinal regions. In both forager and collector systems, the two main site types consist of the *residential base* and the *location*. The *residential base* is the center of subsistence activities for a group; in contrast, the *location* is where extractive tasks for acquiring food and other necessary resources occur. Residential sites are often located near critical resources, such as water, from which group members daily set out to exploit resources at task-specific locations elsewhere. Essentially, in the more mobile forager system, consumers move to resources; as such, they frequently relocate their residential bases when they decide that declining nearby resources can no longer reliably support the group. Binford (1980:15–17) argued that the forager settlement/subsistence pattern is most likely associated with an environmental context characterized by a widely homogenous resource base, making a highly mobile foraging strategy a successful adaptive response to such an environment.

Collector groups also use residential bases and locations, but in addition they use Binford's other three site types, the *field camp*, *station*, and *cache* (1980:10–12). Binford argued that collector systems are better adapted to a more heterogeneous, or patchy, resource base. As such, collectors typically are found in temperate regions (as opposed to a tendency for foragers in equatorial settings) where pronounced seasonality makes resource availability heterogeneous. With higher population densities and more sedentary *residential* sites (usually winter and summer camps), collectors typically rely on more complex strategies for bringing resources to the residential base for storage and redistribution. *Field camps* facilitate long distance overnight procurement of specific resources for collector groups, *stations* provide lookouts for acquiring mobile food resources, and *caches* are temporary storage sites. Central to this logistical system, collectors move resources to consumers, relying more on mass-harvest and storage. Moreover, their residential moves are less frequent than their foraging counterparts.

Building on a proposition first proposed by Schalk and Cleveland (1983), Burtchard (1998) suggests that the forager-collector model can be applied in a temporal fashion to heterogeneous resource areas, such as mountainous landscapes in the Pacific Northwest. As such, this iteration does not characterize hunter-gatherers in terms of their latitudinal context, but rather uses both types of groups (foragers and collectors) to model changing subsistence and settlement patterns over time. This revision suggests that early to middle Holocene populations exploiting Mount Rainier in a context of generally low regional population density would have been most effectively served by, and hence generally characterized by, a foraging mode of production. However, as population increased, it became harder to maintain a highly mobile settlement strategy. Regional

population increase resulted in a decrease in the capacity of foraging groups to minimize competition with other foraging groups by moving to new, previously unexploited resource acquisition areas. This process created a selective context favoring a shift to a collector subsistence mode whereby groups began sending out overnight task groups from semi-sedentary residential sites in the lowlands to acquire distant resources located elsewhere. Given the relatively recent Late Holocene dates for use of the Berkeley Rockshelter (1,970 and 290 radiocarbon years B.P.), the site was most likely used by hunters and gatherers employing a collector-type settlement and subsistence system.

Theoretical Expectations of the Study

Assuming that the Berkeley Rockshelter was occupied by hunter and gatherers tethered to logistically complex, collector-based systems, which site type does it best fit given Binford's (1980) model? It is improbable that it functioned as a *location* or a *station*. According to the model, a *location* would tend to have little material evidence, being a spot where resources were acquired and taken to another site for further processing. A *station* should also exhibit very little material evidence because of its function as a lookout; it might contain a few small retouch flakes or biface fragments consistent with tool curation activities. The Berkeley Rockshelter assemblage, however, contains a notable quantity of flaked stone debitage and a diversity of tool types (see below), a characteristic not consistent with a typical location or station. Moreover, the shelter sits in a low spot relative to its surrounding topography, making it an unlikely place for a lookout. The Berkeley Rockshelter, therefore, best fits Binford's *summer residential base* or *field camp/cache* collector site types.

Geographic context and the extent of interior space in the Berkeley shelters would suggest that it was used as a field camp. However, there is a relatively amplified amount of external open space in front of both overhangs that also could have been occupied, especially given the assumption that these sites were only used in the summer. As such, the site area could have supported larger groups than those typically associated with a field camp. Consequently, our objective was to evaluate the function of the site by looking at its flaked stone artifact assemblage. At a *residential base*, we would expect the flaked stone data to reflect relatively long-term occupations characteristic of seasonally sedentary residences. This evidence would be consistent with processing and manufacturing of all goods utilized by the society for daily activities (Binford 1980:9), including tools used on-site as well as those shaped for use elsewhere (Table 1). The range of tool types might include both expedient implements, such as retouched flakes, and more formal tools, such as biface cores and bifaces (knives, projectile points, etc.). Expedient tools can be used for many on-site domestic activities, whereas formal tools typically fulfill more specialized functions. The onsite manufacture of a range of tool types should result in a requisite range of debitage reflecting their production and maintenance. In essence, the assemblage should be relatively diverse, indicating the on-site activities of men, women, and children. Finally, such seasonal residential sites might tend to have a relatively high density of lithic remains if they were used repetitively over a lengthy period of time.

In contrast, a *field camp* should reflect a much more limited range of activities, being those focused on a specific extractive task (i.e., deer, elk, goat, or other specific resource procurements). For flaked stone tools, such expectations could range from local expedient tool manufacture for field processing needs (e.g., huckleberry harvest or other floral resources) to nearly finished tools, that were brought to the site to be used for specific purposes (e.g., projectile points for hunting).

As such, debitage and tool diversity should be less than that associated with seasonal residential bases. Moreover, a site with fewer tool types may also be associated with debitage representing a narrower range of the reduction process. Finally, *field camps* might be expected to have lower lithic densities because their occupations were relatively short. In short, a seasonal summer *residential base* should have an assemblage reflecting multiple activities, whereas a field camp should have an assemblage reflecting a more focused function.

TABLE 1. EXPECTED FLAKE STONE ASSEMBLAGES FOR A RESIDENTIAL SITE TYPE VERSUS A FIELD CAMP

Residential Base	Field Camp
Diversity of expedient and formal tools	Relatively low tool diversity
Debitage representing a wider range of the lithic reduction sequence	Debitage representing a narrow range of lithic reduction sequence
Relatively high lithic densities	Relatively low lithic densities

Methods

The lithic technology approach used in this study permits inferences about prehistoric behavior from flaked stone artifacts (Flenniken 1981). Flaked stone artifacts separate into two major categories: 1) debitage (flakes) produced during tool production, and 2) tools and cores. As for debitage, there are many methods used for classification. Here, a six-stage system developed by Jeffrey Flenniken (1981) was applied, which represents a general sequence of lithic reduction (Andrews, Tofte, and Huelsbeck 2008). Tools were classified according to basic morphological and functional attributes following a similar study (Andrews and Greubel 2008).

Debitage

Any sequence of flaked stone tool production begins at the quarry or other secondary source areas where raw material is acquired. Initial shaping of raw material starts with decortication, or the removal of the weathered surface of a stone. Stage 1 represents primary decortication; primary flakes tend to be relatively large and have cortex covering their entire dorsal surfaces. Stage 2 represents the removal of secondary flakes, defined as those with cortex covering less than one-hundred percent of their dorsal surfaces (Fig. 4a). These initial stages are used to prepare raw material for subsequent reduction and to produce flake tools for expedient uses.

Stages 3 and 4 represent early and late core flakes, respectively. These flakes are removed to further shape a core, to use immediately as expedient tools, or to make “blanks” that can be shaped into formal tools. Early core flakes have few dorsal flake scars, often have relatively thick cross-sections, and have platform-to-dorsal surface angles between 90 and 70 degrees (Fig. 4b). In contrast, late core flakes can have several dorsal flake scars, and generally have a lower thickness to width ratio than their stage 3 counterparts (Fig. 4c).

Stage 5 corresponds to early and late percussion bifacial thinning, and is represented by several distinct flake types. These flakes are removed to shape bifacial and unifacial artifacts into more formal tool types. Early biface thinning flakes are removed during the initial process of

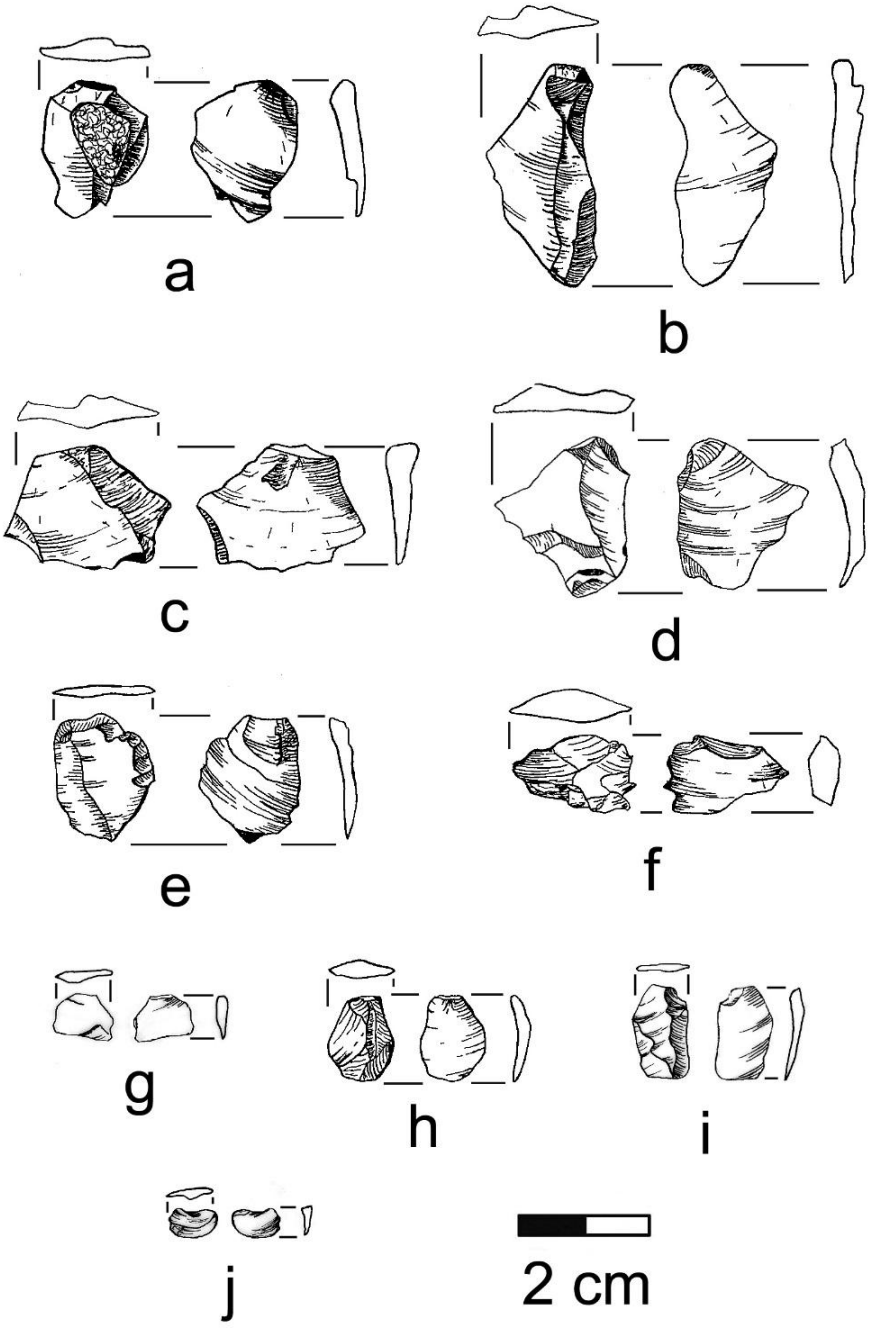

Fig. 4. Technologically diagnostic flakes: stage 2 secondary decortication flake (a); stage 2 early core flake (b); stage 3 late core flake (c); stage 5 early biface thinning flake (d), late biface thinning flake (e), margin removal flake (f), platform preparation flake (g); stage 6 early biface pressure flake (h), late biface pressure flake (i), notch flake (j). (Illustrations by Stephanie Steinke and Bradford Andrews).

shaping formal tools and tend to have curved longitudinal cross-sections (Fig. 4d). In contrast, late biface thinning flakes are removed later in the reduction sequence, have platform-to-dorsal face angles less than 70 degrees, multiple dorsal scars, and are flatter and less curved in longitudinal cross-section than their early counterparts (Fig. 4e). They can exhibit ground platforms as a result of careful platform preparation, and often have relatively thin distal ends. Two additional stage 5 flake types include margin removal and edge preparation flakes (Figs. 4f and 4g). Margin removal flakes (Fig. 4f) remove a relatively excessive amount of the edge of a biface/flake blank. These flakes are the result of excessive force applied too far from the margin, and are therefore often regarded as errors. Edge preparation flakes (Fig. 4g) are those intentionally removed from the edge of a flake blank to impart curvature to its ventral surface (detachment scar). Imparting curvature to this surface is important because it helps to facilitate subsequent flake removals, which can be difficult to perform if the detachment scar is relatively flat.

Stage 6 represents early and late pressure flakes. Overall, compared to flake-types removed in the earlier stages, pressure flakes are more standardized in form and have distal terminations that tend to swing either to the right or left of their platforms. Early pressure flakes are the less standardized of the two varieties because they are removed during the transition from percussion to pressure reduction; as such, they exhibit percussion flake scars on their dorsal surfaces (Fig. 4h). In contrast, late pressure flakes are often more parallel-sided and regularized in shape, and have dorsal pressure flake scars resulting from the removal of previous early pressure flakes (Fig. 4i). Notch flakes are a morphologically unique stage 6 flake type removed to make notches for the purpose of hafting formal implements such as projectile points (Fig. 4j).

Several other categories of debitage created during lithic reduction include flake fragments, chunks, and shatter. Flake fragments are defined as flakes lacking their proximal, platform bearing ends. Chunks and shatter represent the miscellany of large to small bits of debris created during flaked stone tool production. Contrary to the views of some researchers (Sullivan and Rozen 1985), these items provide limited or ambiguous technological information, and therefore, they receive no additional discussion here.

Tools

The Berkeley Rockshelter assemblage also contains several types of tools. These artifacts include intentionally shaped items such as projectile points, as well as informal tools made for expedient purposes. Columbia Plateau projectile point types described by Lohse and Schou (2008) were used to classify the projectile points.

The tools were classified according to their morphology and inferred function, which implies how they were made and/or hypothetically used (Figs. 5, 6, and 7). Tool categories include projectile points, projectile point preforms, bifacial and unifacial scrapers, and flake and scalar cores. These artifacts are referred to as formal implements because they represent the shaping of flakes, spalls, or cores for specific purposes. In contrast to formal tools, retouched and utilized flakes represent a variety of expedient tools (Figs. 6e–6h). These implements were identified on the basis of their edge characteristics, generally informal shape, and a lack of evidence indicating that they were further shaped with flaking. The flake cores (Fig. 7) were classified according to the direction and nature of flake removals (multidirectional, and bipolar; all tools are discussed in greater detail below).

The Data

The 1,709 artifacts recovered from the Berkeley Rockshelter consist of 1,656 flakes and 53 tools. The majority of these artifacts are chert (N = 785, 45%), with jasper (N = 552, 33%) and chalcedony (N = 367, 21%) composing most of the remainder of the assemblage (Table 2). Other minor material types included andesite (N = 2), dacite (N = 1), siltstone (N = 1), and pumice (N = 1). Based on what is known of quarry sites in Mount Rainier National Park, most of the chert and chalcedony in the assemblage were probably not available on the mountain. The jasper, however, is locally available in the scree deposits upslope of the site itself. It should be noted that the non-local chert and chalcedony are generally good quality, whereas the local jasper is predominantly poor material with low silica content.

Debitage

Of the 1,656 pieces of debitage, most (N = 1,071, 64.7%) were flakes and flake fragments lacking clear technologically diagnostic traits (Table 3). Accordingly, this analysis focused on the technologically diagnostic flakes (N = 585, 35.3%; Table 4) because the present intent is to infer the kind of flaked stone tool technology performed at the shelter.

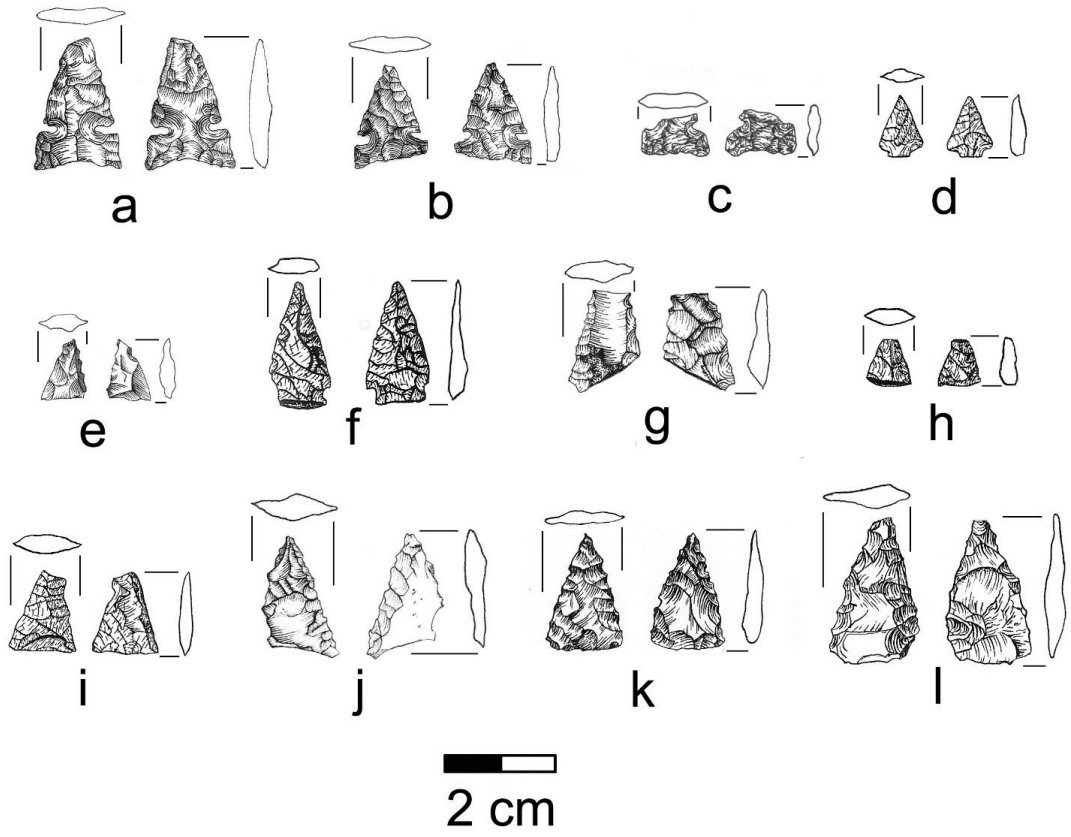

Fig. 5. The projectile point artifacts recovered at the Berkeley Rockshelter: complete Plateau Side-notched points (a and b); probable point fragments (c–j); probable projectile point preforms (k and l). (Illustrations by Kathryn Hunt, Kipp Godfrey and Laura Johnson)

Considering the flake classification system outlined above, stages 1 through 4 are not well represented (Table 4, Fig. 8). These stages collectively make up only 5.3% of the technologically diagnostic flakes. As such, initial flake reduction activities largely appear to have taken place elsewhere. In contrast, flakes reflecting bifacial thinning activities are comparatively better represented. Stage 5 comprises 7.7% of the diagnostic sample (Table 4), suggesting that percussion biface thinning activities were a limited focus of activities at the site.

The majority (87%) of the diagnostic sample is comprised of stage 6 pressure bifacial thinning flakes (Table 4). As such, these data indicate that late-stage biface reduction related to the final shaping of formal implements such as projectile points and the sharpening or maintenance of tool edges were the primary focus of flaked stone tool production and use at the site.

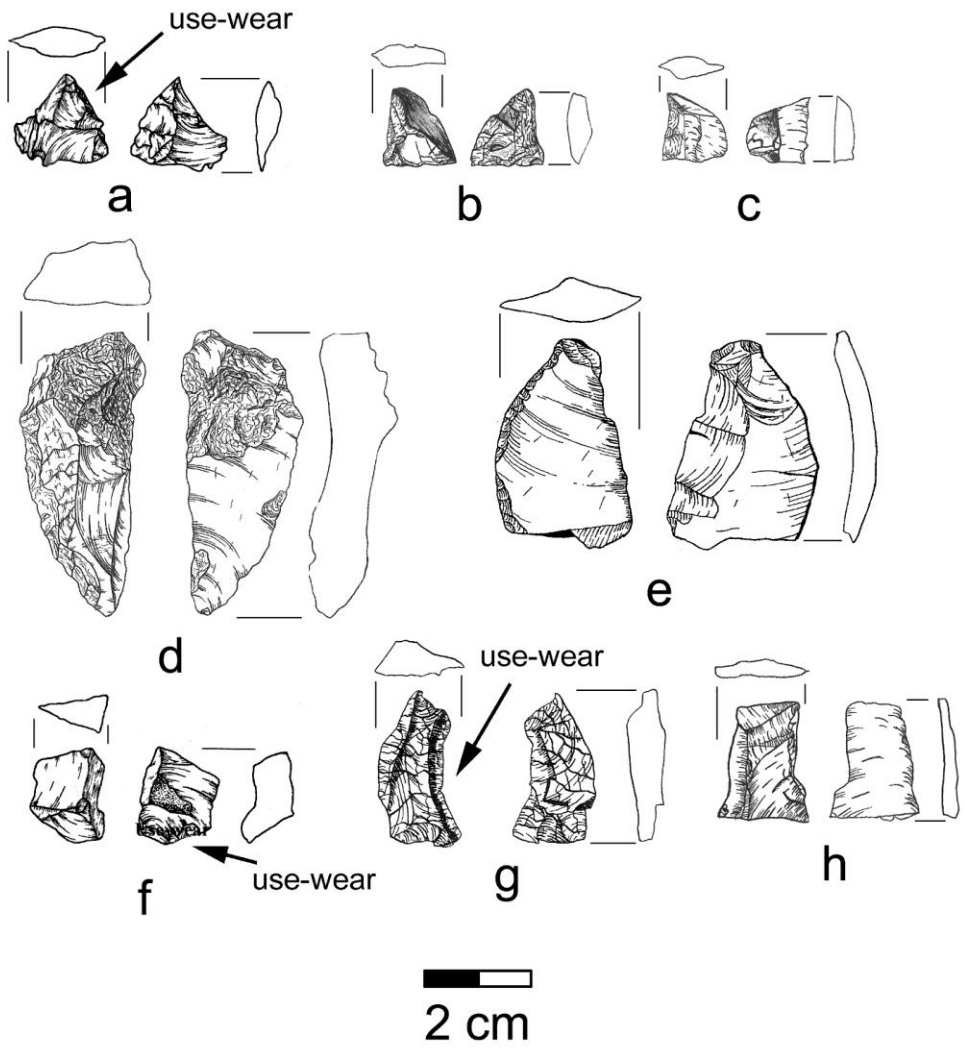

Fig. 6. Non-point flaked stone implements recovered at the Berkeley Rockshelter: bifacial scrapers (a and b); unifacial scraper fragment (c); unifacial scraper (d); utilized flake scraper (e); utilized flakes (f–h). Two of the utilized flakes are possible "spoke shaves" given their edge morphology and the location of use-wear (f and g). (Illustrations by Kipp Godfrey, Emma Holm, and Bradford Andrews)

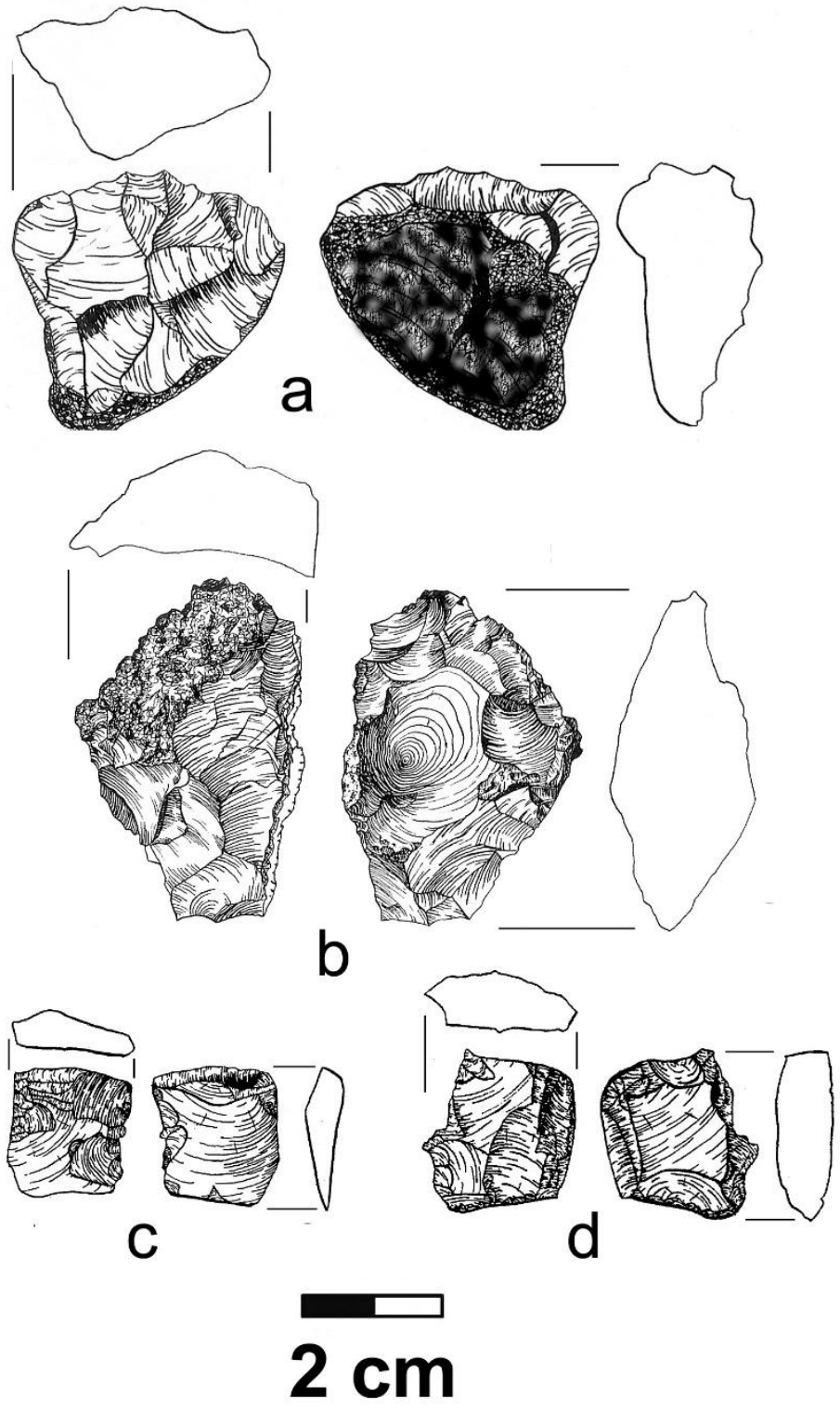

Fig. 7. Core artifacts recovered at the Berkeley Rockshelter: multi-directional flake core (a), heat damaged bipolar flake core (b); scalar bipolar cores (c and d). (Illustrations by Kathryn Hunt and Kipp Godfrey)

TABLE 2. ARTIFACT BREAKDOWNS BY MATERIAL TYPE

Classification	N (%)
Chert	785 (46%)
Jasper	552 (32%)
Chalcedony	367 (21%)
Andesite	2 (<1%)
Dacite	1 (<1%)
Siltstone	1 (<1%)
Pumice	1 (<1%)
Total	1709 (100%)

TABLE 3. DEBITAGE BREAKDOWNS BY REDUCTION STAGE

Classification	N (%)
Undiagnostic	1071 (64.7%)
Stage 1	3 (0.2%)
Stage 2	9 (0.5%)
Stage 3	11 (0.7%)
Stage 4	8 (0.5%)
Stage 5	45 (2.7%)
Stage 6	509 (30.7%)
Total	1656 (100%)

TABLE 4. TECHNOLOGICALLY DIAGNOSTIC DEBITAGE BREAKDOWNS BY REDUCTION STAGE

Classification	N (%)
Stage 1	3 (0.5%)
Stage 2	9 (1.5%)
Stage 3	11 (1.9%)
Stage 4	8 (1.4%)
Stage 5	45 (7.7%)
Stage 6	509 (87.0%)
Total	585 (100%)

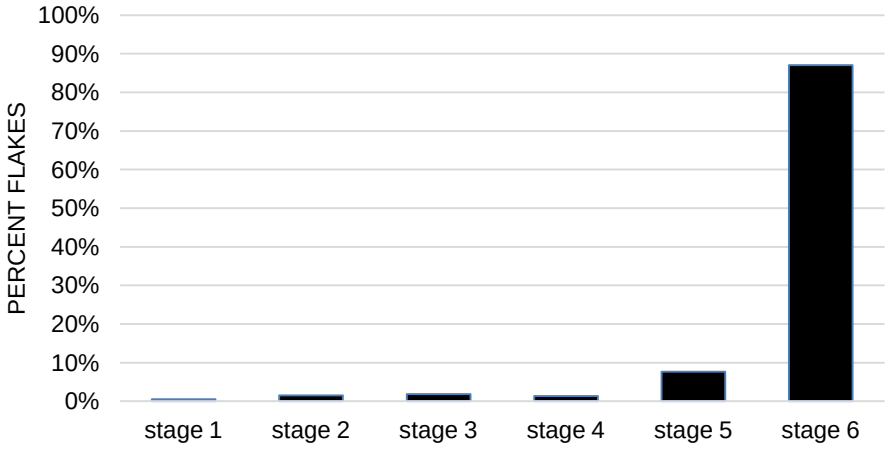

Fig. 8. Histogram of the diagnostic flake sample showing stage breakdowns.

Tools

There are 53 formal and informal tools in the Berkeley Rockshelter sample (Table 5). Among the formal tools, most (N = 21, 40%) are nearly complete projectile points and projectile point fragments (Tables 5 and 6). Based on their size and form, it is likely that they were used to tip arrow shafts. The next most prevalent tool type includes bifacial scrapers (N = 8, 15%) and biface fragments (N = 5, 9.3%). Of note, although these implements are flaked on two faces, they do not have formal bifacial plan views (Figs. 6a and 6b). Other implements include unifacial scrapers (N = 4, 7.5%, Figs. 6c and 6d) and flake cores (N = 2, 3.8%, Figs. 7a and 7b). One of the cores is classified as a multi-directional core (Fig. 7a), whereas the other has rather severe heat treatment damage (pot-lids and crazing fractures) and flaking scars with opposing ripples of force morphologically consistent with bipolar reduction (Fig. 7b). With the exception of the projectile point artifacts, it is important to point out that even though these implements are referred to here as "formal," they generally lack typical formal characteristics, appearing instead to be largely expedient in nature.

TABLE 5. FLAKED STONE TOOLS RECOVERED AT THE BERKELEY ROCKSHELTER

Formal Tool Types	N (%)
Projectile points	21 (39.6%)
Bifacial scrapers	8 (15.1%)
Biface fragments	5 (9.3%)
Unifacial scrapers	4 (7.6%)
Flake cores	2 (3.8%)
Scalar flake cores	2 (3.8%)
Pumice abrader	1 (1.9%)

TABLE 5. FLAKED STONE TOOLS RECOVERED AT THE BERKELEY ROCKSHELTER (CONT.)

Informal Tool Types	N (%)
Utilized flake scrapers	4 (7.6%)
Utilized flakes	6 (11.3%)
Total	53 (100%)

TABLE 6. PROJECTILE POINT ARTIFACTS RECOVERED AT THE BERKELEY ROCKSHELTER

Formal Tool Types	N (%)
Projectile points	2 (9.5%)
Projectile point fragments	12 (57.1%)
Preforms	7 (33.4%)
Total	21 (100%)

In addition, the assemblage has two scalar cores (N = 2, 3.8%; Figs. 7c and 7d). These types of cores are relatively thin, have V-shaped longitudinal profiles giving them a wedge-shaped appearance, and reflect flaking patterns consistent with bipolar reduction. Another interesting find was a cylindrical pumice abrader (1.9%, Fig. 9). Although this implement is not a flaked stone tool, we believe its presence in the assemblage is consistent with the primary focus of prehistoric activities that took place at the site (see below).

The informal tools include flakes that were not systematically shaped with flaking, but exhibit edge use-wear and/or retouch. These artifacts include utilized flake scrapers (N = 4, 7.5%, Fig. 6e) and utilized flakes with unknown, probably varying functions (N = 6, 11.3%; Figs. 6f–6h). Four of the utilized flakes have use-wear evident on one or more concave-shaped edges, suggesting a possible function as “spoke shaves” for shaping arrow shafts (Figs. 6f and 6g). The use-wear on most of these tools is limited indicating they were used briefly and then discarded.

Discussion

The abundance of stage 6 flakes in the Berkeley Rockshelter assemblage (Fig. 8) is consistent with its high number of small, fragmented projectile points (Table 6). Specifically, we think that the site was primarily a place where arrow shafts and other hunting-related equipment were refurbished/maintained during hunting forays. According to Binford's model, such a specific activity focus is consistent with the use of the site as a hunting field camp, repeatedly occupied for relatively short periods of time.

The projectile point artifacts are nearly complete, or are fragments with characteristics supporting the inference that most were broken during use and then discarded when their arrow shafts were refurbished. The two nearly complete projectile points have a clear stylistic affinity for the "Plateau Side-Notched" point type, as described by Lohse (1985; Lohse and Schou 2008). Although one is slightly fractured at the tip due to impact, these points have intact bases and tipped blades separated by parallel side notches (Figs. 5a and 5b). This point type is highly variable, but its side-notched, straight-to-concave base is usually wider than its blade. The notches on some Plateau Side-Notched points, including those discussed here, are highly pronounced. This point type is temporally affiliated with the period 1500–200 B.P. (Lohse and Schou 2008), which is consistent with the radiocarbon dates for the Berkeley Rockshelter.

The projectile point artifacts are dominated by projectile point fragments. One fragment has similar diagnostic qualities to the two Plateau Side-Notched points discussed above (Fig. 5c). It is a finished, pressure-flaked projectile point base with a transverse fracture that occurred just above its notches. Acknowledging the dangers of typing points that are incomplete (Flenniken 1986), this artifact also may have been the base of a discarded Plateau Side-Notched style point.

Other projectile point artifacts are classified by the portions of the points they probably represent. One fragment was probably a point tip/body (Fig. 5d). It exhibits pressure flake scars, and appears to have fractured where it was formerly side-notched. Given its size, this artifact was probably the blade of a larger broken point that was reworked and used again. Also, it too was likely a Plateau Side-Notched point given its dimensions and fracture characteristics. Another artifact was probably a point tip judging from its small size and the relative symmetry in the angle of its edges (Fig. 5e).

Several artifacts in the collection are probably discarded projectile point midsections. These artifacts represent points fractured at their tips and probably immediately above their notches. One midsection has a perpendicular transverse fracture near its tip and a diagonal transverse fracture across its blade (Fig. 5g). It appears to have been notched where the fracture terminates. Two other projectile point fragments exhibit fractures that originated where they were notched (Figs. 5f and 5j). One of them has a perpendicular fracture that straddles its former notches; it has late stage reduction flake scars that clearly indicate it was notched where it subsequently fractured (Fig. 5f).

Many of the projectile point artifacts also have attributes consistent with unique fractures associated with impact, indicating that they were used, and then were re-worked and/or discarded. This evidence further supports our interpretation that refurbishing hunting kits was an important activity at the site. A number of archaeologists have done experimental research on impact fractures typically found on used projectile points (Flenniken 1986; Titmus and Woods 1986; Kelterborn 2001). For these experiments, replicas of prehistoric projectile points were knapped and then hafted to arrow shafts with sinew and mastic or resin, which was usually a combination of pitch and charcoal (Titmus and Woods 1986:38). Various types of materials were used as targets (animal flesh, tree trunks, soil, etc.) to determine whether damage varied accordingly. Regardless of target medium, not surprisingly, most impact fractures affected the base and the tip of projectile points (Flenniken 1986).

One fracture pattern recognized by Kelterborn (2001) is the "bending break." Titmus and Woods (1986) also describe this break as a transverse fracture across a projectile point, usually at the tip and/or base near the notches (Titmus and Woods 1986:fig. 4). This fracture type is evident on many of the Berkeley Rockshelter projectile point artifacts, with breaks at the tip (Figs. 5a, 5g, 5h, and 5i) and breaks at the base (Figs. 5d, 5f, 5g, and 5j). Again, those with basal fractures broke close to the narrowest point of the blade where they were probably notched.

Kelterborn (2001) refers to another type of impact fracture that occurs on some Berkeley Rockshelter artifacts as "facial flaking." What makes these flake scars distinct is the direction of force that produced them. Normal, late stage pressure flake scars resulting from production tend to reflect flaking force originating from the lateral edges of the blade. In contrast, facial flaking is the result of force coming from the tip of the blade. This force is usually rather substantial compared to that needed during point production because it is generated during use when the point tip strikes a hard surface. Hence, these impact fracture scars are distinct compared to most of the flaking scars on these artifacts (Figs. 5a, 5g, 5i, and 5j). The most obvious example of this attribute exhibits a flake scar 6 mm wide that extends 13 mm down the length of one of its faces (Fig. 5g). Another artifact has a prominent facial flake scar extending 10 mm down one blade face that is 4 mm wide (Fig. 5i). One example is less distinct but shows a few scars originating at the tip, running down the face of the blade (Fig. 5j). Still another artifact exhibits flake scars originating at the tip of the blade, extending down the middle of one blade face (Fig. 5a).

The collection also has artifacts classified as preforms (Figs. 5k and 5l). Preforms are artifacts that were reduced to the basic triangular shape of a projectile point, but were never notched. It is likely that these items would have been carried on hunting trips rather than transporting more delicate finished, notched points, which would have had a greater probability of breaking prior to being hafted. Also, finishing preforms in the field ensures the use of projectile points with newly sharpened edges, which would make them more effective at penetrating game. The presence of preforms is consistent with the specific use of the site as an overnight hunting camp. Preforms optimize the efficiency of a mobile toolkit because they are more durable and light weight than raw material in less processed form, and they can be easily notched during refurbishing. Preforms were most likely shaped elsewhere at sites such as longer-term residences or quarries. They were then taken on hunting forays to replace points broken beyond repair.

Seven artifacts were identified as preforms. Three lines of evidence support this inference. First, the lateral edges of these artifacts are symmetrical and they are not notched. Second, all of them were finished with pressure bifacial thinning. Finally, at least two preforms have a basic size and shape consistent with preforms that could be easily notched to make Plateau Side-Notched points (Figs. 5k and 5l).

Collectively, the debitage and projectile point data support the inference that bifacial flaking used to shape and rework projectile points was a prominent activity at Berkeley Rockshelter. The abundance of late-stage pressure and notch flakes is also consistent with the presence of preforms, suggesting that such items were brought to the site and then finished into projectile points during refurbishing activities. Arrow refurbishing, primarily involving the final shaping of preforms, is also consistent with the quality of the non-projectile point implements, many of which are expedient in form. For example, except for the projectile point artifacts, there are no well-shaped bifaces that could be reasonably typed using Callahan's (1979) biface classification system. Callahan (1979:10–11) distinguishes five biface stages beginning with stage 1, which is defined as a usable blank. Stage 2 results from the initial edging of a blank, which is then transformed into a stage 3 implement by removing middle biface thinning flakes. The subsequent stage 4 category is the result of secondary thinning activities involving the removal of late biface thinning flakes. Stages 1 through 4 are generally regarded as bifaces that were thinned with percussion flaking techniques. The final stage 5 bifaces are refined, well-shaped implements, usually produced by removing late biface thinning flakes with pressure techniques (not to be confused with stage 5 bifacial thinning flakes as defined in this study). The debitage and tools from the Berkeley Rockshelter, therefore, indicate that bifacial thinning activities were largely restricted to the late-stage pressure flaking of stage 5 bifaces (i.e., points and preforms).

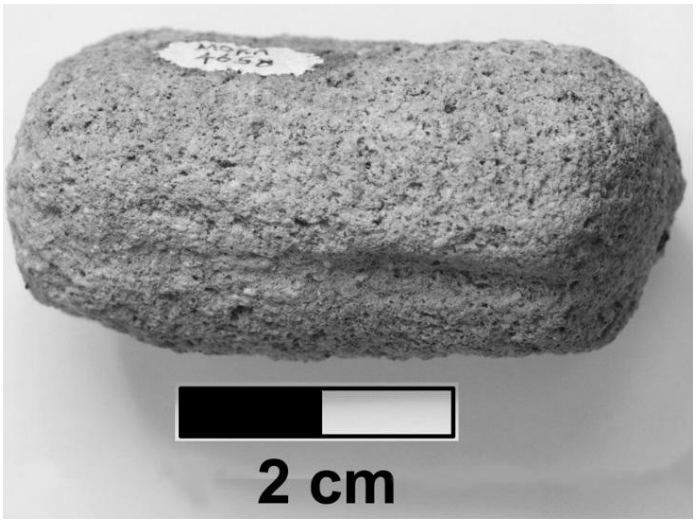

Fig. 9. Possible pumice “arrow shaft” abrader recovered at the Berkeley Rockshelter.

Finally, many of the non-point tools (N = 19, 36%) are made of the poor quality local jasper available immediately upslope of the site. These tools are predominantly utilized flakes and informally shaped biface fragments (N = 12, Figs. 6a, 6c, 6e, 6f, 6h). The nature of the toolkit, therefore, indicates the onsite manufacture of largely expedient scraping and cutting tools. These items would have been useful for doing various processing and whittling tasks associated with arrow shaft maintenance and the re-hafting of new points. Both flake cores are jasper (Figs. 7a and 7b), and likely provided flakes for these types of tools.

As discussed, the local jasper from the Berkeley Rockshelter vicinity is poor quality material that occurs no larger than small fist-sized sub-angular and rounded nodules. Bipolar techniques provided one means for flaking raw material of this quality all over the world (Le Blanc 1992; Close 2006; De León 2008). The bipolar flake core in the assemblage (Fig. 7b) indicates that this was also the case at the Berkeley Rockshelter. The interpretation here is that bipolar and bifacial percussion techniques were used to initially process the jasper nodules, resulting in a miscellany of small flakes and tablets that could be immediately used, or further shaped with pressure bifacial thinning.

It is clear that the local jasper was an important toolstone at the site because it comprises 32% of the flaked stone artifacts (Table 2). The assemblage has both jasper flakes and tools, but only a single projectile point artifact was made of this material (Fig. 5h). Hence, it appears that only the occasional piece was found that could be knapped into a point; it was a useful local toolstone for largely expedient tasks related to arrow refurbishing, but not for making new points. Without a doubt, the Berkeley Rockshelter was a particularly attractive over-night field camp because those hunters who reused the site could plan on having local toolstone, albeit poor quality, to use for refurbishing tasks. Except for points, the exploitation of this jasper relieved the need to carry extra non-local toolstone on logistical forays. Surely, prehistoric peoples were fully aware of their regional lithic landscapes and took full advantage of using poorer quality sources of stone when it was convenient (Ozbun 2015).

Other tools that are consistent with the inference that arrow refurbishing was the primary activity at the site include the bipolar scalar cores (Figs. 7c and 7d) and the pumice abrader (Fig. 9). The scalar cores are made of good quality non-local chert. This type of artifact has been found worldwide in association with bipolar industries, and the question of whether it functioned as a

"core" or a tool is the subject of intense debate (Hayden 1980; Parry 1987; Shott 1989; Le Blanc 1992; De León 2008). These artifacts could provide useable bipolar flakes early in their use-lives, only to be used as a tool when they became too small. Realistically, the scalar cores in the Berkeley Rockshelter assemblage were too small to have been viable cores in "their" core-stage. Instead, their thin, V-shaped longitudinal profiles would have made them good wedge-type tools for splitting and/or whittling wood. As such, these implements also would have been particularly useful for shaping arrow shafts. Finally, the pumice abrader, a purposely shaped cylinder with a clear longitudinal groove on one face, could have been used to sand arrow shafts (Fig. 9).

Conclusion

Taken together, the overall characteristics of the Berkeley Rockshelter assemblage support previous interpretations that the site functioned as a hunting *field camp* (sensu Binford 1980) during the Late Holocene (Bergland 1988; Burtchard 1998:114). If the Berkeley Rockshelter was used more as a *residential base* it should have evidence for activities related to a broader range of food procurement activities. Such activities could have included berry harvesting, food processing and consumption, and tools associated with a miscellany of other daily productive tasks (e.g., making baskets and/or clothing). However, the Berkeley Rockshelter assemblage does not reflect a wide range of activities.

The data indicate that the site was visited during summer forays when hunters were a long way from residential summer camps, most likely located in Puget Trough lowland settings. Specifically, the evidence indicates that hunters staying at the site repaired their tool kits by re-working damaged projectile points, and/or making new points to replace those that had been severely broken during earlier hunting episodes (Fig. 10). Such activities also would have required arrow shaft maintenance, including arrow shaft reshaping and/or complete arrow shaft replacement. The recovery of large mammal bone (unfortunately unidentifiable) associated with these artifacts suggests that the hunters who used the Berkeley Rockshelter were indeed successful.

The analysis on which these conclusions are based has clarified how these activities were carried out. Burtchard (1998:92) stated a number of years ago that prehistoric exploitation of the Mount Rainier uplands involved a combined use of local and non-local sources of toolstone. The present analysis indicates that most projectile points were probably imported. Many of them may have been carried to the mountain as preforms. The overwhelming dominance of late-stage, pressure bifacial thinning flakes (87%) and projectile point artifacts, including preforms, support this interpretation. If larger bifaces were a more common import to the site, there would be more debitage reflecting percussion reduction.

The poorer quality jasper available immediately upslope of the site appears to have been largely reduced onsite to make various tools for refurbishing activities. The smallish nodules of this material were initially "cracked" open with percussion or bipolar techniques—any subsequent flaking applied to further shape jasper tools was largely done with pressure. As such, this material was transformed into functional, largely expedient implements at its source (Burtchard 1998:93).

The importation of toolstone in highly processed form (e.g., preforms) and the use of poorer quality local sources for expedient uses is a pattern that may be evident at other Late Holocene sites on Mount Rainier. For example, the Frozen Lake (45-PI-407) site is dominated by jasper similar to that from the Berkeley Rockshelter source (Burtchard 1998:93). One possible travel route to Frozen Lake went up Lodi Creek to the north. If used, this route would have

allowed convenient access to the Berkeley Rockshelter jasper source along the way. Therefore, Frozen Lake jasper may in fact have originated from this source, or from a reported source on the upper eastern flank of Mt. Freemont near Sunrise Ridge (Burtchard 1998:167). It may be that the jasper from both sources is chemically comparable because they occur in the same geologically identical Tatoosh Pluton. Future research should attempt to clarify how widespread the distribution of the Berkeley Rockshelter (or Tatoosh Pluton) jasper is on the mountain.

Fig. 10. Artistic rendition of prehistoric arrow shaft refurbishing at the Berkeley Rockshelter. (Artwork by Michael Stasinos)

Continuing comparative research aimed at defining the function of sites in Mount Rainer National Park will further broaden what is known about the Holocene occupation of the region. Conceptually modified to assess temporal trends (sensu Schalk and Cleveland 1983; Burtchard 1998), Binford's (1980) forager-collector model provides a solid theoretical basis for examining how local hunter-gatherer organization varied over time. This revised model posits a Late Holocene shift to a collector strategy, which would have been primarily associated with the short-term use of high elevation areas by small task groups targeting specific resources. The Berkeley

Rockshelter fits this expectation because it dates to the Late Holocene and its artifact assemblage indicates a hunting focus.

The Binford (1980) model also implies archaeologically testable expectations about the character of archaeological assemblages associated with different site types. At present, there is a particular need for more firmly dated sites with data supporting reasonable inferences of site function, especially those from the Early and Middle Holocene periods. Such efforts will undoubtedly lead to a more informed and sophisticated understanding of prehistoric hunter-gatherer life in the southern Washington Cascades and how it changed over time.

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EAGLE GORGE TERRACE (45-KI-1083): AN UPLAND HUNTING CAMP AND ITS PLACE IN THE ECONOMIC LIVES OF THE PRECONTACT PUGET SALISH

James C. Chatters and Jason B. Cooper

ABSTRACT

Outside of the lowland rivers and saltwater margins of the Salish Sea, field camps of the Northwest Coast's logistically organized foragers are extremely rare. Chronologically delimited occupations with faunal remains are even more so. The Eagle Gorge Terrace site (45-KI-1083), located along the Green River in the foothills of the Cascade Range, is one such site—a hunting camp containing a specialized tool kit and a large collection of calcined faunal remains dating to the sixth or seventh century AD. Analysis of this assemblage and comparison with the approximately contemporary nearby village of *Tualdad Altu* (45-KI-59) demonstrates that upland hunters used a discrete subset of their culture's technology in a highly focused effort to process meat and hides from some of the region's largest land mammals. Spatial congruity between meat processing and lithic reduction activities demonstrates that lithic material procurement, and even most stone tool manufacturing was embedded in the upland hunt. This hunting/tool making specialization joins evidence of intra-household activity differentiation to demonstrate that the highly sophisticated economic system that characterized historic Northwest Coast cultures had existed among the Puget Salish for more than 1000 years before contact.

The Puget Salish were one the most economically complex foraging societies in human history. As described by ethnographers, these Northwest Coast peoples were highly logistically organized (Binford 1980), maintaining permanent villages of skill-differentiated households, from which they engaged in an intricate seasonal round of expeditions for amassing foodstuffs and raw materials from a rich, ecologically differentiated environment (e.g., Castile 1895; Haeberlin and Gunther 1930; Smith 1940; Thrush 2005). They situated their villages along salmon-rich rivers of the lowlands, where they had access to marshland, estuarine, marine and terrestrial resources that they harvested from encampments established for this purpose. Shellfish, water birds, and nearshore marine fishes were harvested and preserved at saltwater camps, roots and berries gathered from encampments in the prairies, and, when villages did not provide the most appropriate access, fish from fishing camps at species-suitable reaches of streams. Some hunting took place locally near all these lowland camps, but was more focused on the foothills and mountains of the Cascade Range, with some hunters climbing high enough to take mountain goats. This pattern, with minor variations of degree from group to group, characterized the lives of the thousands of Puget Salish.

The archaeological record of the region, at least for its latest 2500 years, or since the beginning of the Marpole Phase in the Strait of Georgia chronology (Matson and Coupland 1995; Ames and Maschner's [1999] Middle and Late Pacific periods) tends to reflect this complex logistical organization, but nodes in the subsistence settlement round are differentially represented. Residential bases represented by remains of rectangular longhouses, with postmold patterns, permanent hearths, and complex tool assemblages, have been found at such sites as Biederbost (45-SN-100; Nordquist 1976), *Tualdad Altu* (45-KI-59; Chatters 1988; Chatters et al. 1990) and *Sbabadid* (45-KI-51; Chatters 1981) on lowland rivers. Sites for exploiting littoral resources are represented by most of the shell middens found in inland marine waters, such as Duwamish No. 1 (45-KI-23; Campbell 1981) and West Point (45-KI-428 and 45-KI-429; Larson and Lewarch 1995), which are rich in faunal remains and typically contain low diversity stone tool assemblages (Nelson 1990). Riverine fishing camps, such as Tokul Creek (45-KI-19; Onat and Bennett 1968), the Redmond High School Site (45-KI-501; Lewarch 2006), and *Yuetswabic* (45-KI-263; Schumacher and Burns 2005) consist of scattered hearths, a few lithics, bone implements, postmolds from temporary shelters, and massive amounts of fishbone.

Two nodes in the system that remain poorly understood both archaeologically and ethnographically are inland encampments for plant gathering and hunting. Sites suspected to have been used for these purposes have been found, such as Connell's Prairie (45-PI-45; Hedlund 1972), Mule Springs (45-KI-435; Nelson 1993), and Berkeley (45-PI-303) and Fryingpan (45-PI-43) rockshelters (Lubinski and Burtchard 2005; Burtchard 2007). However, excavations at such sites have been limited, tool inventories tend to be small and chronologically ambiguous, and faunal remains and features are rare (Mierendorf 1999; Burtchard 2007). The archaeological record of such inland logistical camps is rare along the entire Northwest Coast (e.g., Matson and Coupland 1995; Ames and Maschner 1999), perhaps in significant part due to the density of forests, and the destructive nature of the acidic soils and extreme levels of bioturbation characteristic of such environments. Ethnographic descriptions of the activities conducted at these kinds of sites are cursory, perhaps because outsiders rarely, if ever, observed them directly or the importance and conduct of these activities had been altered in post-contact times. This makes archaeological investigation particularly important for understanding the part inland logistical sites played in the economic lives of the Puget Salish.

The opportunity to learn about hunting camps and their place in the economies of Puget Sound cultures came with the discovery in 2010 of Eagle Gorge Terrace (45-KI-1083), a tiny site located in the foothills of the Cascade Range (Cooper 2012; Cooper et al. 2015) (Fig. 1). To understand the activities conducted at 45-KI-1083 and how it integrates with other nodes in the logistically organized economic strategy of Puget Salish peoples, we describe that site in detail and compare its archaeological record with that of the approximately coeval and intensively excavated village site of *Tualdad Altu* (Chatters 1988; Chatters et al. 1990).

The Sites

In the following paragraphs we summarize the characteristics, described content, and inferred functions of the Eagle Gorge Terrace and *Tualdad Altu* sites. Detailed analyses on which these summaries are based can be found in the original site reports (Chatters 1988; Cooper 2012; Cooper et al. 2015).

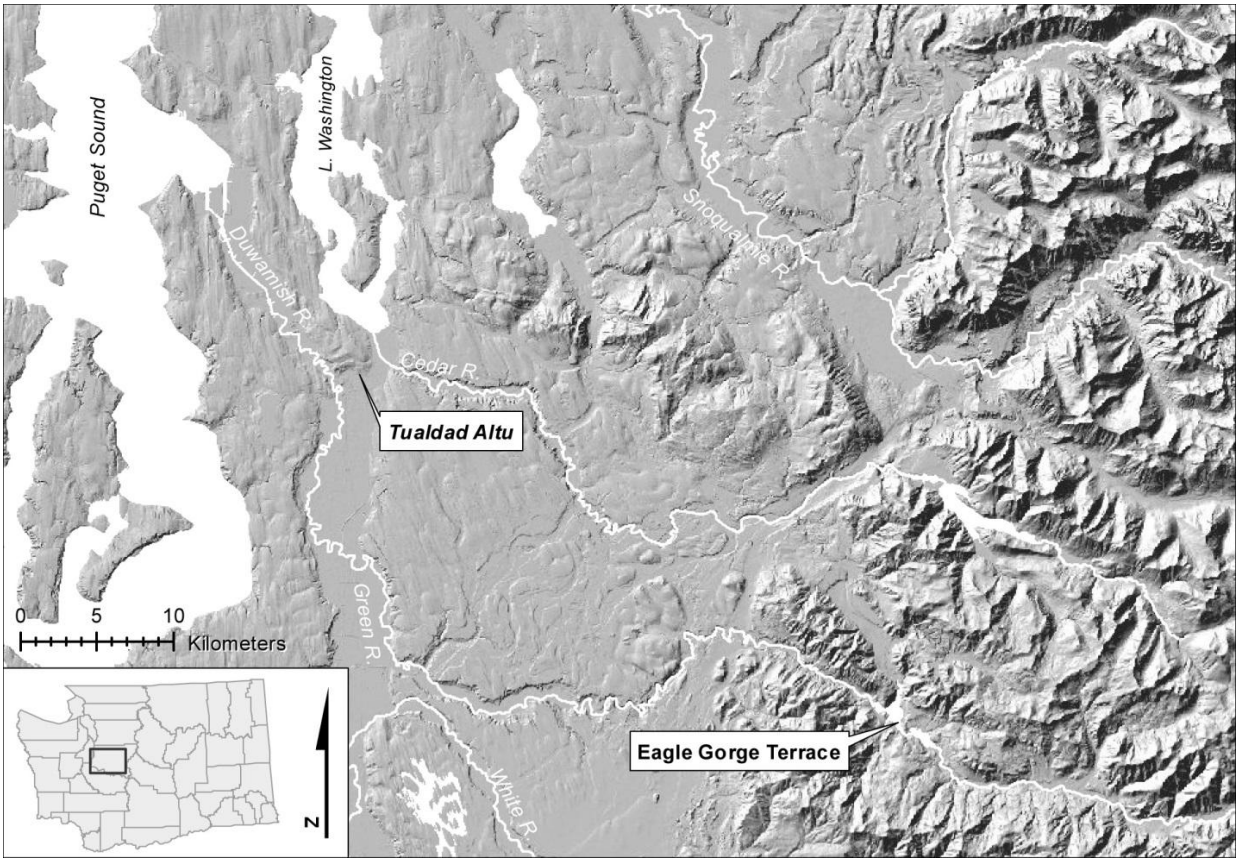

Fig. 1. The locations of the Eagle Gorge Terrace and *Tualdad Altu* sites, Washington State.

Eagle Gorge Terrace, a Hunting Camp

The Eagle Gorge Terrace Site (45-KI-1083) was found by AMEC Environment and Infrastructure Inc. (Bothell, WA) archaeologists in winter 2010 during a brief reconnaissance conducted for the Seattle District, U.S. Army Corps of Engineers, along the shoreline of Howard Hanson Reservoir. The site clings to the edge of a narrow glacial outwash terrace at an elevation of 355 m, overlooking the Green River, a major Duwamish River tributary, that flows 30 m below. The surrounding landscape is densely forested and precipitous, with ridges rising to more than 1200 m within 6 km both north and south. Tens of thousands of hectares of mountainous terrain stretch to the north, east, and south. Partially eroded into the reservoir at the time of discovery, what remained of the site was a half circle approximately 8 m in diameter.

Eagle Gorge Terrace was immediately recognized as being of unusual significance because it contained copious amounts of calcined bone. Bone in any condition is exceedingly rare in open non-shell-midden sites of the Northwest Coast. Excavations during the winters of 2011 and 2014 covered 23 square meters and appear, based on artifact density patterns (Fig. 2a) to have recovered most of what remains of the site. Trowels were used exclusively in the midden excavation and the resulting sediments screened through 1/8-in. mesh in the expectation that fish remains might be recovered among the calcined bones. All material was found within 30 cm of the surface, beginning directly below the forest duff. Absence of evidence for post-depositional sedimentation and presence of numerous krotavina indicate a surface occupation modified by bioturbation. The entire site collection was, therefore, treated as one coeval assemblage.

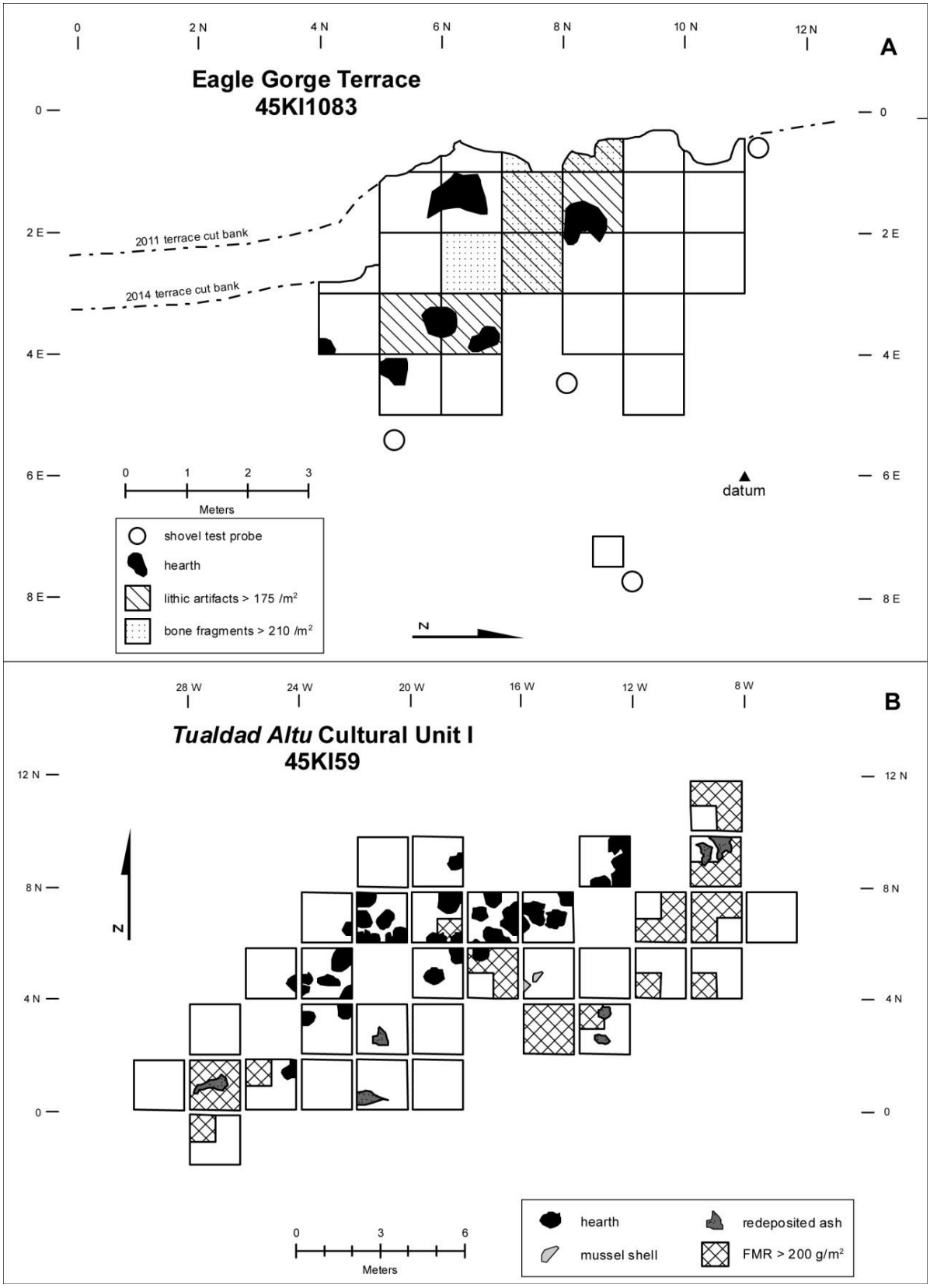

Fig. 2. Plan maps of excavations, showing feature and artifact distributions. a) top image is Eagle Goerge Terrace 45-KI-1083 and, b) bottom image is *Tualdad Altu* 45-KI-59.

That occupation consisted of a dense central cluster of as many as six hearths, in the midst of which were over 2800 fragments (462 grams) of calcined bone, and more than 3600 lithic artifacts. The lithics and bone were most highly concentrated around and between the largest two hearths within an area less than 3 m in diameter (Fig. 2a). They dropped off precipitously to a light scatter outside this area. The site appears, from this high degree of feature discreteness (Chatters 1987), to have been occupied for only one continuous interval, at most representing multiple annual visits that took place over no more than a generation. The presence of a temporary shelter over the central concentration is not out of the question, although no direct evidence of it exists in the form of postmolds or preserved structural members.

The bone from 45-KI-1083 is unique among open sites in Western Washington, in both quantity and content. All fragments but three are from large mammals, and only black bear (*Ursus americanus*), elk (*Cervus canadensis*), and mountain goat (*Oreamnos americanus*)—three of the four largest animals in the ecosystem—were identified. All unidentified bone except for three bits of mouse-sized animal longbone came from animals in this size range. Anatomical part distributions indicate all regions of the skeletons of these animals were discarded onsite (Cooper et al. 2015). Cultural modification in the form of cut marks and conchoidal fracturing, along with the absence or evidence for carnivore scavenging, indicate the bone results from human activity. Stone tool cut marks, including those caused by chopping, filleting, and dismemberment, were found on six bone fragments. Inspection for conchoidal fracturing due to marrow extraction in a subsample of 345 fragments of longbone shaft indicated such breakage in 35 percent of specimens. Just four modified bone pieces (all calcined) are present in the assemblage, including a spatulate that might have functioned as a beamer, a segment of a probable matting needle, a possible awl, and one piece of bone detritus. The detrital fragment is from a grooved longbone, indicating production of a bone blank. There is no evidence for bone tool production at the site beyond the making of such blanks.

Stone artifacts consist of nearly 3600 pieces of chipped stone and one thin edge-polished hand-sized cobble. The large lithic assemblage includes only 90 tools. Projectile points, knives, and end scrapers dominate among the 62 retouched tools (details below). Lithic debitage and cores tell of extensive lithic reduction and tool finishing at this locality. In two seasons, archaeologists recovered 21 cores of a bright red jasper, white chert or opaline, and chalcedony. Debitage was primarily of these same materials. It was dominated by biface thinning and pressure flakes numerically (64.0 percent) and by cortical and interior percussion flakes by weight (87.8 percent). It appears from these findings that the full trajectory of tool manufacture, from core reduction to flake blanks and finished bifacial tools, was occurring here.

Tualdad Altu—a Lowland Village

Tualdad Altu (45-KI-59) is situated on the floodplain of the Black River, beside a silted-in ancient distributary channel of that stream. The Black River formerly connected Lake Washington with what is now called the Green River to form the Duwamish River, so it occupies the same watershed as Eagle Gorge Terrace. At an elevation of only 4 m above sea level, it lay during its occupation on the delta of the Green and Black rivers, not far from salt water (Chatters et al. 1990).

Tualdad Altu consisted of two discrete areas of black midden paralleling the former riverbank, all of which was buried beneath more than a meter of clay alluvium. The University of Washington Office of Public Archaeology intensively excavated the western of these two middens in 1980 as mitigation for the expected effects of industrial park development (Chatters 1988; Chatters et al. 1990). Systematic coring and excavation of four balk-interrupted trenches through

the entire midden revealed four cultural horizons separated by thin, sterile layers of alluvium. Excavation of the midden was conducted by trowel in 1 meter squares. Vertical control was by 10 cm levels within stratigraphic units. Matrix was water screened through 1/4-in. mesh, with residue from one quadrant of every 2 x 2 m unit also passed through window screening. Cultural Unit (CU) I, the uppermost, was exposed (Fig. 2b) and classified into horizontal sampling strata based on the characteristics of the midden surface. Blocks two meters square were selected for excavation by stratified random sampling. In all, 130 square meters of the total 192 square meters of CU I was excavated for a total of 60 percent of this stratum. This discussion focuses on the structure of and assemblages from CU I.

CU I was strongly horizontally patterned. An elongated array of bone ash and fire-modified rock (FMR)-rich hearths, paralleling the river channel, was flanked on the landward side and both ends by a gap of around one meter in which almost no features occurred (Fig. 2b). Outside of that area were concentrations of FMR, secondary deposits of ash, and small concentrations of crushed blue mussel shell. This patterning was inferred, based on its similarity to *Sbabadid*, an early 19th century longhouse also on the Black River, to represent one side of a longhouse surrounded by an extramural trash midden (Chatters 1988). The long rows of hearths were separated by a hearth-free space containing a concentration of FMR into what were inferred to be two sets of living quarters.

CU I produced a large, diverse artifact assemblage comprising 2729 chipped stone artifacts, including 185 retouched lithic tools of 9 functional types, 7 adze bits, and 609 complete and fragmentary sandstone abraders; 107 bone artifacts; and 3588 fragments of unmodified bone. Most of the bone recovered from this cultural unit is calcined. Bone implements in the collection, also calcined, include a barbed harpoon, composite harpoon elements, awls, matting needles, spatulates inferred to have been net shuttles (but also possibly hide scrapers like the similar tool found at Eagle Gorge Terrace), wedges, and a beaver-tooth chisel.

Faunal materials from *Tualdad Altu* were similarly diverse. Although salmon (*Oncorhynchus* sp) dominates the assemblage, a broad array of birds, mammals, and marine and freshwater fish is also present. We present more detail on the mammalian assemblage below. Seasonality of the species and their skeletal condition show site occupation through at least summer, fall and winter.

This duration of use, along with the site structure, high level of faunal and implement diversity, and the high proportion of tools for fabricating other implements, including needles, awls, abraders, wedges, and adzes, strongly supports the identification of *Tualdad Altu* as a residential base—a longhouse village. The two sets of living quarters in the house were functionally distinct in artifact inventories, indicating they represented apartments in an economically differentiated household like those that characterized Puget Salish households historically (Chatters 1989; Chatters et al. 1990). Dwellers of the east end used more composite harpoons and matting needles, and used three forms of projectile points—broad necked and narrow-necked stemmed forms, and triangular un-notched forms probably used as end blades. Those of the west end were the only users of antler wedges and spatulates, and made more use of awls, perhaps in skin working. Their projectiles were tipped only with narrow-necked, stemmed points. The west end group may have been more involved, among other things, in land hunting with bows and skin processing, the east end group in sea mammal hunting, harpoon fishing, and mat production.

Ages of the Sites

Tualdad Altu and Eagle Gorge Terrace assemblages show strong stylistic similarities in projectile point, end scraper, knife, and other tool forms (Fig. 3). Both contain primarily stemmed

and corner-to-basal-notched arrow points (although one end of the *Tualdad Altu* house also contained broad-necked, probable dart points and triangular end-blades), triangular, square-stemmed, and leaf-shaped knives, small end scrapers, and other tool forms discussed below. The objects are in both cases made almost exclusively from fine-grained cryptocrystalline materials, most notably jasper, chert, and chalcedony, with a small amount of petrified wood and opaline. They have strongly similar dimensions, type by type, as Fig. 3 shows. The sites thus appear to be approximately contemporaneous from the standpoint of material culture.

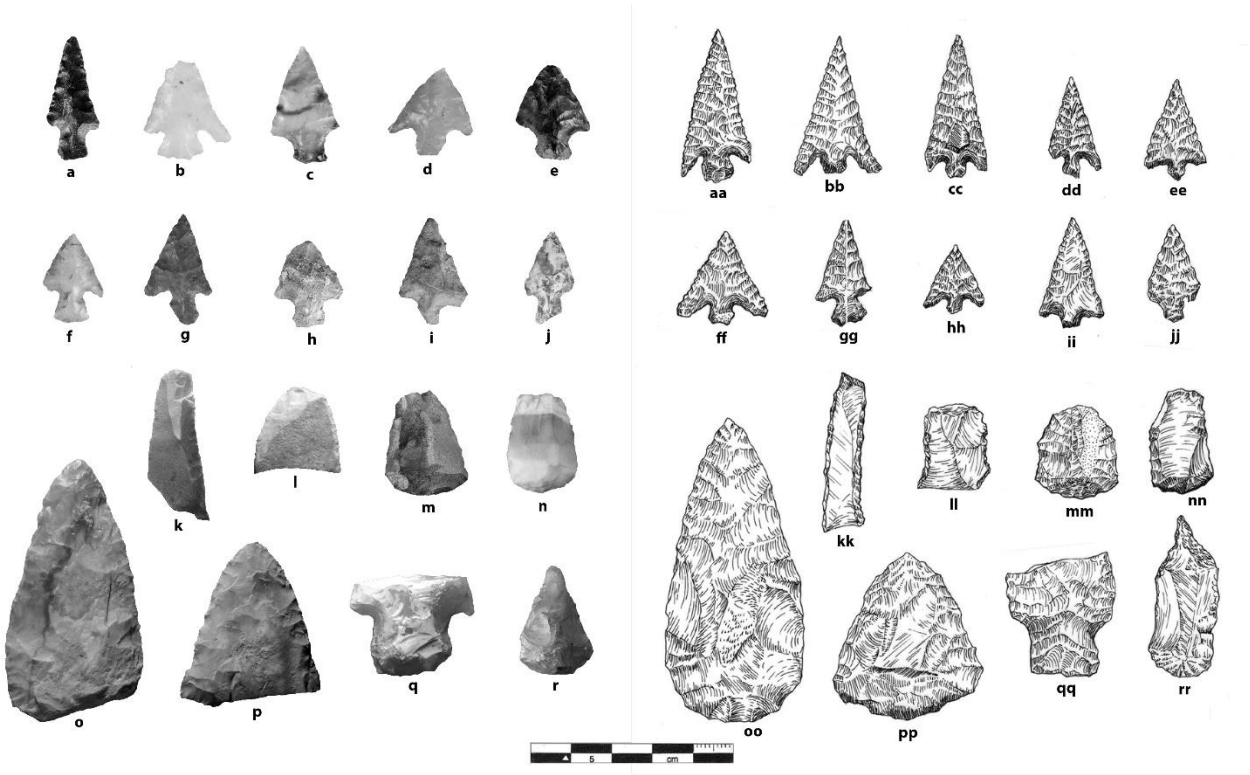

Fig. 3. Examples of retouched lithic tools from Eagle Gorge Terrace (a–r) and *Tualdad Altu* (aa–rr), showing the strong morphological similarities between tools of the same functional type. Tools are projectile points (a–j; aa–jj), narrow rectangular uniface (k, kk), broad rectangular uniface (l, ll), end scrapers (m, n, r, mm, nn, rr), and knives (o–q; oo–qq). End scrapers r and rr have gravers at the opposite end.

Both sites were radiocarbon dated when originally excavated, but in both cases the results were questionable (Chatters at al. 1990; Cooper 2012). *Tualdad Altu* produced dates ranging from 1560 ± 50 to 1700 ± 70, but with the youngest date on CU III, which strongly indicated that the old wood problem affected at least the ages of the upper two cultural strata. This is not surprising for the west flank of the Cascade Range, where a single cedar log can span four or more centuries. A single date of 865 ± 30 from Eagle Gorge Terrace was obtained from charred bone (Cooper 2012; Gerrish et al. 2015), which is a low reliability medium due to the difficulty of removing all contaminating organic acids without also destroying the heat-weakened collagen. This date

appeared to be too young because of the absence in the assemblage of side-notched projectile points, which begin to occur in the northwest after about 1000 B.P., and the strong similarity between the lithic assemblages of this site and *Tualdad Altu*.

Both sites were re-dated using calcined bone as part of a DirectAMS research project to explore the value of this medium for dating sites in the conifer forests of the Northwest Coast. That project demonstrated a high degree of reliability for this medium (Chatters et al. 2015). Three large fragments of mammal longbone from Eagle Gorge Terrace provided radiocarbon ages of 1179 ± 27 (D-AMS 3275), 1272 ± 38 (average of two runs of D-AMS-3277) and 1307 ± 41 B.P. (average of two runs of D-AMS 3276). Calibration of these results places the site between 661 and 949 cal AD at 96% probability, with the most likely age, based on highest probability range (>80%) of the two closely matched older dates, between 646 and 779 cal AD. Two calcined bone fragments from CU I at *Tualdad Altu* produced radiocarbon ages of 1364 ± 28 (D-AMS-9408) and 1309 ± 31 (D-AMS-9409). These calibrate to between 615 and 770 cal AD with 94% confidence.

Given the ages obtained from the calcined bone, *Tualdad Altu* CU I and Eagle Gorge Terrace may be considered to represent two aspects of the subsistence-settlement round of Puget Salish culture circa the 7th or 8th century AD. They occupy the same watershed just 36 kilometers apart as the crow flies and approximately twice that distance following the sinuous course of the Green River. Lithic materials that dominate the Eagle Gorge Terrace collection are also common in *Tualdad Altu*. It is not inconceivable, although certainly less probable, that the members of the same community produced both sites.

Comparing the Lithic and Faunal Assemblages

In comparing the assemblages from the village and hunting camp, we addressed the question of differences between faunal assemblages, retouched tools, and the relative frequencies of lithic waste materials and retouched tools. Bone tools were not compared statistically because of the small quantity found at Eagle Gorge Terrace. Although both assemblages were analyzed using the same criteria and almost entirely by the same individuals, they differ somewhat in the techniques used to collect them. Both sites were excavated by trowel in 1 m units and the sediment screened. Eagle Gorge Terrace was excavated in 10 cm levels and analyzed as a single assemblage. Soil matrix was dry screened through 1/8-in. mesh and all resulting debitage was analyzed. Lithic debitage was subjected to full reduction stage and size analysis. *Tualdad Altu* sediments were primarily water screened through 1/4-in. wire mesh with a fourth of each 2 x 2 meter unit more finely screened. Counts of lithic debitage reported herein represent only the material captured in the larger mesh. That waste material collection has never been subjected to detailed debitage analysis, so only the gross counts of cores and debitage are currently available for this site. To make the debitage assemblages comparable, we consider only fragments larger than 5 mm from the Eagle Gorge Terrace dataset and rely strictly on debitage and core counts in this analysis.

Retouched lithic tools at both sites were categorized according to the definitions applied by the senior author to the *Tualdad Altu* collection (Chatters 1988:59). Those definitions derive from a paradigmatic classification based on retouch faciality, object plan, wear and its location, and in some cases artifact dimensions. The senior author conducted both analyses in their entirety, including reclassifying the small collection resulting from 2014 excavations at Eagle Gorge to ensure comparability. For this reason, the reader may see some differences in tool counts between this analysis and Cooper et al. (2015). We base the stone tool comparison on retouched tools only, because the identification of utilized flakes from among the *Tualdad Altu* debitage was made by

laboratory staff without the senior author's input and may or may not be based on the same criteria as those reported for Eagle Gorge Terrace. Bifaces in preliminary stages of reduction are also not included; they were surprisingly absent from *Tualdad Altu.* Ten chipped stone tool categories are recognized: projectile point, knife, awl, drill, graver, wide rectangular uniface (a flake with both lateral edges retouched and broader than 13 mm), narrow rectangular uniface (the same but narrower than 13 mm), end scraper (with steep convex retouch on the distal flake edge), convex-edged unifaces (retouch on one lateral edge, often called side scrapers), and concave-edged unifaces (spokeshaves). The projectile point category combines what may be functionally distinct forms, including broad and narrow-necked stemmed points as well as triangular end blades. We address this issue in the discussion section. In addition, we recognize adze bits and bit fragments. Quantities of sandstone abraders are recognized as further distinguishing the two assemblages, but the difficulty of quantifying such friable artifacts led to their exclusion in the statistical coverage. Likewise the flat, edge-polished cobble is excluded because of uncertainty whether or not such forms would have been recognized as tools at *Tualdad Altu*. What was striking about the *Tualdad Altu* collection, and seems to be repeated in that of Eagle Gorge Terrace, is the uniformity in the sizes and forms of each of the chipped stone tool categories. The technology appears highly formalized and curated.

The senior author supervised the faunal analysis at *Tualdad Altu*, conducting the mammal, bird, and some of the fish identifications personally. The majority of the fish assemblage was analyzed and reported by Butler (1990). The senior author also conducted the faunal analysis at Eagle Gorge Terrace (Cooper 2012; Cooper et al. 2015). In both cases, identifications were based on comparison with his personal comparative collection and the extensive mammal and bird skeleton collections of the University of Washington's Burke Museum of Natural History and Culture. Assemblages, particularly of the mammalian fauna, on which we focus are, therefore, analytically equivalent.

For comparison of the assemblages, we consider percentage frequencies of stone tool forms, percentage taxonomic composition of the faunas based on numbers of identified specimens, and ratios of cores and debitage to retouched tools. Chi-squared is used to assess the significance of differences between the assemblages of faunal remains and retouched tools. We apply Simpson's Diversity Index as a measure of faunal and stone tool diversity to incorporate both category richness and category evenness, thus minimizing the effect of sample size on the assessment (Leonard and Jones 1989).

Results

The two assemblages differ strongly in every respect. Lithic reduction was a more important activity at Eagle Gorge Terrace, which also has significantly different and more limited stone tool and faunal assemblages than *Tualdad Altu*.

The ratios of retouched lithic tools to lithic waste materials (Table 1) are so markedly distinct that statistical treatment is unnecessary to demonstrate the significance of this difference. Ratios of both debitage and cores to retouched tools are much lower in *Tualdad Altu* than Eagle Gorge Terrace. This indicates that lithic reduction was a much more significant activity at the upland hunting camp than in the village. The near-absence of cores in the latter as well as the apparent absence of early stage bifaces indicates that flake blanks and completed bifaces, rather than lumps of raw material, were brought into the base camp from source localities. The high frequency of cores at Eagle Gorge Terrace, coupled with the frequency of early stage bifaces and

the proportion of debitage in the collection, indicates Eagle Gorge Terrace was such a source location. In fact, AMEC archaeologists observed large blocks, including one boulder, of the same jasper found in the site lying near the Green River directly below the terrace's edge.

The *Tualdad Altu* stone tool assemblage is much more diverse than that of Eagle Gorge Terrace, with a Simpson's Diversity Index just short of a perfect 1 versus 0.7333 (Table 2). The *Tualdad Altu* assemblage not only contains more tool categories, including all ten, but also has nearly equal proportions of all categories—a high level of evenness (Fig. 4). Eagle Gorge Terrace, conversely, lacks three tool categories and is almost missing a fourth. It is highly uneven, with projectile points accounting for almost half of the collection. The two sets are significantly different ($X2 = 108.07$ at 9 df; $p < 0.01$).

TABLE 1. COMPARISON OF LITHIC TOOLS AND BYPRODUCTS FROM *TUALDAD ALTU* AND EAGLE GORGE TERRACE

Assemblage	**Retouched**	**Cores**	**Debitage**	**Core/Ret.**	**Debitage/Ret.**
Eagle GorgeTerrace	61	21	3144	0.34	51.54
Tualdad Altu CU I	185*	2	2542	0.01	13.74

* Adzes, which are ground, rather than chipped, are excluded from this count.

TABLE 2. COMPARISON OF STONE TOOL ASSEMBLAGES, BY FREQUENCY AND DIVERSITY

Stone Tool Category	**Eagle Gorge Terrace**	***Tualdad Altu* CU I[a]**
Projectile Point	26	32
Knife	9	23
End Scraper	11	33
Convex-edged uniface	7	25
Concave-edged uniface	0	19
Wide rectangular uniface	4	13
Narrow rectangular Uniface	1	23
Graver	4	12
Drill	0	5
Adze	0	7
Simpson's Index of Diversity	0.7333	0.9600

[a]CU: cultural unit.

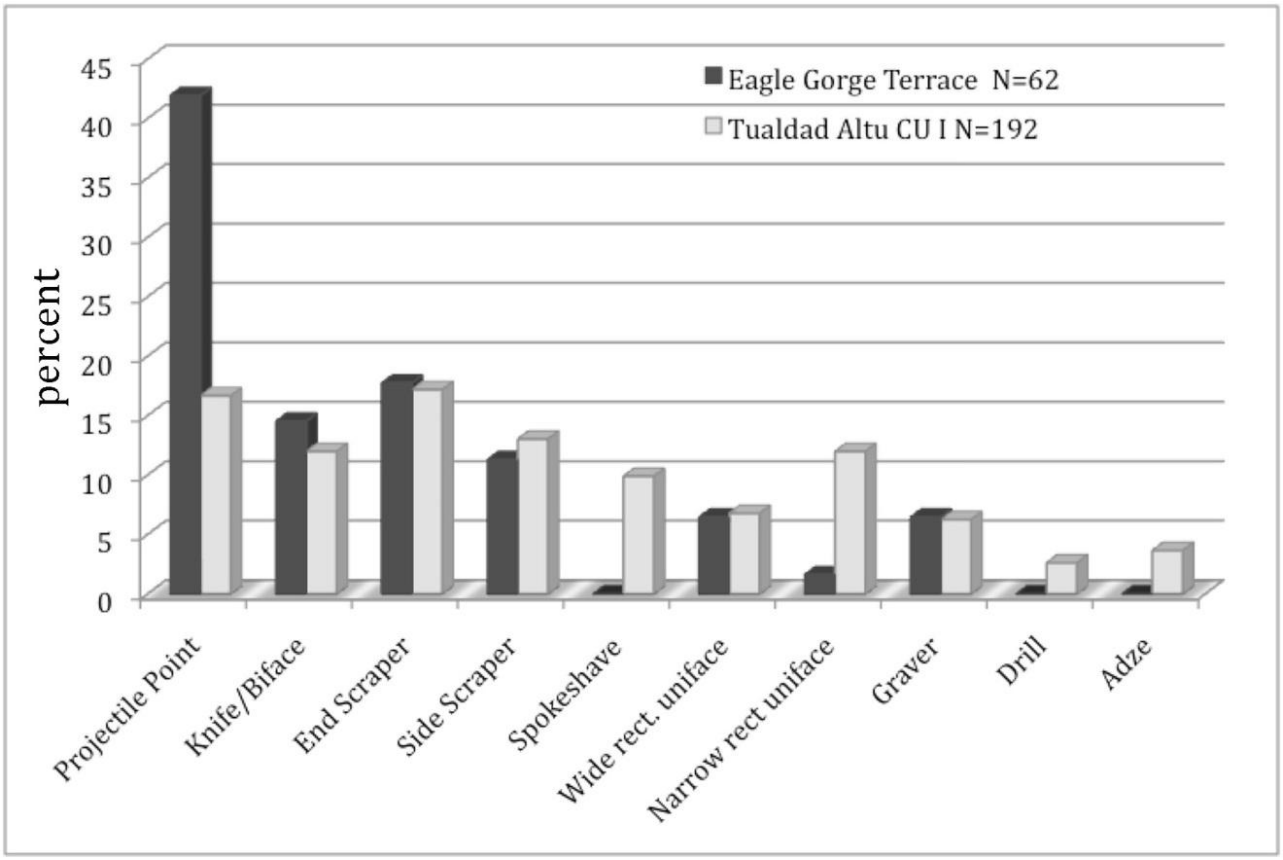

Fig. 4. Comparison of Eagle Gorge Terrace and *Tualdad Altu* stone tool kits by percentage frequency.

The difference is even greater if we consider the three projectile point forms at *Tualdad Altu* to be functionally distinct. Of these—end blades, broad-necked stemmed forms and narrow-necked stemmed forms—only the narrow-necked stemmed form occurs at Eagle Gorge Terrace. We can be certain that a chronological difference does not cause this distinction, at least for the end blades. Small, asymmetrical points of this triangular form occur throughout the later prehistory of Puget Sound (Croes 2015), including the nearby Duwamish No.1 site (Campbell 1981), which spans the period from the 7th through 17th centuries AD.

The Eagle Gorge Terrace assemblage is a subset of the toolkit found at *Tualdad Altu*. Most interesting in this regard is which tool categories are emphasized and which are missing. Eagle Gorge includes primarily implements for killing (projectile points), butchering (knives), and hide working (end scrapers and perhaps convex-edged unifaces). Add to this the polished stone cobble used as a hide beamer and the bone spatulate, which may have functioned in a similar way, and all but nine of the stone tools and one of the bone implements from in this site are associated with a single activity set: meat and hide acquisition and processing. This is somewhat tautological, since we are making this comparison because the site is considered to be a hunting camp, but the difference is profound, the dedication to a single set of activities complete.

What is missing is even more instructive of how people spent their time at hunting camps. Absent or nearly so at Eagle Gorge are narrow rectangular unifaces, drills, adzes, and spokeshaves. To this we can add sandstone abraders and note the near complete lack of worked-

bone detritus. All of the missing stone implements are tools for shaping or fitting other materials. Concave-edged unifaces or "spokeshaves" were presumably used to shape cylindrical shafts; drills made perforations for binding components of structures or implements; adzes shaped wood and, presumably bone or antler; and sandstone abraders shaped and sharpened wood and bone. Narrow rectangular unifaces appear, based on wear and breakage patterns, to have been chisel bits. Edge-wear and breakage on these objects occurs on the un-retouched distal flake edge, rather than on the retouched lateral edges. This functional form is also nearly absent. Hence, it appears that little fabrication of bone tools, composite implements, or structures was taking place at the Eagle Gorge encampment.

Faunal collections are even more strikingly different (Table 3, Fig. 5). The two mammalian assemblages are nearly the inverse of one another. Deer (*Odocoileus*) dominates the *Tualdad Altu* collection, with the much smaller muskrat (*Ondatra*), beaver (*Castor*), and raccoon (*Procyon*) also well represented. None of these animals occur at Eagle Gorge Terrace. Animals larger than deer are nearly absent at *Tualdad Altu*, accounting for just over 6% of the identified mammals, but are the only identified mammals at Eagle Gorge Terrace.

TABLE 3. REPRESENTATION OF MAMMALIAN GENERA AT THE TWO SITES, ARRANGED ACCORDING TO BODY SIZE, WITH THE LARGEST AT TOP

Mammalian Genus	**Eagle Gorge Terrace**	***Tualdad Altu* CU I**
Cervus (elk)	9	2
Ursus (bear)	20	4
Oreamnos (mountain goat)	3	0
Odocoileus (deer)	0	45
Felis (cougar)	0	1
Canis (wolf/dog/coyote)	0	2
Castor (beaver)	0	13
Procyon (raccoon)	0	8
Aplodontia (mountain beaver)	0	4
Ondatra (muskrat)	0	17
Mustela (weasel)	0	1
Simpson's index of diversity	0.5215	0.7248

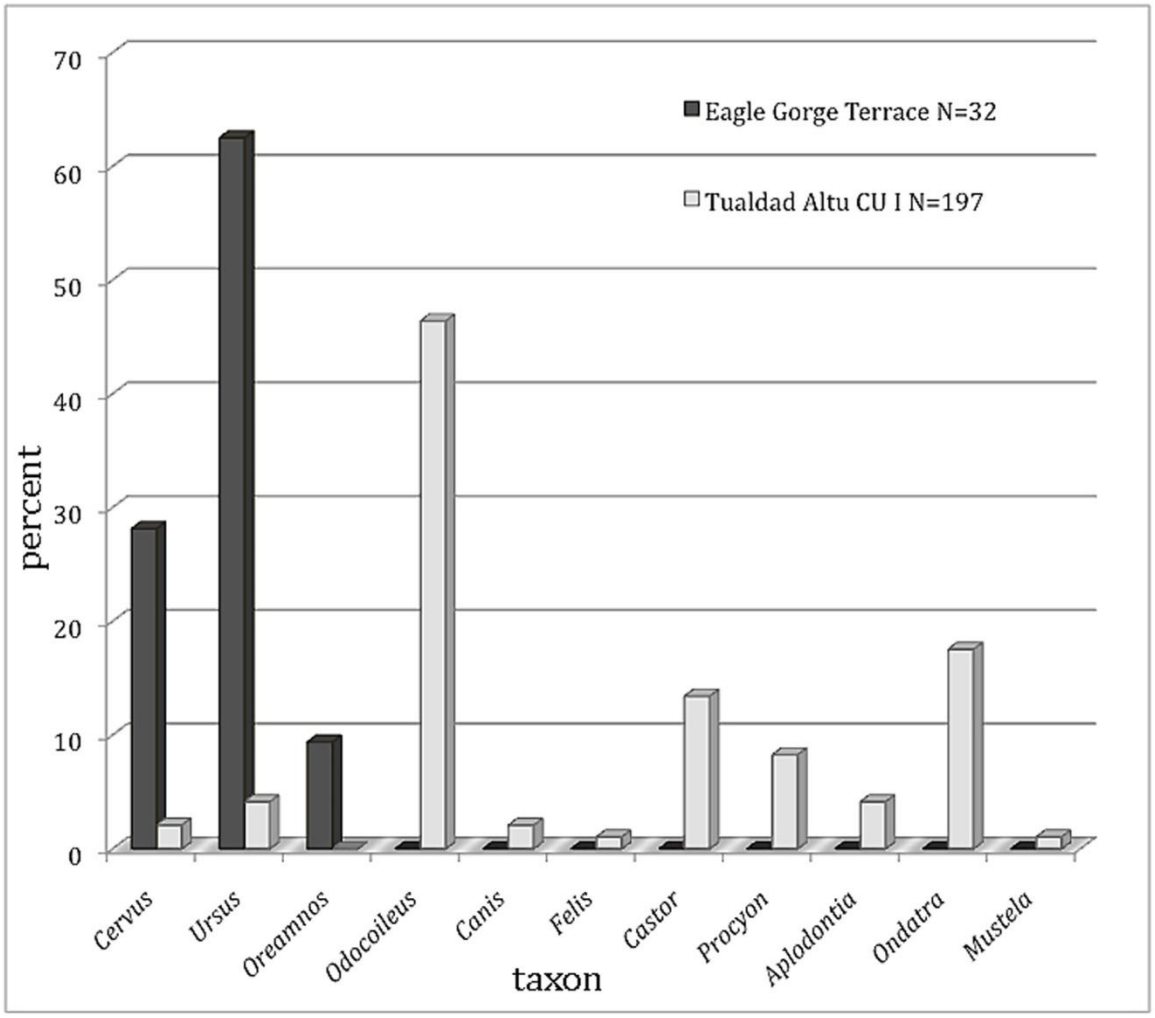

Fig. 5. Comparison of Eagle Gorge Terrace and *Tualdad Altu* CU I mammalian faunal assemblages by percentage frequency.

The difference is brought even more strikingly to the fore when we consider the total faunal assemblage at each site. Including birds and fish, at least 24 vertebrate taxa were present in CU I at *Tualdad Altu*. Only three were present at Eagle Gorge Terrace. The number of genera in the *Tualdad Altu* assemblage is probably higher, considering that fish were often identified only to family. Whereas fragments of fish bone dominated the *Tualdad Altu* assemblage, they were entirely absent at Eagle Gorge Terrace. The absence of fish is probably real and not a function of preservation. A great deal of fine trabecular bone, which is similar in its durability to fenestrated salmonid vertebrae, was present among the mammal material at Eagle Gorge Terrace. The paucity of taxa at that site was so complete that all but three of the fragments that could be attributed to animal size came from large to very large animals, such as the elk, bear, and mountain goat identified there. The remaining three specimens were mouse sized and probably lay naturally in the soil when the fires were set. Hunters occupying this site focused on big game exclusively.

One additional characteristic of the Eagle Gorge Terrace assemblage bears mention. Anatomical part distributions of the elements identifiable to mammalian order, including those identifiable to genus and those that could only be placed in the carnivora or artiodactyla, indicate little, if any, skeletal material was removed from the processing site. Bones of feet, skulls, the

axial skeleton and the limbs are all represented. Fragments of longbone shaft comprise more than half of the collection of unidentifiable large mammal material. In the *Tualdad Altu* collection, bear (as well as cougar) is only represented by elements from the feet (Chatters 1988). (Interestingly, teeth do not occur at either site, perhaps due to their tendency to explode in fires). It appears that, except perhaps for a few longbone shaft segments saved as tool material, hunters boned out their prey and transported only processed meat and hides to their village.

Discussion

The Eagle Gorge Terrace assemblage and the similarities and differences between it and *Tualdad Altu* illuminate several aspects of the role hunting forays played in the economic system of the Puget Salish. We address the nature of activities conducted at the hunting camp, the association of hunting with lithic procurement, and the fit between our findings and theoretical models of human exploitation in the Cascade Range as proposed by Burtchard (2007).

Overall, the features and some artifacts found at Eagle Gorge Terrace fit with Haeberlin and Gunther's (1930) description of meat handling and deerskin working among Puget Sound peoples. These authors state that:

> Deer and elk meat were considered the best varieties and dried with special care. The meat was cut in pieces and hung on a frame. Fires were built on three sides and the meat was thoroughly roasted. Then it was hung higher to dry more slowly. (Haeberlin and Gunther 1930:21)

Bear meat was also roasted and dried in this way, although Haeberlin and Gunther seemingly contradict themselves by reversing the order of roasting and drying from their description of deer processing (Haeberlin and Gunther 1930:23). Of hide processing they say:

> Deer skin [after being soaked in water for three days] was hung over an upright pole. . . and scraped. . . .The skin was immersed in [a water-brains mixture] and left to soak for three days. When it was taken out it was rinsed and wrung between two sticks. . . . When the skin was dry it was rubbed with a rough stone to make it pliable. Finally it was hung over the fire for about an hour to smoke it. (Haeberlin and Gunther 1930:33)

High frequencies of projectile points, knives, and end scrapers, the polished, flat stone that edge wear indicates was used as a beamer to soften hides, and the close concentration of fires surrounding a dense scatter of processed bone all can be accounted for by this description.

The concentration of bone is almost coterminous with the highest density of lithic debris at the site. The high ratio of cores and debitage to retouched tools, evidence for the full range of lithic reduction—from primary core reduction, to percussion flaking of biface blanks, to the finishing of tools as represented by numerous pressure flakes—all demonstrate the importance of lithic tool production at this site. Tool production and game processing were taking place in the same small space around the largest fires of the site. This is in marked contrast with the minimal level of lithic reduction at the lowland village of *Tualdad Altu*, where early reduction stages are not in evidence and curated tools comprise a high proportion of the assemblage. These findings demonstrate, that, as Binford (1979) surmised for hunter-gather populations in general, lithic

procurement was embedded in the activities that took people close to the lithic sources. In this case, it was hunting that provided people the opportunity to obtain brittle stone from gravels of the high-gradient mountain streams. Clasts large enough to be tool sources would have been difficult to find on the broad, lowland floodplains where *Tualdad Altu* and other lowland villages stood. There, the rivers' bed loads appear to consist primarily of sand and gravel.

Torrence (1989), writing about time budgeting among hunter-gatherers, suggests that lithic procurement could be embedded in subsistence pursuits only when it did not take too much time away from said pursuits. Again, looking at Haeberlin and Gunther's (1930) description of meat and hide processing and its close relationship to the structure and pattern of the Eagle Gorge tool, feature, and bone assemblages, it is easy to see how lithic procurement and processing could be accommodated in order to create blanks for transport to a residential base such as *Tualdad Altu*. Lithic materials were readily available in the nearby Green River and could be collected while fresh hides soaked in fresh water and brains. During the soak, and while the meat and hides were drying or smoking over slow fires, individuals minding the fire would flake stone in their down time; hence the coterminous lithic and burned bone distributions. Tool blanks could be carried to the residential villages along with processed meat and hides. In this sense, the lithic procurement activity would be nearly cost-free in an energetic and time sense.

This finding is congruous with lithic procurement by *Skwupabsh*, the people (*-absh*) of the Green River Valley, as described in an ethnohistory by Thrush (2005). He states that *Skwupabsh* quarried and traded stone for manufacturing into hunting weapons, domestic tools, and ceremonial items. In the upper reaches of the Green River watershed, at places like Echo Lake and Arch Rock, stone was gathered and reduced into projectile point preforms, scraper blanks, cores, and other stone tool preforms (Thrush 2005). Once the stone was collected and partly reduced upstream, it would be brought down the valley and further refined into finished knives, projectiles, scrapers, and adzes by stone tool artisans. Our finding demonstrates a continuity of this practice for more than 1000 years, but it also shows that tool-stone procurement did not occur as a separate activity but as a component of the upland hunts. This too makes sense in energetic terms. A hike deep into the mountains from lowland villages, with the sole objective of stone procurement, would not be an efficient use of labor in this complex foraging society.

In his model of Holocene subsistence and settlement patterns for the montane Pacific Northwest, Burtchard (2007) has offered predictions about the structure of tool kits and faunal assemblages to be expected at hunting camps and how they might change through time as regional human populations increased. In general, his expectation is that hunters would have taken increasing amounts of small game through time as population pressure increased. During his Intensive Collecting Period, which subsumes the period when both sites described here were occupied, he proposes that faunal assemblages should include higher proportions of small game, such as rabbits, marmots, and mountain beavers, than found in earlier periods. Lithic assemblages should reflect that change, becoming more complex and multifunctional, with butchering tools suitable to processing a wider size-range of animals. He uses the late precontact site of Fryingpan Rockshelter (45-PI-43), which contained a fauna consisting of mountain goat, mountain beaver, and marmot (Lubinski and Burtchard 2005), to support this idea.

While the faunal assemblage of *Tualdad Altu* certainly indicates high diet breadth and the importance of small mammals, birds, and fish in the subsistence system as a whole, as well as a highly diverse lithic assemblage, Eagle Gorge Terrace seems to contradict the expectation for upland hunting camps. Instead of a complex generalized tool kit, the tool assemblage at Eagle Gorge appears specialized, containing almost entirely projectile points, large knives, and scrapers—implements for killing and processing large game. The faunal assemblage, containing exclusively large game and none of the small animals suggested by Burtchard, demonstrates that

big game specialization still existed at this late date. Eagle Gorge Terrace and Fryingpan Rockshelter can be seen to represent two aspects of hunting behavior. The rockshelter—and small rockshelters in general, we suspect—were used as temporary shelters by solitary hunters or small hunting bands during the actual search for game. The minimal artifact assemblages and ephemeral features they typically contain, like those of both Fryingpan and nearby Berkeley Rockshelter (45-PI-303; Burtchard 2007), tend to reflect this. Eagle Gorge, in contrast, was a hunters' *field camp*, where meat and hide processing took place after large animals were taken down. It is also important to consider that the faunal remains found in a rockshelter may have been introduced, largely or in part, by raptorial birds, big cats, bears, and canids, which also are known to use natural shelters. Even if the small game were killed by people, they are less likely to have been targeted species and more likely to have been simply taken opportunistically as a quick meal. They were unlikely to have been a focus of the hunt. They were too small a meat package to bring back to the processing field camp. Eagle Gorge Terrace indicates that upland hunters during Burtchard's Intensive Collecting Period were big game specialists.

Conclusion

The Eagle Gorge Terrace site is a discrete, briefly occupied encampment, untainted by later occupations. As such it offers a rare window into the behavior of Puget Salish hunters in the late first millennium AD. The specialized toolkit they used, a discrete subset of the broader tool kit in use at the time, focused on killing and processing the largest animals in the Cascade Mountains. The hunters used the access this activity provided to raw toolstone, and the time it permitted for reducing that stone, to equip the more complex technology of their entire economic system. Eagle Gorge Terrace suggests that, rather than an opportunistic quest for any animals that might be encountered, the montane hunt of the Puget Salish was a pursuit directed at and successful in provisioning villages with the best meat, hides, and stone tools available. When considered in comparison with the complex technology and intra-household specialization evident in the approximately coeval lowland village site of *Tualdad Altu*, Eagle Gorge Terrace highlights the economic sophistication of Puget Salish culture more than 1000 years before contact.

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CHEMICAL ANALYSIS OF PHARMACEUTICAL MATERIALS RECOVERED FROM A HISTORICAL DUMP IN NAMPA, IDAHO

Ray von Wandruszka, David Valentine, Mark Warner, Vaughn Kimball, Tara Summer, Alicia Fink, and Sidney Hunter

ABSTRACT

In 2009, Idaho Power Company archaeologists monitored construction of a substation on the former location of an ad hoc trash dump in Nampa, Idaho. The monitoring resulted in the recovery of a collection of artifacts that included glass bottles and containers, many with remnants of the original contents. The work reported here focuses on bottles that held health-related products in common use during the earlier parts of the twentieth century. The materials were identified through various chemical analyses, thereby highlighting the utility of analytical chemistry in historical archaeology.

Introduction

> Archaeological chemistry is a rapidly growing field for good reason. Today, a number of innovative approaches are revealing exciting new information about the past. Elemental and isotopic analyses of prehistoric objects can tell us about subsistence and diet, exchange and trade, residence, demography, status and other aspects of prehistoric human behavior and organization. Organic analyses are revealing the contents of pottery and how ancient implements were used. Genetic studies of ancient DNA are outlining the origins and relationships of past human groups. (Price and Burton 2012:5)

The preceding quotation comes from a recently published book, *An Introduction to Archaeological Chemistry* (Price and Burton 2012). The book is part of a broader movement in archaeology exploring linkages between archaeology and the natural sciences, a field commonly labelled archaeometry (Malainey 2012). Archaeometry has been widely applied to contribute to understandings of an array of pre-contact cultures and old-world contexts (see, for example, the contents of the journal *Archaeometry*). What is notable about that quote is the specific focus on prehistory; what is missing is any mention of the application of archaeological science to historical contexts. Simply put, archaeometry and archaeological chemistry are relatively underutilized in historical archaeology. Illustrating this is the fact that just 2 out of the 26 case studies presented in the just-mentioned *Archaeological Chemistry* volume explore archaeological questions associated with the recent past.

For the past eight years Mark Warner (anthropology) and Ray von Wandruszka (chemistry) have built an interdisciplinary collaborative project where students use analytical chemistry to analyze the contents of bottles and other materials from archaeological sites across

the United States. Over the years students have analyzed tooth fillings, coal slag, the chemical composition of glass, gunpowder, and more than 60 bottles from numerous archaeological sites (Spinner et al. 2011; Freeman et al. 2012; Warner et al. 2014; von Wandruszka et al. 2015; Voss et al. 2015). It is a body of work that is expanding the scope of archaeometry in general and archaeological chemistry in particular in a sustained way into historical archaeology, serving to expand the range of analytical tools available to historical archaeologists. The work presented in this article is a continuation of that endeavor, analyzing a series of bottles from southern Idaho.

Project Background—the Nampa Dump

A series of building projects at an Idaho Power Company (IPC) substation in Nampa, Idaho revealed an archaeological site that functioned as an *ad hoc* dump prior to the construction of the substation in 1948 (Fig. 1). The site, 10-CN-132, is of undetermined size, confirmed only within the fenced perimeter of the substation. IPC archaeologists became aware of the presence of the historic dump during construction in 2009. Work was restricted to company-owned land and did not require federal funding or permitting that would have engaged the National Historic Preservation Act Section 106 process. As a result, no prior work had been undertaken to identify historic properties and no work was required afterword. Nevertheless, IPC archaeologists monitored the excavation of footings in October 2009 and recovered a grab sample of whole bottles, jars, and glass fragments. Other potentially diagnostic artifacts were also collected, including ceramic containers and fragments, insulators, horseshoes, and pages from a pulp magazine. Few complete metal artifacts were recovered.

The purpose of collecting the grab sample was to ascertain the nature, age, and extent of the historical dump deposit. A total of 808 glass artifacts were recovered and the data collected from each included branding, embossed signage, weight, dimensions, glass thickness, finish, and cross-sectional profile (Fike 2006:8–10). This information was used to determine the function and contents of each bottle. Of the 808 bottles, 338 had characteristics that allowed for the estimation of the period in which they were manufactured. The bottle information ultimately led to the conclusion that dumping at the location began late in the nineteenth century and continued through the Great Depression.

This finding was consistent with the history of Nampa, which began in 1886. A homesteading farmer, Alexander Duffes, and his partners formed the Nampa Land and Improvement Company and divided Duffes' homestead into lots. They speculated that the town was an ideal location for a railroad spur from the recently completed Oregon Short Line Railroad into Boise. This proved to be correct, and the first buildings were constructed in the fall of 1886 (Clark 1985).

In the 1880s, solid waste management was essentially nonexistent in the West, and arbitrary dumping occurred in and around every western town. When comparing western towns in his book, *The Virginian: A Horseman of the Plains*, Owen Wister wrote: "Each was similar to the next, as one old five-spot of clubs resembles another. Houses, empty bottles, and garbage, they were forever of the same shapeless pattern" (Wister 2015:6).

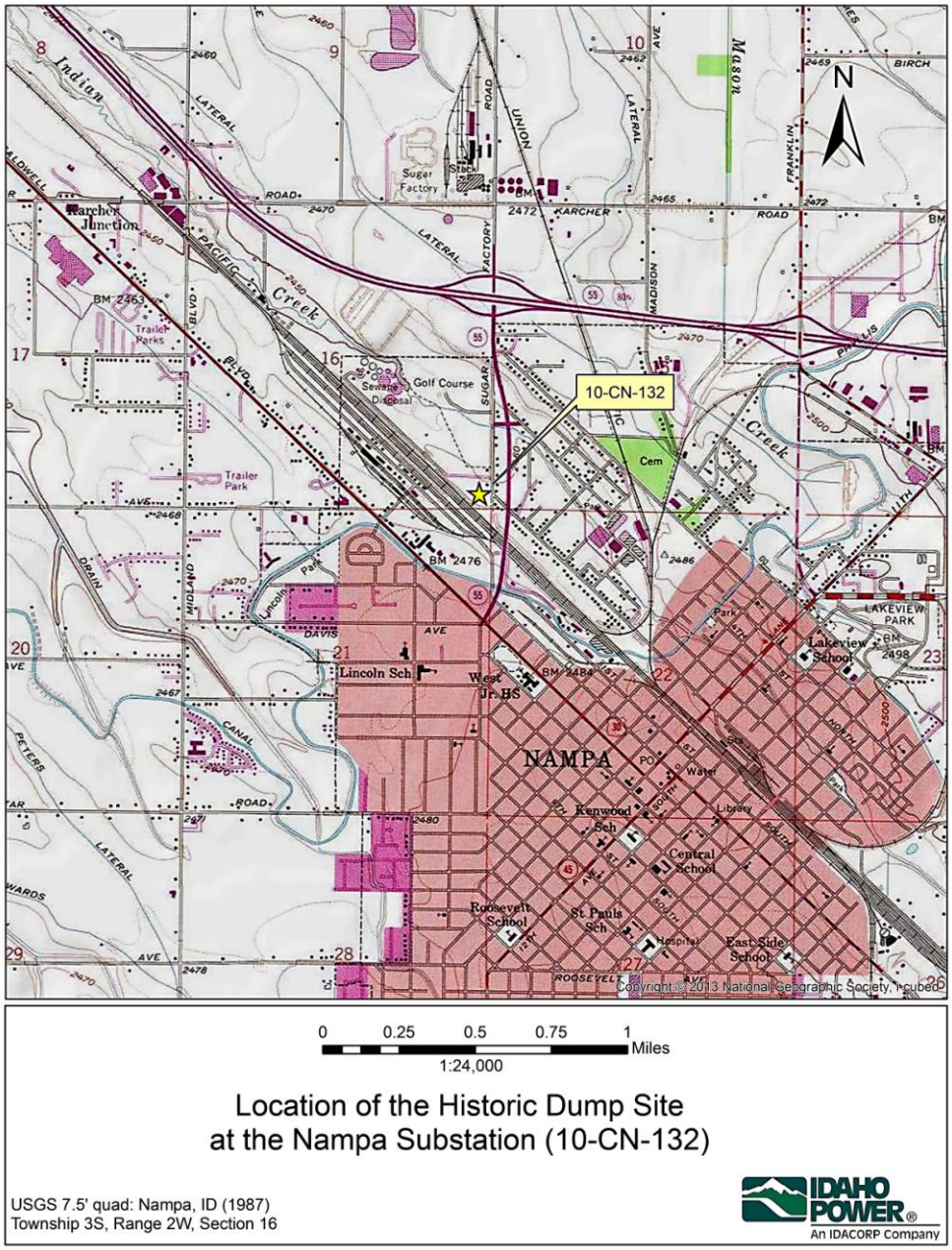

Fig. 1. Location of historic dump site at the Idaho Power Substation Dump Site, Nampa, Idaho.

By the end of the nineteenth century, this casual approach to trash disposal was beginning to change in some of America's larger cities, but it took time to trickle down to smaller and newer communities. At the turn of the twentieth century, many towns had not progressed beyond designating an official city dump. Nampa did so at some time prior to 1913, but old habits die hard and many residents continued to deposit refuse in backyards, empty lots, and alleys throughout town (*Idaho Daily Statesman* [IDS] 1913a).

In 1913, Nampa went through a town cleanup, which according to the local newspaper (IDS 1913b), was a success. The civic mindedness of the citizenry that inspired this action did not last, however, and residents continued to dump trash in inappropriate ways. This was certainly the case at site 10-CN-132, and it continued through the early 1940s (IDS 1921a, 1921b, 1929, 1941) when dumping there ceased due to the construction of the IPC substation.

The site is located in the floodplain of Indian Creek, and site stratigraphy shows that the dump began on top of finely sorted alluvial sands deposited by the nearby stream (Fig. 2). There was a notable lack of metal cans among the recovered artifacts, although rusty remnants of decomposed cans and other ferrous objects were found. The poor condition of these items pointed toward cycles of wet and dry periods at the site. It seems likely that this dumping ground was an otherwise undesirable piece of land adjacent to Indian Creek, and was inundated on a regular basis.

Of the 808 bottles and jars in the collection, 19 were determined to be alcoholic beverage bottles; 50 held other beverages; 9 were related to domestic food canning; and 179 contained commercially prepared food products. A total of 141 items were related to cosmetics or personal hygiene products; 90 to other household uses; and 47 bottles had unknown functions.

A total of 273 bottles and jars from the assemblage (34%) contained products connected to medicinal uses, and 4 of those had panels embossed with the words "Baker Drug Store, Nampa Idaho, Phone 146." An individual named Clarence M. Baker was listed in Polk's Nampa City Directory as a druggist in the period 1925–1945 (Polk 1925–1945). In a local history, his daughter recounted that he purchased the store in 1913 and operated it until 1944. Baker was a prominent figure in the community (Holt et al. 1986:329–330).

Fig. 2. Photograph showing almost two meters of exposed stratigraphy at the Nampa Dump Site (10-CN-132). The historic feature is positioned on top of alluvial sands, and capped by road mix fill, brought in during the late 1940s when the substation was built.

A distinctive aspect of the glass assemblage was the fact that a number of bottles were recovered with their contents partially intact. All of the bottles that possibly had some sort of residue in them were sent to the University of Idaho for testing. Approximately 35 bottles were sent for testing. Out of that total 11 were tested and contained materials that were potentially identifiable. The study described here deals with the chemical analysis of the pharmaceutical bottles that were submitted for testing. It should be noted that two of the bottles from the Nampa collection (not described here) were previously analyzed and described in another publication; Von Wandruszka et al. (2015) included them in an investigation of the unexpected results that may be derived from the analysis of glass bottle contents.

Analytical Methods

The work described below includes a number of analytical methods routinely used in the identification of chemical compounds. The following key techniques warrant brief mention:

1. Dissolution—The solubility of an unknown compound in different solvents can provide a hint of the nature of the material in question. Water, organic solvents such as alcohols, and strong acids and bases are usually considered. Many important analytical measurements require samples to be in solution.
2. Heat treatment—Placing a sample in a 800^{o} C (red heat) furnace for several hours burns off the organic content and leaves only inorganic components for further analysis.
3. pH determination—Determination of the pH (acidity/basicity) of a liquid sample, or the aqueous solution of a solid sample, indicates whether the material is an acid or a base.
4. Flame color—Certain elements in materials produce characteristic colors in a flame. For instance, sodium (Na) gives a yellow flame, calcium (Ca) a red one, and lead (Pb) a blue one.
5. Atomic absorption spectrometry (AAS)—This technique is used for qualitative or quantitative determination of metallic elements in a dissolved sample. The instrument generates light of a wavelength characteristic of the element under consideration and then monitors the absorption of this light by a sample solution aspirated into a flame.
6. Infrared spectroscopy—This is a largely qualitative technique in which the absorption of infrared (IR) radiation by a liquid or solid sample is monitored. The instrument scans through the IR wavelengths range and continuously records the absorption values in a *spectrum* of the sample. The absorption "peaks" in this spectrum is characteristic of particular molecular features of a compound, often allowing for the deduction of its structure.
7. Ultraviolet-visible spectroscopy—This technique is used for the qualitative or (more often) quantitative determination of compounds in solution. The instrument generates light in the visible and ultraviolet region of the spectrum and monitors its absorption by the solution under investigation.
8. Spot tests—Numerous specific tests exist for a wide range of organic and inorganic compounds. Usually these tests rely on the appearance of characteristic colors in a series of prescribed reactions involving a particular compound of interest. The tests are virtually always qualitative in nature.

It must be kept in mind that chemical analyses of historical bottle contents inherently contain a degree of uncertainty. Chemical deterioration and transformation of the materials in question, especially through oxidation, hydrolysis, and polymerization, often happen during

prolonged environmental exposure. Contamination through penetration of extraneous matter into the bottles also commonly occurs. Such events inevitably introduce a measure of conjecture into the analytical findings.

Results and Discussion

I. Antacid

Appearance of Artifact

A quantity of white granular substance was contained in an unmarked, colorless glass bottle with a rusted ferrous screw cap and a volume of approximately 0.5 liters (FS7.021, Fig. 3). A slight patina had formed on the outside surface. The contents formed a layer on the bottom of the bottle and also adhered to the interior sides and neck.

Procedures and Results

Approximately 14 grams of material was recovered from the bottle. Its coloration and granulation suggested that it contained a number of different constituents. The infrared spectra of all of these indicated the presence of amine, hydroxyl, carbonate, and silicate moieties. When placed in a muffle furnace at 800^{o} C for 8 hours, the sample lost 59% of its weight, as well as all the infrared absorption peaks—except the one for silicate.

The sample was found to be insoluble in H_2O, partially soluble in HCl, and fully soluble in 3:1 HCl:HF. Strong acid caused the material to bubble slightly. Atomic absorption spectroscopy showed that it contained a trace of iron, 0.8% calcium (as $CaCO_3$), and 34.3% magnesium (as $Mg(OH)_2$.

Fig. 3. Glass bottle with white powder: specimen FS 7.021 from site 10-CN-132.

Discussion and Conclusions

The chemical evidence suggested that the unknown was a dried antacid preparation, akin to milk of magnesia—containing primarily Mg and Ca compounds. The major component was $Mg(OH)_2$, and a small amount of $CaCO_3$ was also present, causing a slight evolution of CO_2 when the material was placed in acid. The remainder, some 65%, was composed of a relatively small amount of an organic component, possibly citric acid, and a larger amount of a silicate. The latter may have served as an inert solid diluent.

Mixtures of $CaCO_3$ and magnesium compounds can be used as antacids to treat heartburn and indigestion. Today, such mixtures are found in many familiar brands of antacids and are available at any grocery store. In earlier times, however, antacids were homemade by mixing together $CaCO_3$ from sources such as powdered limestone or chalk with magnesium from a variety of sources, including ground fish bones, fish oil, or even whole milk. These solutions were taken in doses similar to those of today's antacid suspensions.

II. Laxative

Appearance of Artifact

The artifact (FS55.069) was a colorless glass bottle, open, with encrusted dirt on top (shaped like a cap—see Fig. 4). It was completely intact, showed no embossing, and had no label. It contained approximately 0.8 milliliters of a slightly viscous liquid and orange crusted solid material.

Procedures and Results

When a portion of the solid in the bottle was placed in a muffle furnace at 800˚C for 12 hours, a 36.8% weight reduction occurred. The remaining solid was soluble in HF, and atomic absorption spectroscopy showed that the solution contained iron and sodium. The solid did not dissolve in the liquid part of the sample.

The infrared spectrum of the material in the bottle was dominated by strong peaks in the 2800–2900 cm^{-1} region of the spectrum, indicating a hydrocarbon. After furnace treatment, only a small peak at around 1100 cm^{-1} remained. The complete infrared spectrum of the liquid portion of the sample was virtually identical to that of liquid paraffin.

Discussion and Conclusions

The furnace results indicated that the solid material in the bottle was 36.8% organic and 63.2% inorganic. The infrared spectra showed that the solid was distended with liquid paraffin. After this was burned off, the weak spectrum remaining showed only a signature of silicates. Atomic absorption showed that the solid contained sodium and iron, and the solubility indicated the presence of silicates. The spectral identification of the liquid sample as paraffin was supported by its viscous nature.

The small silicate component of the solid in the bottle suggested that this material was invading dirt. The iron content was probably due to a corroded metal cap that originally closed the bottle; this would also account for the red-brown color (some of which may also have come from the dirt). It can be tentatively concluded that liquid paraffin constituted the entire original content of the bottle. Its use is a matter of conjecture: the design and relatively small size of the bottle may point at personal use, possibly medicinal. Paraffin is occasionally used as a laxative, but has some undesirable side effects (Nathan 2006:68).

Fig. 4. Glass bottle with reddish solid and liquid: specimen FS 55.069 from site 10-CN-132.

III. Mentholatum

Appearance of Artifact

The artifact was a white glass container with a metal screw cap (FS 11.001, Fig. 5A) and its label was partially intact. The word "Mentholatum" was embossed on the bottom. The contents were a dry orange solid (Fig. 5B).

Procedures and Results

A portion of sample was placed in a muffle furnace at 800˚ C for 8 hours, resulting in no weight loss or gain. Some of the original sample was completely dissolved in HCl and a pale yellow color was produced. Quantitative atomic absorption showed that the sample was 44% Fe_2O_3.

The infrared spectrum showed an O-H absorption at 3154 cm^{-1}, probably due to some hydration. This was undoubtedly driven off in the muffle furnace, but the concomitant weight reduction did not show up. It could have been offset by an equal weight gain through oxidation of extraneous materials that had penetrated the container.

Discussion and Conclusions

The Yucca Company, founded in 1889, was the original manufacturer of Mentholatum. They produced ointments, shaving creams, laundry soap, and toiletries. In 1906, the company changed its name to Mentholatum Company after its flagship product, an ointment for aches and bruises (Fig. 6). The Mentholatum Company still exists today, since 1988, as a subsidiary of the Japanese Rohto Pharmaceutical Company (Taylor 2006).

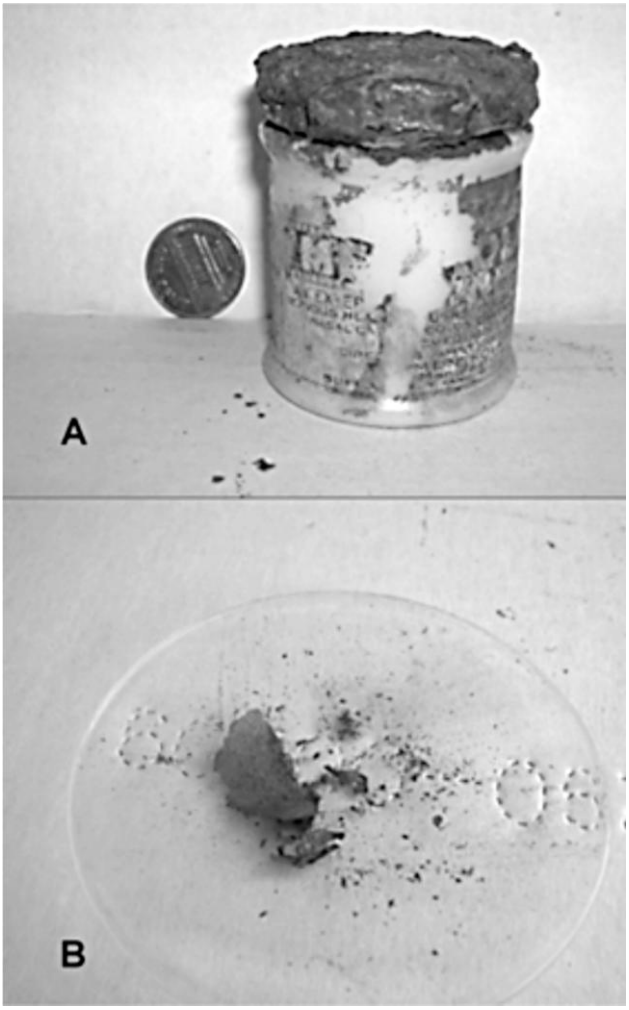

Fig. 5. Mentholatum jar (A) and contents (reddish-brown color); (B) specimen FS11.001 from site 10-CN-132.

Mentholatum consists of menthol, an anti-inflammatory compound, in a petroleum jelly carrier. Very little of these ingredients remained in the present sample. The only indication was a very small C–H infrared absorption peak at 2916 cm^{-1}, suggesting the presence of organic material that may have been part of the original contents. Atomic absorption measurements indicated that the sample was 44% iron in the form of rust. This almost certainly originated from the metal lid of the container, which had partially fallen in. The remainder of the material was probably dirt that had penetrated through the hole in the lid.

Fig. 6. Early twentieth century Mentholatum advertisement.

IV. Activated Carbon

Appearance of Artifact

The item was a small glass container without a lid and with a volume of about 30 milliliters (F51.064, Fig. 7). It was completely intact and embossed with the letters K.A.P. L.A. CAL on the bottom. It was entirely filled with a lustrous black material that appeared to be carbonized.

Procedures and Results

When placed in a muffle furnace at 800˚C for 12 hours, a weight reduction of 92% resulted. The remaining white solid was soluble in concentrated HCl. Atomic absorption spectroscopy showed that it contained calcium and magnesium.

The infrared spectrum of the original sample showed spectral features that were similar to those of standard activated carbon. When it was placed in an aqueous solution of methylene blue, it decolorized it in the same manner as an activated carbon control sample did.

Discussion and Conclusions

The furnace results indicated that the material in the bottle was 92% organic. The chemical characteristics described above strongly suggested that it was activated carbon. The remaining 8% appeared to be inorganic material that contained calcium and magnesium. Carbon can be activated through impregnation of the original ligneous stock with salts such as calcium and magnesium chloride, followed by carbonization (Activated Carbon Manufacture; Mash and Rodriguez-Reinoso 2006:322). This is usually carried out, after drying, in a rotary furnace at 600^{o} C. The small size of the bottle containing the present sample suggested that the material was for small scale, personal use. One possibility is that it had a medical application, since activated carbon can be taken internally for detoxification (Neuvonen and Olkkola 1988).

Fig. 7. Small jar with black material: specimen F51.064 from site 10-CN-132.

V. White Lotion USP

Appearance of Artifact

The artifact (F58.011) was a small generic pharmaceutical bottle with a volume of about 100 milliliters. It had no lid and no embossment or label. A light colored solid adhered to the inside bottom and surfaces (Fig. 8).

Fig. 8. Bottle with White Lotion USP: Specimen F58.011 from site 10-CN-132.

Procedures and Results

The solid was found to be insoluble in water, but soluble in HCl with the evolution of gas. The smell of the gas identified it as hydrogen sulfide (H_2S). A portion of the sample was placed in a muffle furnace for 6 hours at 800^o C and a 21.9 % weight loss was observed.

The infrared spectrum of the original sample showed a prominent O–H peak at 3267 cm^{-1}. Qualitative atomic absorption determinations for zinc and potassium were carried out and were found to give substantial positive signals.

Discussion and Conclusions

The evolution of H_2S upon dissolution in HCl indicated that the material contained a sulfide. Infrared absorption bands around 880 cm^{-1} were indicative of S–O bonds, as were others at 1042 cm^{-1} and 1353 cm^{-1}. It can therefore be inferred that sulfate was also present. The presence of zinc and potassium led to the conclusion that ZnS and K_2SO_4 were likely components. The mass reduction in the muffle furnace was probably due to a loss of SO_2 and some water.

These observations suggested that the bottle contained a product known as *White Lotion USP*, which is composed of 'Liver of Sulfur' and zinc sulfide. Liver of Sulfur (sulfurated potash) is a poorly defined mixture that chiefly consists of potassium polysulfide and potassium thiosulfate. Its formula is represented as $K_2S_2O_3/(K_2S_x)_2$. It is compounded with zinc sulfate to make White Lotion USP, which is used as a treatment for skin disorders (Cowley 2012:464). The components of the lotion mixture react and form ZnS, with the following stoichiometry:

$$3ZnSO_4 + 2K_2S_2O_3 + K_2S_3 \longrightarrow 3SO_2 + S + 3ZnS + 3K_2SO_4$$

White lotion, when irradiated with UV light or sunlight, gives off hydrogen peroxide which has the effect of lightening skin discolorations.

Results of Analysis and Project Implications

The results of the bottles tested are summarized in Table 1. From an archaeological perspective, analysis of the bottles contents provide more nuanced insight into the function of four bottles and confirmation of the contents of one of them. Historical archaeological excavations regularly excavate bottles such as Samples I and IV. Without analysis of the contents the bottles would likely be identified as "unknown" or "pharmaceutical." Clearly, knowing the contents of these bottles adds to understandings of the excavated remains and in many cases such information is of considerable significance. It is important, however, to acknowledge both the limitations and the possibilities for further scholarship. The limitations of this study are obvious, a relatively small number of bottles does not provide a scale of analysis to make broadly generalizable conclusions; rather, this study added a level of descriptive detail about the bottles and their function that was not previously known.

On the other hand, the results generated highlight the potential of analyzing bottle collections from archaeological contexts. Chemical analyses of bottles have produced useful results in several ways. First, as reported elsewhere (von Wandruszka et al. 2015), chemical analysis of bottle contents provided conclusive evidence of re-purposing of bottles. This is behavior that archaeologists have been aware of but have only infrequently been able to document.

TABLE 1. SUMMARY OF BOTTLE CONTENTS FINDINGS.

Sample	Initial Assessment	Contents
I	Unknown/pharmaceutical? (based on vessel form)	Antacid
II.	Unknown	Laxative
III.	Metholatum (based on jar label)	Metholatum
IV.	Unknown	Activated carbon (prob. medicinal)
V.	Probably Pharmaceutical (based on vessel form)	White Lotion

Second, with regards to the materials reported here, the participation of analytical chemists can provide answers where archaeologists may only speak of presumptions. The findings of the bottle contents for four of the five bottles (we consider the Mentholatum bottle to be a confirmatory finding) provided concrete evidence of a variety of medicinal/grooming practices, identifying a likely laxative, an antacid, a skin care product, and activated carbon. Work, such as this in larger assemblages, can potentially provide revealing insights about medicinal/health practices in a number of contexts.

Finally we note the educational value of the project. This work is a continuation of what is now an eight-year long collaboration between archaeologists and chemists at the University of Idaho. This partnership has resulted in valuable training for undergraduates and provided unique insight on archaeological data from at least half a dozen archaeological sites throughout the west.

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SKELETAL EVIDENCE OF PRE-CONTACT CONFLICT AMONG NATIVE GROUPS IN THE COLUMBIA PLATEAU OF THE PACIFIC NORTHWEST

Ryan P. Harrod and Donald E. Tyler

ABSTRACT

The research described in this article evaluates the presence and significance of violence among a sample of human skeletal remains recovered from sites in the interior northwestern portion of the continental United States. Violent encounters were measured by analyzing signatures of traumatic injury indicative of violence. All of the burials were recovered from cultures found in the southern portion of the Plateau culture area. Historically, the populations inhabiting the Plateau have been thought of as relatively peaceful, with violence only developing because of contact with Euro-American explorers, soldiers, and settlers. The reality, however, is that more and more evidence is being presented to suggest that violence was always a part of life in this part of the world. This study adds to a growing body of research that supports the notion that violence was an important part of the local inhabitants' ideology and an adaptive strategy for securing resources and maintaining group solidarity. The results indicate a great deal of variation in violence among the groups over time but in general, there were periods of conflict in this region before and after Euro-American contact.

Introduction

This article offers a summary of the analysis of signatures of trauma and to a lesser extent, pathological conditions that were left on the bodies of individuals from Native American groups before and after Euro-American contact in portions of Washington, Oregon, and Idaho. Trauma for each individual in this project was recorded by estimated age-at-death, biological sex, cause or etiology of the injury, and location. Additionally, to see if the region experienced traumatic injuries homogenously, the human skeletal remains were assigned to one of three geographically and culturally defined regions (Fig. 1).

The findings of this research indicate that patterns of trauma changed over time, that the Plateau was never entirely free from violent encounters. Yet while the Plateau was never completely peaceful, violence appears to be less common than cooperation or simply avoidance in the region. Evidence of the range of behaviors and activities directly related to violence is often not readily apparent in the archaeological record. Access to human remains may be limited or they may simply not be available, recorded history may be absent or inaccurate, archaeological reconstruction of past environments may be lacking, or the "signatures" of violent interaction may be ambiguous. As a consequence, some researchers see this lack of evidence among early pre-state groups as supporting the notion that organized warfare is a relatively recent phenomenon which

emerged as a result of the development of sociopolitical complexity and inequality (Adams 1989; Ferguson 1997; Fry 2007; Rousseau 2008). Ferguson (1997:343) in particular has used the lack of evidence before the Mesolithic period to suggest it was a fairly peaceful time and that clear evidence of violence occurs only among cultures exhibiting a "degree of sedentism, concentration on material value, political centralization and hierarchy, and boundedness." Thus, conflict among hunter-gatherers has often been considered less violent than conflict among complex chiefdom- or state-level societies, limited to interactions between neighbors, and not necessarily related to issues of land or resource acquisition (Fry 2005, 2007, 2013; Fry and Söderberg 2013).

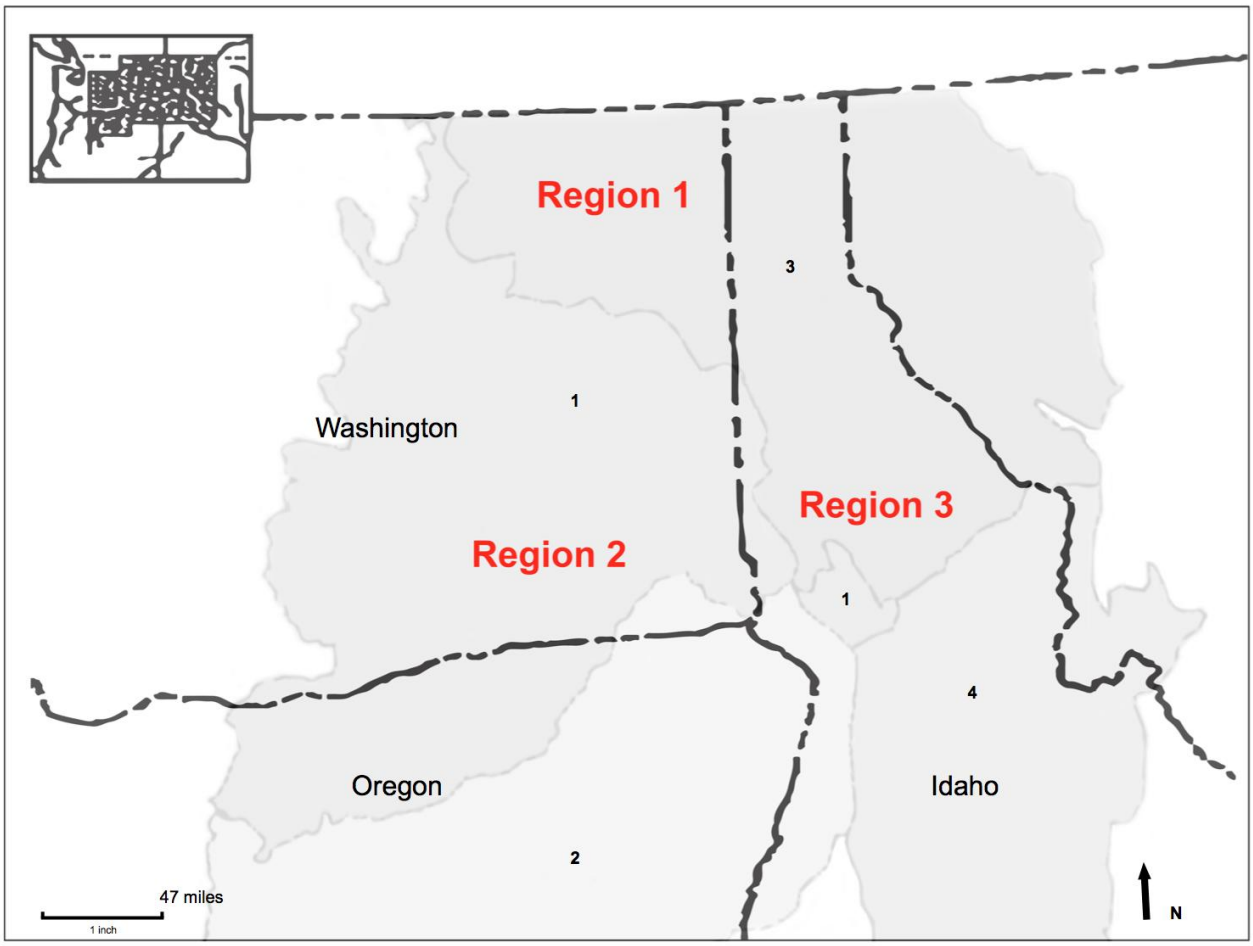

Fig. 1. Southern Plateau. Region 1, 2, and 3 refer to geographically and culturally defined regions. Shaded areas with numbers refer to ecoregions (1 = Columbia Plateau; 2 = Blue Mountains; 3 = Northern Rockies; 4 = Idaho Batholith). Image modified from Anastasio (1985:111) and the EPA (2008).

In reality, however, on-going archaeological and bioarchaeological research looking at site layout, weaponry, and skeletal data indicate that violence was present among forager groups (see for example, Walker 1989, 2001; Keeley 1996; Martin and Frayer 1997; Lambert 2002; Allen and Jones 2014; Gat 2015; Martin and Harrod 2015), but the scale and type of violence can be very different from the conflict found in socially stratified societies (Jones and Allen 2014). Occasionally, such violence escalates when there is a technological advantage, such as the advent

of the bow and arrow (Blitz 1988; Bettinger 2013; Bingham et al. 2013). Acknowledging that the degree and expression of violence have changed as human cultural complexity has increased, Kelly (2005) argues that violent encounters among people (e.g., interpersonal violence) and groups (e.g., raiding and warfare) are and always have been a crucial aspect of human behavior. A growing body of research suggests that violence has always been a fundamental part of human existence (Keeley 1996; Kelly 2000; Walker 2001; Guilaine and Zammit 2005; Gat 2006; Potts and Hayden 2008; Pinker 2011).

The importance of the antiquity of violence is illustrated by research on warfare among Native American groups in the southern portion of the Columbia Plateau in northwestern North America. The cultures in this area have traditionally been viewed as peaceful, and this assumption has led early researchers to argue that they were pacifists (Ray 1939; Lane 1953; Spencer and Jennings 1965; Jorgensen 1980). This notion is so strong that it persists despite evidence that violence did in fact occur among the Plateau cultures (Kent 1980; Chatters 1989; Cannon 1992). The current research project attempts to reconstruct the variable roles that violence played among these populations. The bioarchaeological data used in this research include the presence of skeletal indicators indicating interpersonal conflict, intergroup warfare, and structural violence (Galtung and Höivik 1971).

Socially sanctioned or *structural* violence refers to the ways social structures affect who has access to resources, is buffered from violence, or has adequate nutrition and sanitation (Farmer 2004, 2009; Parsons 2007). Although it is difficult to assess structural violence in the archaeological record, bioarchaeological research clearly demonstrates that colonialism and structural violence can play an important role in the health and wellbeing of Indigenous people (Larsen 2001; Klaus and Tam 2009; Klaus 2012).

This study assessed robusticity, trauma, and pathological conditions to provide insight into the presence of, and shift in, systems of violence during pre-contact and post-contact periods. Antemortem and perimortem traumatic injuries provide evidence of direct interpersonal conflict and warfare, and differences in robusticity offer a means of attempting to determine if structural violence in the form of differential access to resources occurred. For example, a system of inequality may be implicated if individuals with traumatic injuries were performing different activities than those without evidence of trauma. Similarly, the distribution of certain pathological conditions in a population is useful for determining whether certain people within the society were more at risk of malnutrition and disease.

The Plateau Culture Area

The Plateau culture area includes the Interior Plateau in Canada and Columbia Plateau in the United States. Geographically it is defined by a large shield volcano that formed through a series of eruptions (Geist and Richards 1993; Hooper et al. 2007). Walker (1998a:3) describes the Plateau culture area as being composed of relatively homogeneous hunter-gatherer populations that primarily settled along rivers to exploit the rich fishing resources. However, analysis of archaeological and extant populations clearly shows that though the groups share many cultural similarities, there are numerous independent cultural groups (Wissler 1917, 1927; Smith 1929; Kroeber 1931, 1939). The focus of this research is on a portion of the Plateau culture area in the U.S. that Anastasio (1985:112) defines as "part of the state of Washington lying east of the Cascade Range, the northern part of Oregon east of the Cascades, northern Idaho, and western part of Montana" (1985:112).

Violence in the Southern Plateau

To understand the role of violence in the southern Plateau, it is crucial to understand how cooperation and conflict shifted over time before and after the arrival of Euro-Americans. The following overview outlines the evidence of violence during the historic or post-contact period as known from ethnohistoric accounts and then discusses why so little is known about the cultures prior to Euro-American contact.

Post-contact Evidence

Although accounts by early explorers, missionaries, and anthropologists provide evidence of violence among the populations of the Columbia Plateau, they only reflect the period after the arrival of Euro-American technologies (i.e., guns and horses). Most of the documented violence discusses intergroup conflict in the form of raiding. Among the northern groups, there are accounts of regular conflict with cultures beyond the Plateau. Teit (1909:550) describes conflict with both Algonquian (i.e., the Cree) and Athabascan (e.g., the Tsilhqot'in, sometimes referred to as the Chilcotin) groups in the Plains culture area. The difference between violence with other Plateau groups and with those outside of the Plateau is that the Shuswap and Thompson were less often the raiders and more often the ones being raided (Teit 1909). The southern groups were not spared from raids, as ethnographic data suggests they were targeted by neighboring Great Basin Numic-speaking groups such as the Shoshone, Bannock, and Paiute (Stern 1998a; Ruby and Brown 2005). Conflicts with the more warlike Plains cultures and expanding Great Basin groups, as well as the frequent interactions with the socially stratified Northwest Coast societies, likely had an impact on how the Plateau cultures interacted with one another.

There are cases of raiding by groups within the Plateau as well, but these accounts typically involve cultures in the northern portion of the Plateau, particularly among the Shuswap and Thompson (Dawson 1891; Teit 1898, 1900, 1909, 1930). "The more northern races were the most warlike and were continually dispossessing the less warlike southern tribes of their fisheries and hunting grounds" (Dawson 1891:25). Teit (1909:540) suggests that rather than being fights over territory, the raids were conducted to capture the dried salmon stores of the cultures in the south, particularly the Lakes, Lillooet, and Okanagan groups. Regardless of motivation, these ethnographic records describe a system of raiding that resembles patterns of conflict that have been documented among the cultures along the Northwest Coast (Maschner and Reedy-Maschner 1998). Dawson (1891:25) argues that, like Northwest Coast culture, the raiding was not limited to subsistence resources but instead the northern groups were "constantly at war and endeavoring to enslave the weaker bands."

The Kutenai (also known as the Kootenai) in the easternmost portion of the northern Plateau is unique among the Plateau cultures because they do not rely on roots (e.g., camas and bitterroot) as much as other groups and they have the woodworking skills to make watercraft (e.g., sturgeon-nosed canoes) (Turney-High 1941; Rolston and Fairey 1952; Brunton 1998). Some researchers argue that these differences indicate that the Kutenai are recent migrants to the Plateau and that they originally inhabited the Plains before they were pushed out by the Blackfoot (Teit 1930; Jenness 1932; Turney-High 1941; Whitehead 1988). According to Newcomb (1950:326), only after the Blackfoot got guns were they able to push the Kutenai west of the Rocky Mountains. However, the Kutenai retained many of the characteristics that define the Plains culture area, the most important being bison hunting. The Kutenai developed a snowshoe similar to that of the Ojibwa (also known as the Chippewa) and the Cree (Winterhalder 1980) to hunt

bison in the winter when there was less chance of encountering the Blackfoot. These regular expeditions into the Plains involved the Kutenai in more conflict than many of their neighbors to the south (Jenness 1932; Turney-High 1941; Ewers 1958; Whitehead 1988).

The cultures of the southern Plateau are the focus of this research because so little is known ethnographically about the level and types of violence when compared with the northern groups. The warfare that is reported is almost exclusively with groups outside of the Plateau culture area. For example, ethnographic records indicate that the Cayuse and the Nez Perce would band together against the Shoshone, Bannock, and Paiute of the Great Basin culture area (Stern 1998a:403; Ruby and Brown 2005:4). Sutton (2014:154), citing Malouf (1968), highlights that it was the Nez Perce that stopped the Northern Shoshone from expanding into the Plateau, causing animosity that was still present after contact. Lewis and Clark also provide several accounts of conflict between the Nez Perce and the Shoshone. Additionally, like the Kutenai, but less frequently and without the use of snowshoes, the Nez Perce would cross the Bitterroot Mountains to hunt bison (Walker 1969:248, Sappington 1989:25). These excursions could lead to conflict with Blackfeet (southern Blackfoot) groups (Sappington 1989:25). The only other accounts of violence among the groups of the southern Plateau are battles fought with the military (Manring 1912; Arnold 1932; McDermott 1978; Pfau 2006) and an increased tension in the relationships with missionaries and settlers (Santee 1934; Addis 2005).

While these ethnohistoric documents provide some insight into the patterns of violence among groups on the Plateau, they are problematic. First, they often depict events through the eyes of European and Euro-American explorers, missionaries, or early settlers without insight from the indigenous cultures. Second, to understand violent encounters noted post-contact we need to consider the introduction of new technologies and major shifts in socioeconomic and ideological systems. For example, the arrival of the horse has been demonstrated to impact the frequency and intensity of raiding among neighboring groups throughout the New World (Wissler 1914; Teit 1930; Haines 1938; Walker 1969; Blackstock and McAllister 2004).

Blackstock and McAllister (2004:30) and Teit (1930:257) show how the horse enabled the Okanagan and Thompson cultures to dominate the Nicola and Similkameen people to the north. The horse also played a role in the southern Plateau. With their arrival, the Cayuse began to raid their neighbors, the Walla Walla and Umatilla (Pritzker 2000:252; Ruby and Brown 2005:8). The most dramatic change in socioeconomics was the arrival of the fur trade, which introduced a system of market exchange and increased competition among the indigenous cultures (Stern 1993, 1998b; Josephy 1997; Ruby and Brown 2005).

Despite the problems with ethnographic accounts, cross-cultural data demonstrate that the violence revealed in the accounts is patterned and tied to a broad range of political-economic and environmental factors (Ember and Ember 1994, 1997). In addition, even though the violence intensified because of contact with Euro-America groups or the introduction of technology, this does not preclude that violence was present before contact (Chacon and Mendoza 2007, 2012; Dye 2009). Thus, though there may be bias in the accounts, they can still reveal a great deal of information about the complexities of the interactions among a number of groups within a relatively small and bounded region.

Evidence of Violence Prior to Contact

Because of the limitations of relying on ethnohistoric accounts, researchers have tried to identify archaeological and bioarchaeological signatures of violence among the groups in the southern Plateau prior to Euro-American contact. One reason the typical archaeological indicators of warfare are not abundant may be because these groups were fairly mobile as a result of having a

subsistence strategy characterized by seasonal transhumance with the utilization of different resources for each season (Frey and Schitsu'umsh 2001:27).

Archaeologists have relied on several lines of evidence to identify violence and warfare, including the presence of defensive architecture or remotely located habitation or cemetery sites and the manufacture of tools utilized in combat. In the Plateau, archaeological research demonstrating warfare and violence has relied on the presence of a few fortifications. Smith (1977) describes several defensive fortifications, but Caldwell and Carlson argue they are ideological sites that represent the "quest for spirit power" (1954:442). To support their interpretation, Caldwell and Carlson (1954) cite ethnographic accounts that describe stones being piled up during these events (Spier and Sapir 1930; Ray 1942). Citing ethnographic accounts of stacked rock fortifications, however, Reid (2014:171–172) provides a convincing argument that many of the archaeological features found in the southern Plateau were in fact defensive structures. In addition to fortifications, there are barbed projectile points and battlefield cemeteries that seem to support the argument that groups in the southern Plateau were ready and able to defend themselves during times of conflict (Reid 2014).

The limited archaeological indicators of warfare in the southern Plateau require that we look for other evidence of violence. Human remains are one of the best ways to document the existence and impact of interpersonal violence in ancient groups. Bioarchaeological research, using data from human skeletal remains, has revealed a long and varied history of victims of violent interactions (Walker 1989, 2001; Jurmain 1991; Milner 1995, 1999; Lambert 1997, 2002; Martin and Frayer 1997; Smith 1997; Martin et al. 2012; Schulting and Fibiger 2012; Knüsel and Smith 2014; Martin and Harrod 2015).

Although skeletal remains from the southern portion of the Plateau culture area have been studied, most of the analysis has been demographic and metric (Birkby 1966; Sprague and Birkby 1973; Lynch 1977, 1978; Mulinski 1977; Murillo 1979; Carino 1987). These descriptive studies focused on age at death, determination of sex, the size and shape of the bones, and qualitative descriptions of pathological conditions and trauma. Population-based analyses that provide regional comparisons of health status, biological and cultural identity, and life histories are less common (Armelagos 2003). Several notable studies have taken a population-based approach to understanding violence in other populations in the Columbia Plateau (Rice 1978; Kent 1980; Suttles 1987; Chatters 1989, 2004; Cannon 1992; Cybulski 2014). Arguments for violence in this region have typically relied on a small number of individuals and sites. We hope the inclusion of more human remains will provide a new dataset to complement this earlier work. For example, Chatters (1989:244–245) analyzed four sites in Okanogan County, Washington and identified several pre-contact individuals and one historic individual with evidence of arrow wounds, cutmarks, and projectile points embedded in the bone. Work by Chatters (1989) shows violence was present in the Plateau, but ethnographic records clearly document raids by the Shuswap and Thompson against these southern groups (Teit 1909). It is possible that some of this violence was the result of defending against raids from the cultures in the north.

Materials

The project summarized here involved the reanalysis of records housed at the University of Idaho's Alfred W. Bowers Laboratory of Anthropology on human skeletal remains recovered from the Pacific Northwest. Data on 314 individuals were available, however, the exclusion of commingled burials or remains in a poor state of preservation, resulted in a sample of 303

individuals (Table 1). Of the 303 individuals, some of the skeletal remains lack certain key elements and could not be analyzed for activity-related changes, pathological conditions, and traumatic injuries. Reanalysis of the burials was not possible because the remains were returned to the descendant populations in order to be reburied both prior and pursuant to the Native American Graves Protection and Repatriation Act (NAGPRA). The human skeletal remains were originally analyzed between 1964 and 1991 by a number of biological anthropologists and archaeologists, including Walter H. Birkby, Thomas M. J. Mulinski, Susan A. Saastamo-Purves, Daniel E. Seachord, and Donald E. Tyler (see Table 2) (Birkby et al. n.d.).

Although there are other sets of data relevant to this study, for example, collections at Eastern Washington University and those used by Chatters (1989, 2004), this study only used the collections housed at the University of Idaho.

TABLE 1. SAMPLE OF HUMAN SKELETAL REMAINS ANALYZED IN THIS STUDY.

Region	**Adults**			**Subadult**			**Population**
	Male	*Female*	*Indeterminate*	*>5*	*5–12*	*13–18*	
1	31	33	1	1	3	4	
2	33	31	4	1	1	0	
3	69	61	5	9	8	8	**303**

Methods

Harrod (2008) previously collected the raw data, comments, drawings, and the few photographs. His intent was to collect all metric measurements and document other observations of the skeletal remains, which included traumatic injuries and pathological conditions, to determine the degree of interrelatedness between cultures in different ecological regions of the southern Plateau. The research described in this article uses a bioarchaeological approach that incorporates contextual information about the type of burial (e.g., grave goods and mortuary behavior) to reinterpret the type, location, status, and severity of traumatic injuries identified on individuals recovered from the southern Plateau. Distinguishing among multiple kinds of violence (interpersonal conflict, intergroup warfare, and structural violence) indicates how important violence was to the groups' ideology.

Osteobiography

An osteobiography (Saul 1976) or biological profile was established for each individual. This involved the determination of age at death, the estimation of sex, the analysis of robusticity, and the presence of traumatic injuries and pathological conditions for each set of remains.

TABLE 2. INFORMATION REGARDING BURIAL SITES USED IN THIS STUDY

Site #	Site Name	# of Burials	Recorder(s)	Date(s) Recorded
IDAHO				
10CW286	Orofino	1	Mulinski	1980
10IH1319	Stites	1	Mulinski	1976
10NP001	Captain John	2	Birkby	1964
10NP108B	Spalding Burial	1	Mulinski	1980
10NP109	Upper Tammany	1	Birkby	1975
10NP110	Lower Tammany	18	Mulinski/Saastamo-Purves	1975
10NP131	Tammany Talus	5	Birkby	1975
10NP179	Sampson	1	Mulinski	1980
10NP277	———————	1	Mulinski	1982
OREGON				
35MW32	Willow Creek Lake	1	Mulinski	1982
35UM035	Old Umatilla	4	Tyler	1991
WASHINGTON				
45AS002	Steptoe	10	Mulinski/Saastamo-Purves; Mulinski	1972; 1975, 1982
45AS009	Asotin	6	Birkby; Mulinski	1964; 1982
45AS009B	Asotin Burial	4	Mulinski/Saastamo-Purves	1972
45AS026	Ten Mile	3	Mulinski	Date missing
45AS081B	Alpaweyma Burial	41	Mulinski/Saastamo-Purves	1972
45AS082	Alpaweyma	1	Mulinski	1972
45CO001B	Tucannon Burial	4	Iverson/Mulinski	1977
45FE001	Freeland	10	Birkby; Mulinski; Seachord	1967; 1973, 1979; 1985
45FE007	Chief Joseph Dam-Site 7	1	Mulinski	1979
45FE016	Nancy Creek	2	Birkby; Mulinski	1967; 1972
45FE024	Chief Joseph Dam-Site 24	13	Seachord	1986
45FE038	Kettle Falls Railroad Bridge	1	Birkby	1967
45FE044	Shonitkuw	6	Mulinski	1976
45FE047	Chaudière	4	Mulinski	1972, 1976
45FE051	Sherman Creek	11	Mulinski	1976, 1979
45FE152	Michelle	3	Mulinski	1978
45FR036B	Palus Burial	51	Birkby	1964
45FR042	Fishhook Island	4	Mulinski; Tyler	1980; 1991
45FR101	Chiawana Park	7	Mulinski	Date missing
45GA018	Rice Bar	1	Mulinski	1981

Site #	Site Name	# of Burials	Recorder(s)	Date(s) Recorded
45GA061	Wexpúsnime	1	Mulinski	1981
45GA100	Offield Bar	6	Mulinski/Saastamo-Purves; Mulinski	1972; 1979
45GA110	Knoxway Canyon	1	Mulinski	1977
45GR317	Paris Site	1	Mulinski	Date missing
45LI006	Mill Creek	1	Birkby	1967
45LI027	Chief Joseph Dam-Site 2	2	Mulinski	1979
45OK011	Narrows	6	Birkby	1973
45OK159	Pakootas	4	Mulinski	1979
45ST008	Chief Joseph Dam-Site 8	1	Mulinski	1976, 1979
45ST031	Chief Joseph Dam-Site 31	1	Mulinski	Date missing
45ST045	Chief Joseph Dam-Site 45	1	Mulinski	1976
45ST046	Chief Joseph Dam-Site 46	1	Mulinski	1979
45ST050	Chief Joseph Dam-Site 50	2	Mulinski	1979
45ST098	Kwilkin	1	Mulinski	1979
45ST296	Addy Sand Pit	1	Seachord	1986
45ST297	Addy Talus	1	Seachord	1986
45WT047B	Wawawai Burial	2	Mulinski/Saastamo-Purves; Mulinski	1972; 1975
45WT053B	Blyton Landing Burial	3	Mulinski	1979
45WT055B	Ferguson Burial	1	Birkby	1968
45WT097B	Wilma Bar Burial	1	Mulinski	Date missing
45WT099	Wilma Bar Silo	15	Mulinski	1976
45WT101B	Lawyer Burial	15	Mulinski/Saastamo-Purves; Mulinski	1972; 1973, 1975, 1979
45WT102	Wilma Bar Bench	10	Mulinski	1976
45WT103	Wilma Bar Culvert	4	Mulinski	1976

The original researchers generated estimated age and sex using standard osteological techniques of the time (Stewart and Trotter 1954; Pons 1955; McKern and Stewart 1957; Thieme 1957; Kerley 1965; Birkby 1966; Bass 1971; Giles and Friedlaender 1976). Age estimation for children was based on long bone growth (Maresh 1955; Johnston 1962) and dental age (Johanson 1971).

Six age categories were identified in this research project based on the categories presented in Buikstra and Ubelaker (1994): subadult with the categories of juvenile (ages 3–13), adolescent (13–18), and late adolescent (15–18); and adult, which included young adult (19–35), middle-aged adult (35–50), older adult (50+), and unknown adult (20+).

Five sex categories were identified: female, probable female, male, probable male, and indeterminate. For our analysis, the probable female was assigned to the female category and the probable male was assigned to the male category, and indeterminate individuals were excluded.

Robusticity was assessed using the metric measurements taken from the long bones. Robusticity is the measure of the overall size and shape of a particular bone. It is obtained by comparing cross-sectional geometry of a location on the shaft of the bone relative to the overall length of the long bone. The methodology follows those of Bass (2005) and Cole (1994). Robusticity was calculated using the humerus, femur, and tibia. The measures used in this study are femur robusticity, midshaft subtrochanter robusticity of the femur, and tibia robusticity.

The original researcher included detailed descriptions of traumatic injuries, pathological conditions, and other abnormal features on each set of human remains. Using these descriptions, we attempted to determine the etiology of each osteological change. Descriptions of abnormal features and pathological conditions were scrutinized closely as these changes may not have been recognized as violence-related injuries by the original researchers. The failure of researchers to recognize trauma is not only a concern for the Plateau; Allen (2014:101–102) discusses the tendency of researchers in Australia to identify cranial depression fractures or long bone perforations as pathological conditions.

First for trauma, we assigned each injury to one of two broad categories: (1) accidental or occupational trauma and (2) trauma from interpersonal violence. Examples of accidental or occupational trauma include injuries that result from slips and falls, crushing from falling objects, and collision with obstructions in the environment. In contrast, examples of violence-related trauma include being hit during face-to-face combat or because of intra- or intergroup animosity and conflict (i.e., feuds and raiding). Then, the location of the injury was noted because it can help distinguish between injuries caused by violence and those that result from accidents. Cranial trauma was associated with violence if it met the growing clinical, forensic, and bioarchaeological literature that indicates violent encounters usually result in trauma on or above the hat-brim line, multiple fractures to various areas of the cranium, or facial fractures (Hussain et al. 1994; Kremer et al. 2008; Brink 2009; Kremer and Sauvageau 2009; Guyomarc’h et al. 2010). Postcranial trauma is more difficult to identify as violence-related because most of these injuries can also result from a fall. For example, fractures of the clavicle, lower arm (Colles'), and legs are a common consequence of falls (Lovell 1997, 2008; Galloway 1999). For this region, this is especially a concern after the arrival of horses (Barber 1973; Moss et al. 2002; Turner et al. 2002; Northey 2003; Petridou et al. 2004; Thomas et al. 2006). Postcranial injuries that are more likely to result from violence include "parry" fractures of the ulna, rib fractures, and metacarpal fractures, but these too can be the product of an accidental injury (Smith 1996; Walker 1997; Galloway 1999; Judd 2008). To avoid over estimating violence in the bioarchaeological record, postcranial trauma that could not easily be associated with cranial trauma were considered the result of accidental injury.

The frequency of three pathological conditions—porotic hyperostosis and cribra orbitalia as well as periosteal reactions—was noted. Porotic hyperostosis and cribra orbitalia indicate nutritional deficiency or anemia during childhood (Walker et al. 2009), while periosteal reactions indicate a reaction to nonspecific infection, illness, trauma, or even malnutrition (Weston 2008). Taken together these pathological conditions may indicate differential access to resources. The researchers used standard methods in paleopathology to describe these conditions (Welcker 1888; Krogman 1962; Wells 1964; Brothwell and Sandison 1967; Stewart 1969; Steinbock 1976).

Regional Comparison of the Populations

Once the data were compiled and an osteobiography was developed, the individuals were analyzed together, by one of three geographic regions, and by temporal period.

Three regions (Fig. 1) were delineated based on cultural characteristics, linguistic affiliation, genetic relations, and geographic and climatic environment. Region 1 is the homeland of a number of different bands, including the Wenatchee, Nespelem, Moses-Columbia, Methow, Colville, Okanogan, San Poil, Entiat, Chelan, Lake, and Spokane. Region 2 is homeland to the Palus, Umatilla, Walla Walla, and Cayuse. Region 3 is primarily the homeland of the Nez Perce.

The languages spoken among tribal groups in the Plateau are divided primarily into two family groups, Sahaptin and Interior Salish, and several small language isolates (e.g., Kutenai and Cayuse) (Nolan 1993; Kinkade et al. 1998). Most of the bands in Region 1 are Salish-speaking groups, while most of the bands in Region 2 and Region 3 speak Sahaptin or Sahaptian with the exception of the Cayuse, which is a language isolate.

Contrasting geologic zones in the southern Plateau create unique microenvironments with different climatic patterns, vegetation, and fauna (Jackson and Kimerling 1993; Chatters 1998). Biological analysis of the human skeletons also supports the presence of diversity. Using a cultural ecology model (Steward 1955; Butzer 1971; Bennett 1993; Cronk 1995; Sutton and Anderson 2010), Harrod (2008, 2011) found that adaptations in subsistence, mobility, and social organization helped various groups succeed in the environment they inhabited.

Region 1 covers the north-central and northeastern part of Washington, which is primarily characterized by xeric montane vegetation with transition to shrub steppe to the west and south. The annual precipitation in this region is higher than in the other two regions. Region 2 covers the northeastern portion of Oregon and the southeastern half of Washington. This region is primarily characterized by shrub and bunchgrass steppe vegetation and has the lowest precipitation of the three regions. Finally, Region 3 encompasses north-central Idaho and a small portion of southeastern Washington. This region is a transitional vegetation zone with shrub and bunchgrass steppe, as well as ponderosa pine.

Comparing the groups by period is important because contact with Euro-Americans results in substantial cultural change, including subsistence pattern, levels of mobility, religion, ideology, and the level and degree of violence. Analysis was restricted to 266 sets of human remains from adult individuals with evidence of traumatic injuries that were recovered from sites that could be assigned to either the pre-contact period or post-contact era. It should be noted that most of the pre-contact individuals in this paper are from just before or during the protohistoric period, so we are not comparing violence at the advent of the bow and arrow with violence during middle Holocene.

Statistical Analysis

Despite the relatively large population size, the small number of individuals with traumatic injury makes most statistical analysis problematic. Since the human remains were recovered during various archaeological projects that generated a nonrandom sample, and the data are categorical (i.e., presence or absence of a cranial depression fracture), Fisher's exact test was utilized.

Results

Trauma

The first comparison, analysis of trauma by age, revealed that cranial and postcranial trauma occurred in individuals of all ages. The incidence was higher among middle-aged and older adults. Table 3 shows the combined data of the prevalence of cranial and postcranial traumatic injuries by age and sex. Looking at just age, the frequency for late adolescents is 15.4% (2/13), for young adults it is 17.8% (17/96), for middle-aged adults it is 32.9% (25/76), and for older adults it is 33.3% (23/69). The difference among the different age groups was not statistically significant, however, there is a trend of increased trauma among older individuals. Additionally, the category of young adult is somewhat misleading as it covers an age range from early twenties to mid-thirties, which is important because someone in their thirties was not likely viewed as a younger member of the community by the respective culture. According to Ackerman (1998), individuals were recognized as members of the community following marriage, which occurred fairly soon after they reached adulthood. Looking specifically at the individuals with trauma identified as "young adults," there appears to be a different pattern of trauma between the sexes. Among females, all the individuals with traumatic injuries were identified as 30–35 or 30+; in contrast the male "young adults" with trauma ranged in age from 18–35 and over half of the sample was under the age of 30. Additionally, of the adolescent and late adolescent remains where sex was estimated, only males had traumatic injuries. There were four individuals in these age categories who were not identified as either male or female, however, so it is possible there were traumatic injuries among younger females. The trend of increasing violence by age could simply reflect a cumulative process, with the chance of suffering trauma increasing over a person's lifetime. The high rate of trauma among subadults or individuals under the age of approximately fifteen years old (31.3%; 5/16) may be misleading given the small sample size. Furthermore, it is worth noting that the two individuals with possible traumatic injuries involving the head are over the age of 12, which supports other research that suggests there is little evidence of child abuse in past more egalitarian societies (Walker 1994; Walker et al. 1997).

The frequency of trauma was similar among females and males, but looking specifically at the types of trauma (i.e., cranial and postcranial), and controlling for both sex and age, we found differences between the sexes over the lifetime. For both females and males, cranial trauma was higher later in life, but among females, postcranial trauma seemed to spike in the middle-aged adult category, whereas for males the spike occurred later (Table 3).

A comparison of both adolescent and adult individuals in the various regions produced some interesting findings. First, the regions were essentially the same in terms of frequency of trauma with Region 1 at 26.2% (17/65), Region 2 at 29.7% (19/64), and Region 3 at 25.6% (33/129). Analysis of the specific types of trauma was especially interesting, as it revealed very different patterns. The frequency of cranial trauma in Region 1 and Region 3 is high but is

noticeably lower in Region 2. Region 1 is 9.4% (6/64), Region 2 is 1.6% (1/64), and Region 3 is 12.4% (16/129). The difference, however, is only statistically significant between Regions 2 and 3 (p = 0.0132, Fisher's exact [two-tailed] test). Comparison of cranial trauma by anatomical feature or bone affected also indicates a difference between Region 2 and the other regions. Individuals in Region 2 have trauma on the frontal only, while individuals in Region 1 and Region 3 have trauma on multiple bones of the head (e.g., frontal, parietal, and occipital). Analysis of postcranial trauma also revealed differences between the groups. The frequency in Region 1 is 21.5% (17/63), in Region 2 it is 28.1% (19/64), and in Region 3 it is 16.2% (21/130). The difference between Region 2 and Region 3 is also statistically significant (p = 0.0382, Fisher's exact [two-tailed] test).

TABLE 3. TRAUMA FREQUENCIES BY TRAUMA TYPE AND AGE CATEGORY AS WELL AS BY TRAUMA TYPE AND ADULT AGE CATEGORIES SEPARATED BY SEX.

Trauma Type	**Population**		
	Subadult	*Late Adolescent*	*Adult*
Cranial	12.5% (2/16)	15.4% (2/13)	8.7% (21/241)
Postcranial	18.8% (3/16)	0.0% (0/13)	18.3% (44/241)

Trauma Type	**Female**		
	Young Adult	*Middle Adult*	*Old Adult*
Cranial	5.3% (2/38)	12.5% (4/32)	10.9% (5/46)
Postcranial	2.6% (1/38)	31.3% (9/32)	17.4% (8/46)
	Male		
	Young Adult	*Middle Adult*	*Old Adult*
Cranial	5.2% (3/56)	9.1% (4/44)	13.0% (3/23)
Postcranial	19.6% (11/56)	18.2% (8/44)	30.4% (7/23)
	Indeterminate		
	Young Adult	*Middle Adult*	*Old Adult*
Cranial	0.0% (0/2)	-	-
Postcranial	-	-	-

When cranial and postcranial trauma is considered together, several individuals in Regions 1 and 3 have evidence of multiple traumas that may be indicative of injury recidivism (Table 4). Four of five of these individuals with multiple injuries are over the age of forty, and one is over thirty, so they may have suffered repeated injuries over their lifetimes, or these injuries could have occurred during a single event.

Finally, to evaluate the impact of Euro-Americans, only human remains identified as from a solely pre-contact or historic occupation were analyzed. At some sites, both periods are represented, and at many sites, there is insufficient archaeological and ethnographic evidence to assign the human remains to a particular period. The result is that we were only able to analyze 111 pre-contact remains and 155 post-contact remains. To overcome this limitation, only sites where the vast majority of burials were assigned to a particular temporal period were analyzed.

The frequency of trauma during the pre-contact period is 27.9% (31/111), consisting of 15.3% cranial trauma and 12.6% postcranial trauma. Trauma during the historic period is only slightly higher than in the pre-contact period with a frequency of 31.6% (49/155). Interestingly, during the historic period, postcranial trauma increases to 25.8% (40/155), while cranial trauma decreases to 5.8% (9/155). The difference in the frequency of trauma during the two periods is statistically significant for both cranial and postcranial trauma. For the decrease in cranial trauma, $p = 0.0234$ (Fisher's exact [two-tailed] test); for the increase in postcranial trauma, $p = 0.0326$ (Fisher's exact [two-tailed] test).

TABLE 4. INDIVIDUALS WITH MULTIPLE TRAUMATIC INJURIES.

Region	Sex	Age	Cranial Vault	Facial Bones	Thoracic Cage	Upper Extremities	Lower Extremities
1	Female	45-50	(R) Parietal				5^{th} Metatarsal (R)
	Male	50+	(L) Parietal				(R) Tibia/Fibula (L) Talus/Calcaneus
3	Female	30-35	(R/L) Parietal			(R) Ulna	
	Female	40-50	Occipital				(L) Pelvis/Femur
	Female	50+	(L) Parietal (R) Temporal	(R/L) Nasal			(R) Fibula

Robusticity

Robusticity is an indication of the amount or duration of loading on the bones, which provides insight into the amount or type of activity performed by an individual (Stock and Shaw 2007). Other researchers have suggested that robusticity can be used to infer subsistence activities (Bridges 1985; Ruff and Larsen 2001; Stock and Pfeiffer 2004; Ruff 2005, 2008; Wescott and Cunningham 2006; Suby and Guichón 2009; Mummert et al. 2011; Sparacello et al. 2011; Sládek et al. 2016) and mobility patterns (Ruff 1999, 2008; Pearson 2000; Shaw and Stock 2009; Marchi and Shaw 2011) of people recovered from an archaeological context.

For females, 93 right humeri, 94 left humeri, 111 right femora, 121 left femora, 94 right tibiae, and 100 left tibiae were analyzed, while for males there were 88 right humeri, 84 left humeri, 125 right femora, 124 left femora, 100 right tibiae, and 109 left tibiae.

Data on robusticity were also used to determine if individuals with traumatic injury utilized their bodies in particularly habitual or stressful ways (Rhodes and Knüsel 2005). The robusticity of the femur and tibia was compared among individuals with trauma and with the average robusticity of the respective regional population (Table 5).

Pathological Conditions

The frequency of individuals that have porotic hyperostosis or cribra orbitalia is 5.6% (17/301), while the frequency of individuals with periosteal reactions is 10.3% (31/301). Region 1 stands out, with slightly higher frequencies of porotic hyperostosis and cribra orbitalia as well as periosteal reactions, but the difference is not significant. The shift in pathological conditions from the pre-contact to post-contact periods indicates a slight increase in the frequency of porotic hyperostosis and cribra orbitalia from 4.5% (7/155) to 8.1% (9/111). The difference in the frequency of periosteal reactions is very small, from 10.3% (16/155) in the pre-contact period to 11.7% (13/111) during the post-contact period.

TABLE 5. ROBUSTICITY OF INDIVIDUALS WITH TRAUMA COMPARED TO REGIONAL POPULATION MEAN.

Region	**Sex**	**Trauma Location**	**Mean Robusticity – Anatomical Feature**			
			Femur	*MidShaft*	*Subtrochanter*	*Tibia*
1	**Female Subgroup**	Cranial	12.89	12.59	13.29	15.30
1			13.49	13.38	13.64	-
1		Postcranial	11.33	11.30	13.27	14.16
1			12.47	12.35	12.35	15.00
1	*Regional Population*		**12.48**	**12.36**	**12.82**	**15.23**
1	**Male Subgroup**	Cranial	13.79	13.73	14.19	16.07
1		Postcranial	12.00	11.95	12.83	14.05
1			12.09	12.06	12.77	17.06
1			12.14	12.08	12.85	-
1			-	12.21	13.38	16.52
1			13.89	12.84	13.82	16.86
1	*Regional Population*		**12.85**	**12.74**	**13.38**	**16.23**
2	**Female Subgroup**	Postcranial	12.64	12.44	13.57	-
2			11.62	11.59	12.85	14.42
2			12.23	12.11	-	14.08
2			-	-	-	15.52
2			12.34	12.18	12.44	13.52
2			12.50	12.37	13.38	15.74
2	*Regional Population*		**12.58**	**12.37**	**12.92**	**15.04**
2	**Male Subgroup**	Postcranial	12.74	12.66	12.88	16.09
2			12.03	11.94	11.94	14.80
2			13.09	13.03	12.61	16.49
2			13.30	13.18	12.00	15.87
2			13.74	13.62	13.62	16.85
2			14.35	14.25	14.01	14.86
2			14.01	13.91	15.11	16.29
2	*Regional Population*		**13.07**	**12.88**	**13.00**	**16.00**

TABLE 5 CONT.

Region	Sex	Trauma Location	Mean Robusticity – Anatomical Feature			
			Femur	*MidShaft*	*Subtrochanter*	*Tibia*
3	**Female Subgroup**	Cranial	11.95	11.86	13.14	14.81
3			-	-	-	15.71
3			13.38	13.25	13.01	14.84
3			-	11.42	12.82	15.27
3			-	-	-	15.19
3		Postcranial	11.34	10.97	12.47	13.78
3			11.93	11.74	11.97	14.12
3			11.56	11.39	12.38	-
3			12.62	12.41	13.38	15.20
3			-	-	12.33	14.93
3			13.01	12.85	13.10	14.41
3			12.84	12.56	13.29	16.16
3	*Regional Population*	**12.38**	**12.18**	**12.73**	**14.73**	
3	**Male Subgroup**	Cranial	12.68	12.59	13.08	16.57
3			12.44	12.17	12.61	14.51
3			12.67	12.56	11.88	15.41
3			11.93	12.02	12.47	14.82
3			12.59	12.47	12.63	15.53
3		Postcranial	-	13.12	12.90	16.27
3			12.90	12.83	13.80	16.27
3			13.19	13.07	12.84	15.84
3			13.71	13.64	13.38	16.42
3			-	-	-	17.54
3			13.21	13.18	13.18	14.81
	Regional Population		**12.59**	**12.47**	**12.63**	**15.53**

Discussion

The trauma recorded on the human remains from the southern Plateau indicates that the likelihood of trauma increases throughout the lifespan, with the highest frequency among middle-aged adults, and in general both males and females are at equal risk of traumatic injury. However, although males have a higher overall frequency of violence, females have slightly higher rates of cranial trauma. This pattern may indicate a cycle of raiding similar to what is seen in the Northwest Coast (Maschner and Reedy-Maschner 1998), but on a much smaller scale, which is supported by the recent archaeological research on defensive fortifications, weapons, and battlefield cemeteries (Reid 2014).

Other interesting patterns of traumatic injuries include differences between regions and periods. The frequency of trauma among the three regions differs, especially among the groups in Regions 2 and 3, even though they are the closest in terms of geography, language, and genetics (Anastasio 1985; Carino 1987; Sprague 1998; Walker 1998b). Region 2 has the lowest frequency of violence, as revealed by the cranial trauma data, yet the highest overall trauma because the postcranial trauma is substantially higher in Region 2. This is significant because trauma involving

the postcranial skeletal is often related to accidental or occupational activities. This may indicate that the cultures in this region were engaged in different daily routines (i.e., variations in subsistence strategy) than the closely related groups in Region 3. Support for this idea is provided by robusticity data, which illustrate no difference between individuals with trauma and those without, as well as by the patterning in pathological conditions, which closely resembles the pattern in Region 3. This distinction between Regions 2 and 3 is supported by prior research, which found differences between individuals in the two regions based on the assessment of environmental adaptation based on metric measures (Harrod 2011).

Lynch (1978) analyzed human remains published in an archaeological report on burials from Region 2 and found evidence of violence in the form of cranial trauma. She reported that 1 of 46 males (2.2%) and 8 of 87 women (9.2%) had cranial fractures, for a total of 6.8% (9/133). Three of the fractures were perimortem injuries. Since the methodology for distinguishing between perimortem and postmortem trauma continued to be refined between the mid-1980s, and the late 1990s (Maples 1986; Ubelaker and Adams 1995; Berryman and Symes 1998; Sauer 1998; Galloway 1999), the traumatic injuries could be misidentified (a problem that also exists with the data being presented in this article). When the criteria for antemortem trauma used here are applied, only 5 of the 87 females (5.7%) show evidence of violence, for a total of 4.5% (6/133). When the reanalysis of Lynch's (1978) study is added to our data, even with the inclusion of the perimortem cranial fractures, the difference between Regions 2 and 3 is still significant (p = 0.0375, Fisher's exact [two-tailed] test). Excluding the perimortem trauma makes that difference even more significant (p = 0.0074, Fisher's exact [two-tailed] test). Assessing the temporal shift in rates of traumatic injuries was difficult with this data set because the remains were not associated with radiocarbon dates. However, comparison of pre-contact (primarily protohistoric) and post-contact (historic) indicates a shift in the role of violence with a reduction in cranial trauma and an increase in postcranial injuries.

The presence of individuals with multiple traumatic injuries is interesting because it could indicate repeated injury over the lifetime (i.e., injury recidivism). However, it is not possible to reanalyze the bones to determine the biomechanics and timing of each injury. The presence of multiple indicators of trauma could represent a single event that resulted in multiple injuries. For example, it is likely that injuries consisting of multiple fractures increased with the arrival of the horse (Barber 1973; Moss et al. 2002; Turner et al. 2002; Northey 2003; Petridou et al. 2004; Thomas et al. 2006). On the other hand, if it appeared unlikely that injuries occurred during the same event, it was suggested that certain people were exposed to multiple traumatic injuries.

Bioarchaeological research has clearly demonstrated a relationship between pathological changes and social status (Powell 1988, 1991; Rathburn and Scurry 1991; White et al. 1993; Goodman 1998; Danforth 1999; Martin and Akins 2001; Steckel and Rose 2002; Ambrose et al. 2003; Wright 2006; Schepartz et al. 2009). There were no notable differences in pathological conditions among the various regions, which is interesting because although hunter-gatherer groups are traditionally considered egalitarian with equal access to resources, there is still variability in the distribution of choice resources, preferential treatment among certain individuals (male coalitional violence relies on this), and lineage-controlled resource patches (Speth 1990; Kaplan 2000).

Pathological conditions only slightly increased after contact, which suggests that structural violence after the arrival of Euro-Americans was not as severe as in other places in the Americas. Looking at Indigenous communities after the arrival of the Spanish, Klaus (2012), in Peru, and

Larsen (2001) in Florida, found that the increase in inter-community and intra-community health disparity was related to substantial resource and labor extraction practices, but the same intensity of resource extraction was not present in the southern Plateau.

Conclusions

There was a great deal of variation in the patterning of trauma among the groups residing in the southern Plateau culture area. Cranial injuries were more frequent in the past than they were after the arrival of Euro-Americans and the horse. In contrast to the scholars who have argued that these groups were largely peaceful and lacked conflict (Miller 1990; Ackerman 2003; Pfau 2006), we suggest that violence has had a lengthy presence on the Plateau. The data from this project, in conjunction with other lines of evidence, argue that the Plateau was never completely peaceful (Rice 1978; Kent 1980; Suttles 1987; Chatters 1989, 2004; Cannon 1992; Reid 2014). The frequency of violence-related injuries in the Plateau is relatively low compared with the levels among populations in the Northwest Coast or Plains culture areas but is higher than the level of conflict Pilloud and colleagues (2014) found in central California in the Central California Bioarchaeological Database (CCBD), which contains osteological records on over 16,000 individuals. Despite the fact that extensive ethnographic and archaeological research (Anastasio 1985; Josephy 1997; Walker 1998c; Frey and Schitsu'umsh 2001; Ackerman 2003) indicates high levels of cooperation, the combined ethnohistoric, archaeological, and bioarchaeological data all point to periods of relatively low levels of violence with intermittent times of violent interaction and conflict, as well as a willingness to fight when it was necessary. "Strongholds, refuges, and perhaps quivers bristling with barbed arrow points allowed the region's riverine residents to gauge their investments in a pan-plateau network more rooted in marriage and trade than glory and plunder" (Reid 2014:178).

Finally, we would like to conclude by highlighting the numerous limitations associated with using a previously published data set. First, some records were not used because the human skeletal remains were incomplete and important elements were missing (e.g., the cranium). Second, since the analysis of the skeletal remains was conducted decades ago, some of the information that population-based approaches in bioarchaeology can provide is missing. Third, the inventory sheets provided with the burials note whether certain anatomical elements were recorded or not, but it is possible that elements were not recorded when they were present because certain features were unobservable. The result of these limitations is that some trauma may not have been recorded. An additional concern is that the data collected from each set of remains may be problematic because the information was recorded on two different forms. The first of these forms was two pages long and centered primarily on metric measurements with only limited room for comments. The second form, which, according to Carino (1987), was designed by Birkby, included lengthy sections dedicated to detailed recording of observable trauma and pathological conditions. Despite these limitations, the standards developed by Birkby for analyzing trauma were among some of best at that time, there is a good deal of consistency in the way that most of the individuals were recorded, and the second author of this paper helped to collect some of the data.

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THE HOLOCENE EXPLOITATION AND OCCURRENCE OF ARTIODACTYLS IN THE CLEARWATER AND LOWER SNAKE RIVER REGIONS OF IDAHO

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ABSTRACT

Twenty six prehistoric zooarchaeological assemblages from nineteen archaeological sites have been recovered from the Clearwater and adjacent lower Snake River regions in Idaho. Nearly 60% of the early prehistoric assemblages (ca. 10,000–6,000 B.P.) are comprised of bear (*Ursus* spp.), while deer (*Odocoileus* spp.) dominate both middle (ca. 6,000–3,000 B.P.) and late (ca. 3,000–500 B.P.) prehistoric assemblages. Bighorn sheep (*Ovis canadensis*), bison (*Bison bison*), and pronghorn (*Antilocapra americana*), all of which have been extirpated from the study area, together comprise up to 2.5% of the total faunal assemblage and 6.5% of the late prehistoric assemblage. Within each phase, rabbits and large rodents comprise $\leq$ 3% of the total assemblage. The relative frequencies of mammals across all sites suggests a focus on large mammals (> 25 kg), which is consistent with the findings of Lyman (2013) across sites in Eastern Washington.

Introduction

Humans have lived in the Clearwater River basin and adjacent lower Snake River region for at least 10,000 years B.P. (Sappington 1994a, 2010; Sobota 2001). This region is ethnographically and historically part of the territory of the Nez Perce Indians who had population concentrations all along the river corridor (Ames 1980; Sappington 1994a). Though the first anthropologist, Alice Cunningham Fletcher, arrived in the region in 1889, serious archaeological investigations were not conducted in the Clearwater region until the early 1960s (Sappington 1994a).

In recent years, a number of zooarchaeological investigations have been conducted in this region, and numerous faunal taxa have been identified from excavated sites. Unfortunately, little research to date has examined faunal distributions within the region as a whole. Meriwether Lewis and William Clark's Corps of Discovery expedition recorded many mammal species in Nez Perce Country that have either been extirpated from the area (grizzly bear, grey wolves, and pronghorn) or have a severely reduced range (bighorn sheep and mountain goat) (Gass 1847; Walker 1998; Moulton 2003; University of Nebraska Press 2005; Pinkham and Evans 2013). In this article I describe 26 faunal assemblages recovered from 19 archaeological sites within the Clearwater and adjacent lower Snake River regions in Idaho. I examine artiodactyl abundance, prey body size categories, and measures of taxonomic richness and evenness to determine whether subsistence practices were generalized or specialized and whether temporal or spatial variation exists with regard to subsistence practices.

Materials and Methods

Data were compiled from 19 site reports representing 26 faunal assemblages (Fig. 1). For each assemblage, the number of identified specimens (NISP) of each taxon, the Total NISP for each assemblage, and the age of each assemblage were tabulated. Only temporally and spatially non-intrusive mammal remains were retained for analysis. As the majority of faunal assemblages from the region are highly fragmented (Sappington and Carley 1987; Sappington 1994b, 1995; Sappington et al. 1997; Sappington and Evans-Janke 2002; Lyon 2000), documentation of human use was occasionally omitted from site reports. Therefore, all taxa ethnographically known to have been exploited by the Nez Perce (Spinden 1908; Marshall 1977; Sappington 1994a) are included in analyses regardless of the presence of butchering marks.

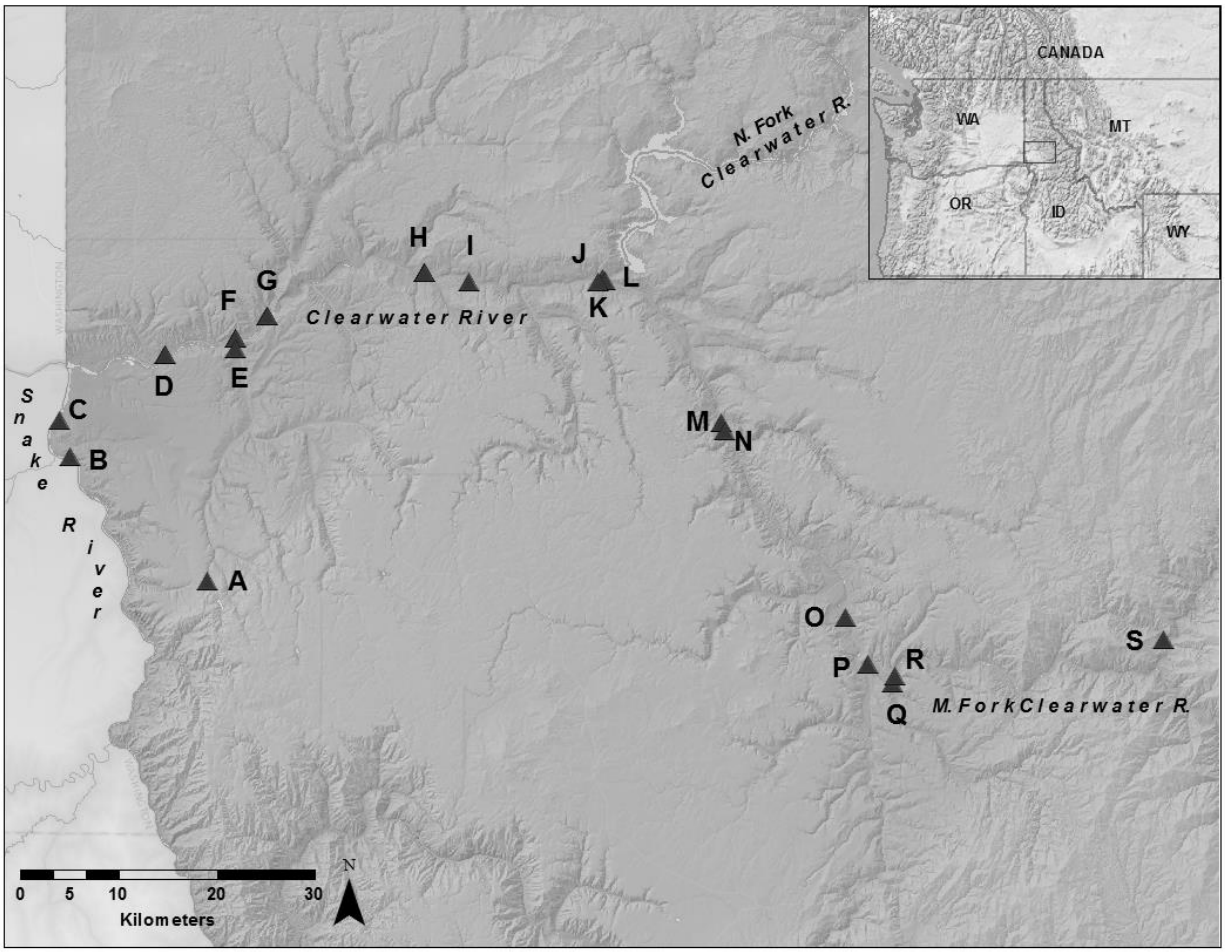

Fig. 1. Map of Idaho showing locations of archaeological sites where faunal remains were recovered (triangles). Site key: A: Sweetwater Springs; B: Red Elk Rockshelter; C: Wewukiyepuh; D: Hatwai; E: North Lapwai Valley; F: Spalding; G: Arrow Beach; H: Lenore; I: We'eptes Pa'axat; J: Clearwater Fish Hatchery; K: Canoe Camp; L: Ahsahka; M: Lolonima'puh; N: Piik'uh taxxsawxt; O: Waterline Trench; P: Kooskia Bridge; Q: Kam'-nak-ka; R: Tuhkaytahs'peh; S: Pete King Creek. Sites A through L are included in the downriver region while sites M through S are included in the upriver region.

A total of 149 radiocarbon dates were used to calculate the midpoint of the age ranges for each site (calibrated years B.P.) (Lyman 2003, 2009; Codding et al. 2010; Fig. 2). The temporal midpoint was used to assign sites to one of three regional cultural phases (Sappington 1994a): the early prehistoric Windust/Cascade phase (ca. 10,000–6,000 B.P.), middle prehistoric Hatwai phase (ca. 6,000–3,000 B.P.), and late prehistoric Ahsahka phase (ca. 3,000–500 B.P.). These three divisions roughly correspond to divisions within the Holocene, but regional terminology was retained for accuracy. For assemblages with no associated radiocarbon dates or where the radiocarbon dates were unreliable, sites were assigned to a cultural phase based on temporally diagnostic artifacts encountered as determined by the principle investigator at the site. Only one multicomponent site (*We'eptes Pa'axat*) was not able to be split into phase-specific components and was therefore excluded from further analyses. Geographic locations of sites were obtained from the Idaho State Historic Preservation Office.

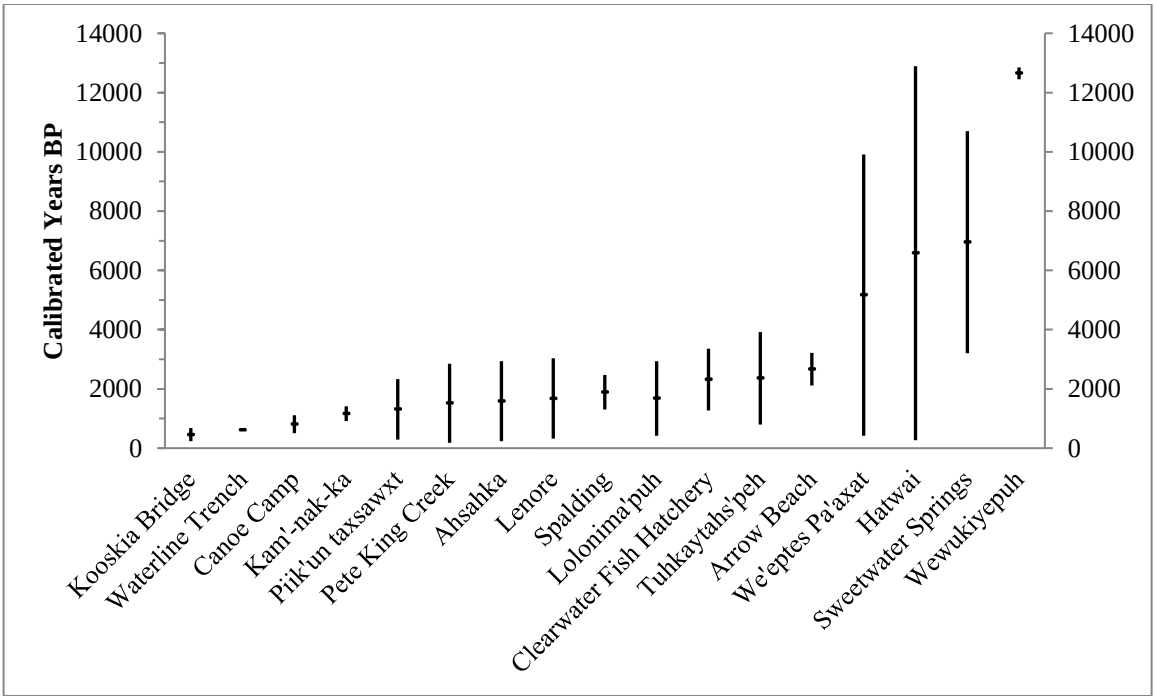

Fig. 2. Age ranges of 17 archaeological sites in calibrated years B.P. Two sites (Red Elk Rockshelter and North Lapwai Valley) are not represented.

To determine whether the prehistoric occupants of the region favored a generalist or specialist subsistence strategy, taxonomic richness and evenness metrics were used. Taxonomic richness was derived by summing the total number of exploited taxa found in each assemblage. Taxonomic evenness, or the extent to which taxa are equally represented in an assemblage, was calculated using the reciprocal of Simpson's Diversity Index (Schmitt and Lupo 1995; Jones 2004; Codding et al. 2010). A generalist subsistence strategy is one in which size categories and taxa are relatively equally represented in an assemblage, whereas a specialized economy is characterized by a disproportionate amount of taxa of one size or taxonomic group (Lyman 2013).

Identified taxa were placed into one of three size categories based on their live weight: small (≥ 0.7 kg), medium (5 to ≤ 25 kg), and large (> 25 kg) (Lyman 2013). Identified taxa were those identified at least to genus-level, though in the absence of any genus-level identification, a family-level identification was used. In sites containing taxa represented at both the genus- and family-level (e.g., *Sylvilagus nuttallii* and Leporidae), only the most specific identification was used to derive taxonomic richness. Other than one short-faced bear specimen (*Arctodus simus*), bison (*Bison bison*) were the largest mammal encountered at sites in the study area. The short-faced bear specimen exhibited evidence of butchering (Chance and Chance 1985) and was included in analyses. In contrast, two Pleistocene megafauna species were recovered at Wewukiyepuh (*Mammuthus spp.* and *Bison antiquus*), but they were from culturally sterile deposits and were not included in this analysis.

To evaluate the relative contribution of artiodactyl species (bighorn sheep, bison, deer, elk, and pronghorn) to smaller prey taxa, an artiodactyl index (AI) was calculated as:

$$\sum \text{artiodactyl NISP}/(\sum \text{artiodactyl NISP} + \sum \text{small mammal NISP} + \sum \text{medium mammal NISP})$$

where artiodactyl NISP is the NISP for each artiodactyl species and small and medium mammal NISP is the NISP values for each small mammal species (NISP values for each species appear on Table 1) (Lyman 2003; Byers et al. 2005; Codding et al. 2010). AI values were plotted against the calibrated age midpoint for each site (Fig. 3). AI values of 0 indicate an exclusive focus on small and/or medium prey, while AI values of 1.0 indicate an assemblage composed entirely of artiodactyl species (Byers et al. 2005).

Mann-Whitney rank-sum tests were used to determine differences in the occurrence of species within downriver and upriver assemblages (those below and above the confluence of the North Fork and mainstem Clearwater Rivers, respectively) during the late prehistoric period, the only period for which upriver assemblage data were available. Stata 9.0 (StataCorp. 2005) was used for all statistical calculations.

Results

Bison, deer, and elk were present throughout early, middle, and late prehistoric assemblages, while pronghorn were present in middle and late prehistoric assemblages only, and bighorn sheep were present in late prehistoric assemblages only. Of these, pronghorn and bighorn sheep were likely acquired locally (< 10 km) (Lyman 2007, 2009). In addition, bison skeletal elements with low general utility indices (Lyman 1994) were recovered at several sites and were likely present within the study area as well (Toups 1970; Chance and Chance 1985; Sappington et al. 1987).

Artiodactyl index values across all sites indicated a reliance on artiodactyls (Fig. 3). Relative to other species, elk dominated the early prehistoric assemblage, while deer dominated both middle and late prehistoric assemblages (Table 2). When compared to all non-artiodactyl species (all small and medium mammals, wolf, mountain lion, bear, and short-faced bear) across all sites, artiodactyls comprised approximately 90% of middle and late prehistoric assemblages, but only 34% of early prehistoric assemblages (Table 2) owing to the large bear NISP found at Wewukiyepuh. However, there was no significant difference in the percentage of artiodactyls between the early and middle prehistoric periods (Mann-Whitney rank-sum test, $p = 0.1913$), suggesting artiodactyl species were the focus of subsistence activities in all prehistoric periods.

TABLE 1. NUMBER OF IDENTIFIED SPECIMENS (NISP) FOR 26 ASSEMBLAGES FROM THE CLEARWATER AND LOWER SNAKE RIVER REGIONS IN IDAHO.

SiteName	Sylvilagus	Mustela	Lepus	Leporidae	Mephitis	Marmota	Vulpes	Mustelidae	Procyon_lotor	Erithozon_dorsatum	Lynx	Canis_sp	Castor_canadensis	Canis_lupus	Antilocapra_americana	Puma concolor	Odocoileus	Ovis_canadensis	Ursus	Cervus	Equus	Bison	Arctodus_simus	Total NISP	Richness	Evenness
Clearwater Fish Hatchery	-	-	-	1	-	-	-	-	-	-	-	-	2	-	-	-	130	-	10	4	8	-	-	155	6	1.41
Ahsahka	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35	4	-	2	-	10	-	51	4	1.97
Canoe Camp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	2	-	-	-	-	-	-	3	2	3
Pete King Creek	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	1	25	-	-	-	28	3	1.26
Kam'-nak-ka	1	-	-	1	4	-	-	1	-	-	-	15	1	-	-	-	111	5	7	13	-	-	-	159	8	1.99
Tuhkaytahs'peh	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	10	-	-	-	-	-	-	12	2	1.43
Kooskia Bridge	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	57	1	16	2	-	-	-	77	5	1.70
Waterline Trench	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	4	1	1
Lolonima'puh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	1	-
Piik'uh taxxsawxt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	4	1	1
Arrow Beach I	-	-	-	-	-	-	-	-	-	-	2	-	-	1	1	-	6	-	-	1	-	1	-	12	6	4.13
Arrow Beach II	2	-	1	-	-	-	-	-	-	-	1	16	2	1	3	-	140	8	1	39	-	21	-	235	12	2.54
Lenore I	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-
Lenore II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	1	-	-	-	-	3	2	3
Lenore III	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	16	-	1	1	-	2	-	22	6	1.91
Spalding I	3	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	1	1	8	6	9.33
Spalding II	5	-	-	-	-	-	4	-	2	-	-	4	4	-	12	-	39	13	-	8	-	-	-	91	9	4.35
Hatwai I	-	3	-	-	-	-	1	-	-	-	1	8	1	-	1	-	126	-	1	14	-	-	-	156	9	1.51
Hatwai II	7	6	1	1	-	1	6	-	-	-	-	14	1	-	-	2	597	3	1	23	-	-	-	663	12	1.23
Red Elk Rockshelter	1	-	6	6	-	-	-	-	-	-	-	2	-	-	-	-	21	11	1	-	-	-	-	48	6	3.81
North Lapwai Valley	-	-	-	1	-	-	-	-	-	-	-	1	-	-	4	-	4	-	-	-	-	-	-	10	4	3.75
Sweetwater II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	1	-
Sweetwater III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	3	-	-	-	5	2	2.5
Sweetwater IV	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	10	-	1	1	-	-	-	13	4	1.44
Wewukiyepuh	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	56	32	-	-	-	88	2	1.88
We'eptes Pa'axat	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	-	-	-	-	-	-	11	1	1

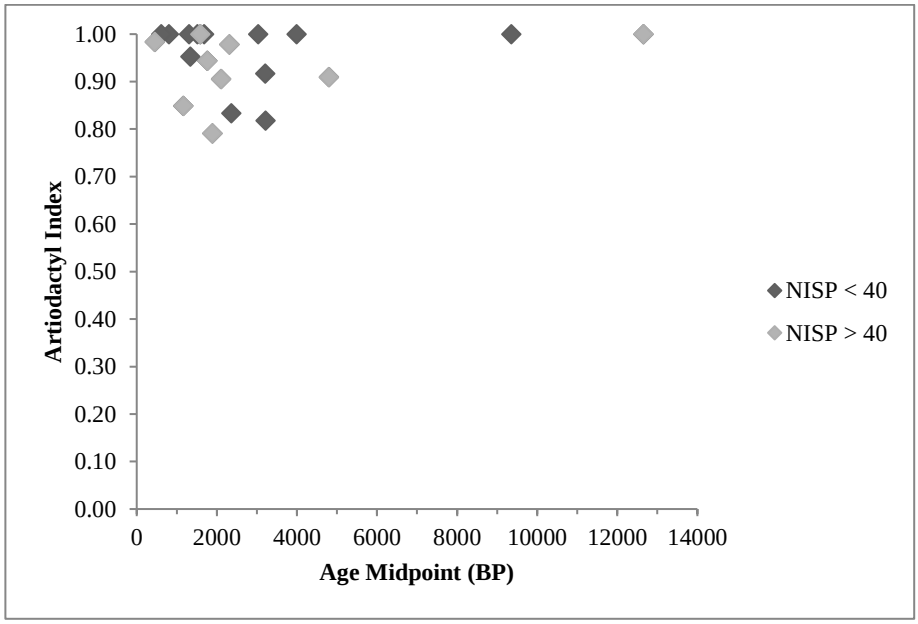

Fig. 3. Artiodactyl index values for 21 assemblages. Not included are the Lenore I, Spalding I, North Lapwai Valley, and Red Elk Rockshelter assemblages as they had no associated radiocarbon dates, and We'eptes Pa'axat as it is a multi-component site.

TABLE 2. ABSOLUTE AND RELATIVE (%) FREQUENCIES OF ARTIODACTYL SPECIES IN 26 PREHISTORIC FAUNAL ASSEMBLAGES.

Period	Bighorn Sheep	Bison	Deer	Elk	Pronghorn	Total NISP
500-3000	45	33	1183	118	21	1576
	(2.9%)	(2.1%)	(75.1%)	(7.5%)	(1.3%)	
3000-6000	-	1	136	18	2	176
	-	(0.6%)	(77.3%)	(10.2%)	(1.1%)	
6000-10000	-	1	1	32	-	98
	-	(1%)	(1%)	(32.7%)	-	

A variety of other mammal species were at least occasionally exploited as well (Table 1). Leporids within the study area were less well-represented than in assemblages in nearby Washington (Lyman 2013), comprising an average of 4.1% of early prehistoric assemblages, 0% of middle prehistoric assemblages, and 2.2% of late prehistoric assemblages.

Taxonomic richness, but not evenness, was strongly correlated with total sample size (Total NISP) across all 26 assemblages (Spearman's *rho* = 0.8283; $p < 0.001$ and Spearman's *rho* = 0.2592;

p = 0.2011, respectively). These results suggest that current sampling intensity limits our understanding of species diversity but not the degree to which specialization occurred within assemblages.

Across all assemblages, deer NISP was negatively correlated with taxonomic evenness (Spearman's *rho* = -0.8061; *p* = 0.0049), further indicating a specialized, deer-focused subsistence. NISP values for bighorn sheep (Spearman's *rho* = 0.3528; *p* = 0.0771), bison (Spearman's *rho* = 0.4115; *p* = 0.0367), and pronghorn (Spearman's *rho* = 0.5277; *p* = 0.0056) were positively correlated with taxonomic evenness, suggesting they represented diversifying components of an otherwise deer-specialized subsistence. Elk NISP was not correlated with taxonomic evenness (Spearman's *rho* = 0.2358; *p* = 0.2463), suggesting elk did not contribute to patterns of specialization in the region.

No difference in artiodactyl distribution between upriver and downriver assemblages was detected (Mann-Whitney rank-sum test, *p* = 0.4892). On a per-species basis, only the occurrence of pronghorn showed a statistically significant difference between up- and downriver sites (Mann-Whitney rank-sum test, *p* = 0.0341), with greater numbers documented at downriver sites. The percentage of small mammals also differed between up- and downriver sites (Mann-Whitney rank-sum test, *p* = 0.0346), with a significantly high percentage of small mammals comprising downriver sites.

Discussion and Conclusions

Bighorn sheep, bison, and pronghorn, all of which have been extirpated from the study area, have been found in archaeological contexts in the Clearwater and adjacent lower Snake River regions of Idaho. Data suggest that bighorn sheep were present within the study area during at least the last 3,000 years, pronghorn were present during the last 6,000 years, and bison were present during approximately the last 10,000 years (B.P.). However, absence of these (or any) species at a site may reflect local absence, poor preservation, or minimal sampling (Lyman 2007, 2009). The abundance of these three species relative to that of deer and elk suggests they were never the focus of specialized subsistence activities and may have been exploited more opportunistically than deer and elk.

Analyses of assemblages from the study area suggest deer were almost always the most important prey item, correlating negatively with evenness values, suggesting a specialized, deer-focused subsistence. The five assemblages with evenness values > 3.5 also have relatively few deer remains, suggesting that other taxa may have been the focus of subsistence efforts in some areas. It is possible that the more arid conditions present in the Columbia Basin between 8,500 and 5,500 B.P. (roughly between the early and middle prehistoric periods) corresponded to the increase in relative abundance of pronghorn remains and decrease in relative abundance of bison and elk remains during the middle prehistoric period (Lyman 2007). More early and middle prehistoric assemblages are needed to provide a more robust sample size to investigate this further. As data from both early and middle prehistoric periods are limited to four assemblages each, and because Total NISP was correlated with the number of taxa found, it is possible that more intensive sampling could reveal the use of bighorn sheep and pronghorn during the early prehistoric period in the study area.

Contrary to traditional models which suggest a generalized diet (Lyman 2013), Holocene assemblages from the Clearwater and adjacent lower Snake River regions of Idaho indicate artiodactyl specialization consistent with findings from other faunal assemblages in the Northern and Southern Columbia Basin (Lyman 2013). Plotting taxonomic richness against taxonomic evenness suggests a specialized subsistence even when the number of taxa (richness) is high (Fig. 4). The only exception is the Spalding I (early prehistoric) assemblage where site inhabitants appear

to have practiced a generalized subsistence and shifted to a more specialized subsistence during the late prehistoric period (represented by the Spalding II assemblage).

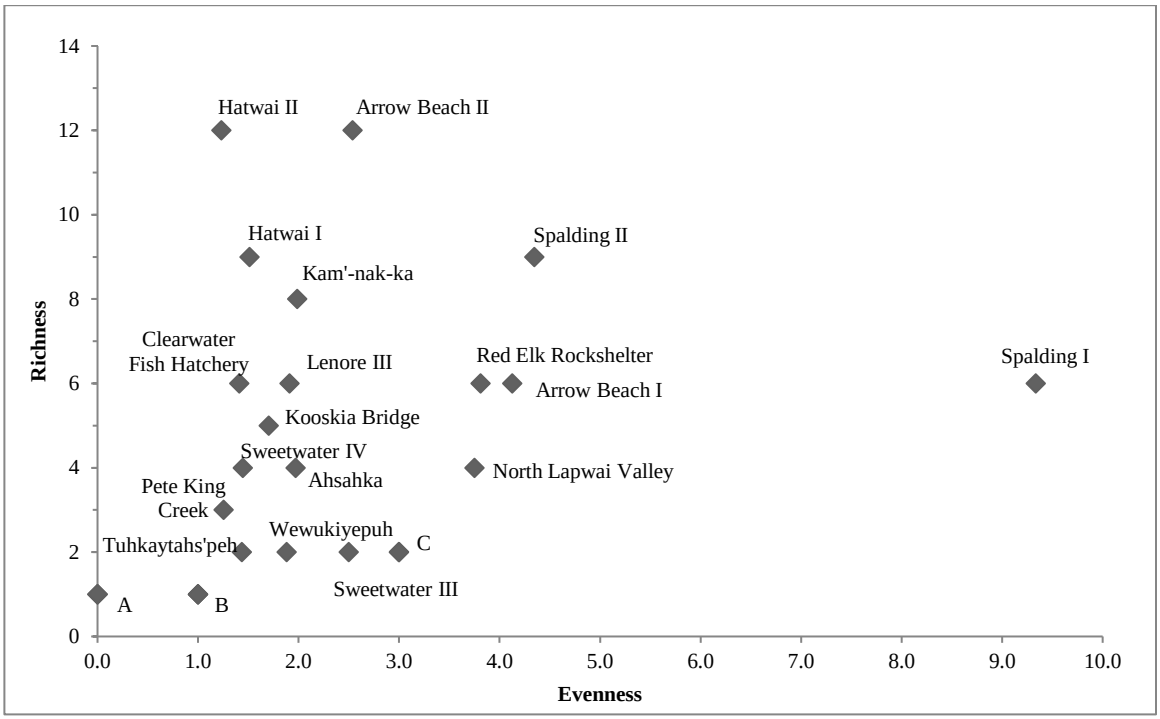

Fig. 4. Measures of taxonomic richness and evenness for all assemblages. A: Lenore I, Lolonima'puh, Sweetwater II; B: Piik'uhtaxxsawxt, We'eptes Pa'axat, Waterline Trench; C: Canoe Camp, Lenore II.

Temporal patterns of artiodactyl exploitation suggest artiodactyl-specialized subsistence from early to late prehistoric periods. The four early prehistoric assemblages indicate subsistence practices may have been more generalized than middle and late prehistoric assemblages, but very low sample sizes urge caution in the interpretation of these data. Artiodactyls were evenly distributed in up- and downriver assemblages during the late prehistoric period. Of the five species documented, only pronghorn displayed any variability in spatial distribution, with greater numbers documented at downriver sites. It is possible that differential preservation of faunal remains between downriver and upriver sites has biased these data, further urging caution in their interpretation. In addition, sampling intensity has been higher in downriver versus upriver areas.

Future investigations of Clearwater and lower Snake River faunal assemblages should prioritize more extensive and intensive faunal sample collection and identification as well as an evaluation of the impact of both site function and regional Holocene climate on artiodactyl abundance.

ACKNOWLEDGMENTS

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Jenifer Chadez received an M.A. in Anthropology in 2015 from the University of Idaho. She is currently working as a seasonal archaeological technician for the Bureau of Land Management. Her research interests include zooarchaeology and Columbia Plateau and Great Basin archaeology.

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THE 68TH ANNUAL NORTHWEST ANTHROPOLOGICAL CONFERENCE
26–28 March 2015

Co-Hosted by University of Oregon's Anthropology Department and the Museum of Natural and Cultural History

Eugene, Oregon

Symposia, Panel Discussion, Contributed Papers, and Posters[1]

Symposia

"...Any Road Will Get You There": ODOT/ WSDOT Transportation CRM Symposium

State transportation agencies are some of the largest funders of cultural resources management projects in the region. ODOT, WSDOT and their consultants present highlights of some of the archaeological investigations conducted over the past year, as well as insights on potential changes or trends in methods and regulations in the near future.

Organizers: Carolyn Holthoff and Scott Williams

*"...Any Road Will Take You There": Highlights of ODOT and WSDOT CRM from 2014***,** Carolyn Holthoff and Scott S. Williams.

Naughty or Nice? Inherent Bias in the Interpretation of Female Material Culture, as seen through the Oak Street Parking Lot Site (35JA860), Central Point, Oregon, Chelsea Rose.

The Bly Mountain Realignment: A View of Collaborative Cultural Resource Management in Klamath County, Oregon, Paul W. Baxter and Tobin Bottman.

14,000 Year BP Record of Fluvial Loess Accumulation in an Upland Bog Developed on a Missoula Flood Gravel Terrace below the Historic Union Train Station: Implications for Early-Holocene Upland Site Burial and Preservation in Portland, Oregon, Curt Peterson and Rick Minor.

An 8,000 Year Old Buried Surface & Associated Cultural Materials Near Puget Sound, Washington, Alexander E. Stevenson and Michele Punke.

Years Below the Prism: a Recent Discovery along Lake Sammamish, Washington, Paula Johnson, Chris Lockwood, and Tom Minichillo.

Interpreting the Exposed Pilings at the Siuslaw River (Florence) Bridge, Brian O'Neill.

[1] Abstracts of individual papers can be found at http://northwestanthropology.com/volumes.php

New Interpretations of Coast Salish Culture and Society

Recent archaeological and ethnographic studies of Coast Salish peoples indicate useful new directions for research and which show the utility of combining both fields in new ways and thinking through several temporal scales. Among these new approaches are a closer look at the role of violence and defense in the early contact period; the examination of food resources, including herring; the rise of new forms of leadership; and the role of mountains in Salish history and identity.

Organizers: Bruce G. Miller and Bill Angelbeck

A Local Practice Based Approach to Coast Salish Rock Paintings: The Xelas of the Tsleil - Waututhngs, Jesse Morin.

Upper Skagit Tribal History Reframed, Bruce G. Miller.

New Perspectives on Coast Salish Landscape Use and Ceremonialism: An Archaeological Investigation of Rock-Shelters, Morgan Ritchie and Ian Sellers.

Investigating Landscape, Sustainability and Social Change over 3500 years at the Montague Harbour Site, Galiano Island, BC, Colin Grier.

Reconstructing Modes of Production in the Coast Salish Past: Ever-Shifting Socioeconomies throughout Seasonal Rounds, Bill Angelbeck.

Cascade Pass: A Pre-Mazama Alpine Camp in the Northern Cascade Range of Washington State, Robert R. Mierendorf.

Howard A. Hanson Dam Archaeological District (DT 184) Revealed through Data Recovery Excavations at Late-Archaic Hunting Camp, King County, Washington, Jason B. Cooper.

Results of Microwear and Residue Analyses of Quartz Crystal Microblades in the Salish Sea, Rachael Kannegaard.

Measuring Maternal and Infant Health: A Four-Field Approach

Maternal and infant health serves as the foundation of well-being for every community in the world. Anthropologists and associated fields in the social sciences and public health recognize the importance of fostering an environment in which maternal and infant health can be optimal. However, it has been recognized particularly by social scientists, that the reality of optimizing maternal and infant health has been a challenge since before the Neolithic. Panelists will discuss the structural and historical implications of maternal and infant health within the context of their research, grapple with measuring maternal and infant health, and provide applications for future research.

Organizer: Holly Horan

Prenatal Stress, Culture, and Preterm Birth in San Juan, Puerto Rico, Holly Horan.

The Curation of the Umm el-Jimal Osteological Research Collection: Maternal and Infant Health in a Transitioning Society, Dawn M. Alapisco.

Women and Epidemics: The Gendered Inequity of Ebola, Sudy Storm.

Nation as Clinic: Brazil's National Children Department and the Politics of Maternal and Infant Health (20th Century perspectives), Cari Maes.

Beyond Life and Death: Negotiating Definitions of Safety in Birth, Leah Houtman.

Oregon's Military Heritage: Archaeological Research of the Past Two Hundred Years of Military History in the Region

A military presence in Oregon has been strong since the initial arrival of Euro-Americans to the Northwest. How such a presence manifested itself on the landscape and the degree of evidence remaining from past military activities is still being discovered. Archaeological excavations have occurred at several historic forts over the past 30 years while recent investigations have attempted to locate and subsequently interpret a historic battlefield. This symposium brings together scholars from a number of universities, federal and state agencies, and private contractors to summarize the wealth and breadth of military research efforts, to date, and to examine how future research and Section 106 compliance efforts can work toward interpreting the role and importance of military sites and their future management.

Organizer: Dennis Griffin

The Military History of Oregon – Rich, Diverse and Little Known, Dennis Griffin.

Pacific Coast Forts of the 1850s: Archival Maps as Archaeological Survey Data, R. Scott Byram.

U.S. Army Fort Umpqua – Past Work and Future Research, Kevin Bruce and Justin Eichelberger.

The Meat of the Issue: Mid-19th Century Military Faunal Remains as a Measure of Class Structure at Fort Vancouver, Headquarters of the Columbia Department (Pacific Northwest), Elizabeth Horton.

The Archaeology of the Hungry Hill Battlefield, Mark Tveskov.

The Fort Klamath Archaeological Project: Preliminary Findings, Kyle Crebbin and Mark Tveskov.

The Archaeology of Class, Status & Authority Within Mid-19th Century U.S. Army Commissioned Officers: Examples From Fort Yamhill & Fort Hoskins, Oregon 1856–1866, Justin Eichelberger.

The House that Sheridan Built: Musings of a Skeptical Archaeologist, David Brauner.
Cultural Landscape of Camp Adair: A World War II U.S. Army Cantonment in the Willamette Valley, Oregon, Rick Minor and Kathryn Toepel.

Fire!

Fire has long been a major modifier of the Pacific Northwest ecosystem. In the last decade alone, the Northwest has experienced the 50,000-acre Biscuit Fire of 2002, the B&B and Deer Creek Fires in 2004 and 2005, the 2006 Tripod Complex Fire, the 2013 Colockum Tarps Fire, and most recently, the massive Carlton Complex, Douglas Complex, and the Beaver Creek Fires. The radically altered post-wildfire landscape creates research challenges and opportunities and requires the development of responsive and flexible management strategies. Looking backward, our forests, shrub-steppe, and grasslands are fire-adapted; research indicates that significant portions of fire-modified northwest landscapes may be the result of deliberate management by early inhabitants. Looking forward, the threat of wildfire and repairing fire damage creates management challenges, solutions must be at least partially informed by the results of archaeological research. Fire-induced changes affect the archaeological record, which in turn affects research design, survey strategies, and data interpretation. The interdisciplinary Fire Symposium considers fire both as phenomenon and artifact, and will include discussions of the effects of wildfire in grasslands, shrub-steppe, and forested environments, reading the forested landscape, reconstructing fire histories, fire and the anthropogenic landscape, and using fire to evaluate field methodologies, among other topics.

Organizer: Katherine M. Kelly

Identifying Fire Managed Landscapes in the Pacific Northwest – a Multidisciplinary Approach to a Burning Question, Kelly M. Derr.

Reading Forest Stand History to Inform Artifact Context, Fire and Disturbance in the East Cascades, Jamie Bass.

Late Holocene Human-Fire Relationships at Sunrise Ridge, Mt. Rainier National Park, Washington, Megan K. Walsh, Patrick T. McCutcheon, and Michael Lukens.

Report from the Hot Tin Roof - Post-Fire Fieldwork on the Methow, Katherine M. Kelly.

Fire's Influence on Canoes within the Plateau Culture Area, Shari M. Silverman.

Seeds: Rare, Medium, or Well Done? Melanie Diedrich and Kayla Snyder.

The Archaeology of Wildland Firefighting, Lucas Hugie.

"Let Me Stand Next to Your Fire" (After it Cools Down), Maurice Major.

Rising Tides: Global Perspectives on Island Archaeology

The archaeological study of islands worldwide provides ample case studies to investigate how peoples with "limited" resources modified their environments to suit their needs. Islands provide a natural boundary within which to study issues of human caused environmental alterations, sustainability, risk management strategies, and cultural transmission. In addition, erosion along coasts caused by rising sea levels and human assisted modification threatens to destroy much of the archaeological record of coastal peoples. This session highlights research on islands around the

world to increase awareness of the issues peoples faced with living on islands both in the past and present.

Organizer: Aaron S. Poteate

Tear it Loose: The Creation of Anthropogenic Environments on Smaller Islands, Aaron S Poteate.

Artifact Networks and Cultural Transmission in East Polynesia, John T. O'Connor and Frances J. White.

Visibility Analysis of Defensive Settlements on Rapa, Brian Lane and Robert DiNapoli.

Risk and Uncertainty in Polynesian Dryland Agriculture, Robert J. DiNapoli and Alex Morrison.

Archaeological Perspectives on Micronesian Colonization and Cultural Change, William S. Ayres.

Roasting Breadfruit in Micronesia: A Combined Macroremain and Phytolith Analysis, Maureece Levin.

Deforestation, Drought, and Humans: The Collapse Theory Is Dead— New Evidence of Adaptability and Survival on Rapa Nui, Candace Gossen.

Landnám Tephra and the Settlement of Iceland: Preliminary Results, Magdalena M. E. Schmid.

Learning from the Past—Legacy Collections

There are no doubt hundreds if not thousands of collections in curation facilities that are worthy of a second or third look. New research frameworks and technological advances make looking at these old or legacy collections worthwhile. You have to know the past to understand the present. (Carl Sagan)

Organizer: Mary Anne Davis

A New Look at Soft Technology from the Biderbost Site, Kathryn Bernick.

Basket Weavers and Collectors; Research on the Mrs. Isaac Lee Patterson Collection at the UO Museum of Natural and Cultural History, Elizabeth Kallenbach.

Laughter Lifted From the Loom—Cultural reciprocity in the Raven's Tail weaving community of Damascus, Oregon, Mathilde Lind.

Meeting with an Old Friend: Dry Sailing to Rock Art Sites in Southern Idaho, Mary Anne Davis.

Initial Analysis of Materials from the 1979–1980 Excavations at the Pines Site on Manastash Ridge in Central Washington, Christopher Moose.

100 Years Revisited: Diamond Jenness' 1914 Barter Island Excavations and the Progress of Systematic Archaeology in Alaska, Joshua D. Reuther, Jason S. Rogers, Chris Wooley, Owen Mason, Jill Baxter-McIntosh, and Robert Bowman.

Western Washington Legacy Collections –Topics to Ponder, Lorelea Hudson.

Place, Inequality, and Moral Economies

Foucault's influential concept of governmentality emphasizes the way in which subjects are formed, classified and disciplined in terms of dominant gazes and technologies of power/knowledge. These papers consider ways in which these disciplinary forces and optics are challenged, interrogated, and re-channeled by subaltern persons and communities. We give special attention to practices of gifting, sharing, mutual support and peace-building though which actors produce 'moral economies' and hidden transcripts within larger capitalist or neo-liberal settings.

Organizers: Bryce Peake and Kathleen Piovesan

Managing Risk on the Street: Forging Alliances and Building Trust, Hillary Matson.

Peace, Love, Unity, and Respect: The Moral Economy of Rave Culture, Brittany Anderson.

Beyond the Eyes of the Dominant: Reciprocity and Peace-building on the Street, Saeed Mohamed.

The Body as a Battlefield of Resistance: Cracking the Skulls of the "System" in a Polynesian Performance, Patrick E. Molohon.

Discussant: Optical Regimes, Moral Economies & Somatic Power, Bryce Peake.

State Violence and Multicultural Displacement in Portland, Oregon, Gennie Nguyen.

Masculinities & Gendered Living among One-and-a-Half Generation Immigrant Deportees in Nogales, Sonora, Mexico, Tobin Hansen.

Health, Equality, and the Political Meaning of "Vulnerability" in Vancouver's Healthy City Strategy, Kathleen Piovesan.

Discussant: Place, Inequality, and Moral Economies, Hope Amason.

Toolstone Geography of the Pacific Northwest

The Pacific Northwest contains substantial and diverse lithic resources technologically important to native peoples of the region for making stone tools. Obsidian, chert, basalt, jade, and other toolstones occur in high concentrations in certain geological contexts. Since time immemorial, native peoples have had an intimate knowledge of these toolstone resources. Archaeologists are just beginning to learn about them and how to apply that knowledge to understanding the archaeological record. This symposium consists of papers from contributing authors to a forthcoming edited volume on Pacific Northwest toolstone sources. The papers explore the

cultural geography of lithic resources including studies of toolstone quarries, lithic procurement strategies, reduction technologies, and their social contexts.

Organizers: Terry Ozbon and Ron L. Adams

Major Toolstone Geography of the Pacific Northwest, Terry Ozbun.

Toolstone Geography in the Upper Skagit River Valley and Adjacent Areas, Robert R. Mierendorf and Kevin E. Baldwin.

Elk Pass Obsidian and Precontact Band Territory in the Southern Washington Cascades, Rick McClure.

Columbia Hills Toolstone Quarrying, Ron L. Adams.

Estimating Biface Production at a Basaltic Andesite Workshop in the Blue Mountains: Twenty Years of Hindsight, Kenneth Reid, Matthew J. Root, and Daryl E. Ferguson.

New Perspectives on the Stockhoff Quarry: Toolstone Procurement at a Quarry Complex in the Blue Mountains of Northeastern Oregon, Nicholas Smits.

Tracking the Trade in Central Oregon Obsidians through the Pacific Northwest, Thomas J. Connolly, Craig E. Skinner, and Paul W. Baxter.

Glass Buttes, Oregon: 14,000 Years of Continuous Use, Daniel Stueber and Craig Skinner.

Obsidian Use in the Willamette Valley and Adjacent Western Cascades of Oregon, Paul W. Baxter, Thomas J. Connolly, and Craig Skinner.

Upper Klamath River Obsidian Frequencies, Joanne M. Mack.

Community-Based Environmental Anthropology

Environmental anthropology is a growing component of the discipline that cuts across the traditional subfields of anthropology and includes a significant applied component. This session brings together scholars and students working on community-based environmental anthropology research projects in the Pacific Northwest and beyond. Community-based research prioritizes the needs, collaboration, and research questions of our communities of study while contributing to decolonization efforts that seek more balanced power relations between scholars and communities of study. Collectively these papers illustrate the integral connection between people, place, and culture, while illustrating the value of community in the research process.

Organizer: Thomas W. Murphy

Ecology of Whiteness: Mormons, Indians, and Boy Scouts, Thomas W. Murphy.

Why Environmental Professionals Need Project Management Training: a Study of Mitigation in Washington State, Alexa C. Ramos.

Understanding Community Through the Soles of Their Shoes, Ashley Pickard.

Two Sisters Return: A Community-based Assessment of Wildlife Activity on Traditional Snoqualmie Land, Laurie Ross.

Mapping Sustainability: An Interdisciplinary Undergraduate Research Project, Alicia Kelly.

Successes and Setbacks: Current Methodological and Theoretical Approaches to Historical Archaeology in the Northwest

Researchers studying historical archaeological sites in the Pacific Northwest have employed a broad range of approaches ranging from evaluating site structure, analysis of site formation processes, to the taphonomy of individual artifacts. In addition, current research on a range of historical sites has helped to diversify the narratives of the individuals working and living in early western communities.This symposium will explore recent trends in methodological and theoretical approaches to historical archaeology in the Northwest and explore the successes and failures of these studies.

Organizers: Christopher Ruiz and Chelsea Rose

The Dalles Chinatown: An Unexpected Discovery, Maryanne Maddoux.

Pre-1900s Chinese Mining in Northeastern Washington State, Lindsey Porter.

Women, Children and Agency in the Early Oregon Country, Mollie Manion.

Getting Burned: Fire, Politics, and Cultural Landscapes in the American West, Chelsea Rose.

Preliminary Results from Archaeological Investigations at the Charles and Melinda Applegate House, Yoncalla, Christopher L. Ruiz, Patrick O'Grady, and Liz Carter.

The Decomposition of Historical Glasses, Elizabeth Harman, Sidney Hunter, and Ray von Wandruszka

Redefining Community Archaeology: Shared Experiences and a Collaborative Approach to the Site Stabilization Efforts Following the Oso Mudslide

AECOM assembled a diverse team of spotters and archaeologists to assist Snohomish County with the site stabilization efforts following the massive mudslide in March 2014. This three month project focused on the recovery of human remains and personal items from the 300,000 cubic yards of search and rescue piles that were created during search and recovery immediately following the slide. The community was intimately involved in every aspect of the project and their feedback and involvement shaped the most crucial milestones of the project: the recovery of a more than 1,000 personal items and the recovery of the final victim. This symposium focuses on how the community was integrated into the project and how the success of the project was directly influenced by community involvement, team diversity, and the integration of archaeological methods into the monitoring, recovery, and reunification process.

Organizer: Stacy Bumback

The Complexities of Designing and Implementing the Archaeological Monitoring and Recovery Efforts for Oso Mudslide/SR530 Site Stabilization Project, Stacy Bumback.

A Unified Team: Integrating Local Spotters and Archaeologists, James H. Mayer and Vonne VanLaningham.

Challenges of Locating a Tribal Cemetery Outside the Oso Slide Area /SR530 Site Stabilization Project, Kerry Lyste.

What We Found: Personal Item Collection At The Oso Mudslide, Sarah Meyer.

Reconstructing the Past: Paleoecology of the Pacific Northwest

Paleoecological studies are an integral aspect of archaeological analysis because they enhance understanding of environmental conditions experienced by cultural groups in the past. Paleoecological records can provide information on a multitude of physical and temporal scales, contributing both high resolution details and data on long term environmental change to interpretation of archaeological contexts. This symposium brings together multidisciplinary fields employing varied and unique research methods in paleoecology in an effort to contextualize Pacific Northwest archaeology. Topics include ongoing research on palynology, isotopic analysis, paleoentomology, geomorphology, archaeobotany, zooarchaeology, sea level change, fire history, and other subjects used in paleoclimate reconstructions.

Organizers: Jaime Dexter-Kennedy and Chantel Saban

Paisley & Connley Caves: Examining Cultural Activity Through a Paleoenvironmental Approach, Chantel V. Saban

The Fish (Pisces) Remains of Paisley 5 Mile Point Caves, R. Patrick Cromwell and Kyle Suzenski.

Sleep Tight: Were the Occupants of Paisley Caves Plagued by Bedbugs? Martin E. Adams.

Macrobotanical Analysis of Hearth Featues at LSP-1 Rockshelter, Lake County, Oregon, Jaime Dexter Kennedy.

Autumn in the Valley: Paleo-ecological Findings at an 800 Year Old Ceramic Bearing Site in Southeastern Oregon, Scott Thomas, Patrick O'Grady, Margaret Helzer, Carolyn Temple, and Chuck Morlan.

Preliminary Analysis of Faunal Remains from Summit Island (49-XHI-43 and 49-XHI-44), Bristol Bay, Alaska, Molly Casperson.

Reconstructing the Fire History of Hecate Island on British Columbia's Central Coast, Kira Hoffman.

Toward a Better Understanding of Holocene Fire-Climate-Human Interactions in the Pacific Northwest: The Usefulness of Macroscopic Charcoal & Pollen Analysis of Lake Sediments, Megan Walsh.

Using Pollen to Reconstruct Environments of the Past: Lessons from the Interior Mesic Forests of Northern Idaho, Erin M. Herring and Daniel G. Gavin.

Rock Art and Rock Features Research in the Northwest

An emphasis on rock features and rock imagery within a landscape context offers a range of research potentials. This symposium will present and extend research with attention to recent collaborative efforts about traditional land and resource uses. Presentations indicate locational to landscape relationships. This includes rock imagery on boulders, basalt panels and escarpments, and stacked rocks, cairns, walls, blinds, circles and rings. This research demonstrates the need to enhance understanding of changing environments and climates over the millennia—and into the future. Preserving and protecting rock features and rock imagery in cultural contexts and archaeological landscapes is emphasized.

Organizer: Douglas Beauchamp

Petroglyph boulders on the Rogue River at Two Mile Creek: Intentions and Actions, 1974–2015, Douglas Beauchamp.

The Landscape of Klamath Basin Rock Art, Robert J. David.

Isn't that Just Another Rock? An Overview of Rock Features Classified or Known as Singularly Placed, Pedestaled, Window, and Boulder Feature Types, Stephen T. Jankowski and Perry Chocktoot.

Heiltsuk & Wuikinuxv Rock Art: Reminders on the Landscape, Aurora Skala.

Upper Klamath Rock Features: "Rain Rocks." Joanne M. Mack.

Overview of Stacked Rock Features at Cottonwood Canyon State Park: Examining and Expanding Criteria, Nancy Nelson.

Using Image Stitching Software to Display Complex Glyptic Images Located at Pine Bar, Hells Canyon NSA, ID: A Field Experiment, William Schroeder.

Sacred Site or Curiosity…? Esther Stutzman.

Cascadia Cave Rockshelter, David G. Lewis.

5th Annual Maritime Heritage Symposium—Protection, Preservation, and Public Archaeology

This year's maritime symposium focuses on the protection and preservation of maritime heritage in the Pacific Northwest. In particular, topics will cover maritime heritage areas, maritime salvage law, underwater archaeology guidelines, and protection of cultural resources through public

outreach. Presentations highlight volunteer maritime heritage oriented projects in the Pacific Northwest, their methods, and the strides these organizations are currently making towards documenting and preserving the coastal, submerged, and extant maritime history of the region.

This symposium also shares a range of current research regarding pre-contact and historic cultural resources found in coastal and submerged settings throughout the Pacific Northwest. In the course of the presentations we will explore: coastal and marine geomorphology, hidden shell middens, surveys of Washington's maritime heritage and submerged resources, the salvage of submerged cultural resources for profit, and the formation of non-profit maritime archaeology societies.

Organizer: Jacqueline Marcotte

Recent Research on Marine Geomorphology and Coastal Landforms in the Alaskan Arctic, Jason Rogers.

Hidden Middens: Identifying and Assessing Submerged Subsurface Shell Midden Deposits in Garrison Bay, San Juan Island National Historical Park, Northwest Washington, Elizabeth A. Horton

Preventative Nautical Archaeology: Protecting and Recording our Historic Ships Before they Become Shipwrecks, Nathaniel Howe.

A Maritime Resource Survey for Washington's Saltwater Shores, Spencer Howard, Susan Johnson, and Katie Chase.

An Admiralty Anchor from Admiralty Bay, Washington: Is it the HMS Chatham's Lost Anchor? Scott S. Williams.

A Survey of State Underwater Archaeology Programs and Underwater Guidelines, Jeanette Hayman.

A Brief Survey of Washington's Submerged Cultural Resources, Jacqueline Marcotte.

Diving Into the Community: The Maritime Archaeological Society, Christopher Dewey.

A Cultural Landscape Approach to Submerged Cultural Resource Management: Cultural Heritage Ecotourism Opportunities for the Shipwrecks of Lake Union, Seattle, Washington, Zachary L. Meyer.

Technical Diving of Submerged Artifacts, Paul Hangarter.

Discussion.

Current Perspectives on the Historical Ecology of the Northwest Coast

Studies exploring the relationship between humans and the ecosystems they inhabit are growing in number in sophistication. This symposium features recent studies in the northwest coast addressing human-environmental interactions, resource use, and resource rights through diverse perspectives incorporating ethnographic, zooarchaeological, ethnobotanical, and

ethnoarchaeological research. Our intent is to present a wide range of views that address the complex and dynamic interplay between humans and plant and animal systems from sites spanning from southeastern Alaska to the northwestern California Coast.

Organizer: Colin Christiansen

Land Otter–Human Interaction and Avoidance at Kit'n'Kaboodle (49-DIX-46), Dall Island, Alaska, Madonna Moss.

The Ethnoarchaeology of Mass Harvested Smelt in the Southern Pacific Northwest Coast, Shannon Tushingham.

From Labrets to Cranial Modification: Credibility Enhancing Displays and the Changing Expression of Coast Salish Resource Commitments, Adam N. Rorabaugh and Kate Shantry.

Fish Dominance, Fish Diversity, Fish Stability at the Parry Lagoon Midden, DgRv-006, Galiano Island, B.C. Justin Hopt.

Native American Fisheries of the Northern California & Southwestern Oregon Coast: A Synthesis of Fish Bone Data & Implications for Late Holocene Storage & Socio-Economic Organization, Colin Christiansen.

Wiyot Archaeology & the Historical Ecology of Humboldt Bay: A View from Manila (CA-HUM-321), Shannon Tushingham, Janet P. Eidsness, Justin Hopt, Colin Christainsen, Angela Arpaia & Julilani Chang.

Climate Change and the Future of California Archaeology, Michael Newland.

Assessing the Timing of the Introduction of Bow and Arrow Technologies in the Salish Sea and Its Implications for the Coast Salish, Tiffany J. Fulkerson and Adam N. Rorabaugh.

Historical Ecologies of swətíxʷtəd in the Duwamish-Green-White River Watershed, Joyce LeCompte.

Under the Bridge: Archaeology on the Tideflats of Seattle's Smith Cove

Nestled in the tide flats of Smith Cove was one of Seattle's small shantytowns, occupied between 1911 and 1941. In 2014, construction monitoring uncovered the remnants of this community, and with it, materials representing an itinerant, low-income, multi-cultural population. The following papers describe the site's landmaking, history, faunal assemblage, and story. The artifacts recovered at 45-KI-1200 indicate the presence of Native Americans, Japanese, Chinese, and Euro-Americans, and demonstrate how Smith Cove functioned as a multi-cultural nexus of traditional practices within a modern industrialized urban landscape during the first half of the twentieth century.
Organizer: Alicia Valentino

Overview and Setting of the South Magnolia Combined Sewer Overflow (CSO) Control Project, Chris Lockwood.

Life on the Sandspit: A Brief History of Smith Cove's Tideflats Community, Katherine F. Wilson.

Eating Around the Margins: Evidence of Culturally Distinctive Butchering Patterns in a 20th-Century Seattle Shantytown, Tom Ostrander.

A Chinese Coin and Flaked Glass: The Unrecorded History of Smith Cove, Alicia Valentino.

Panel Discussion

An Open Discussion Panel of Cultural Resource Topics for Students and Entering Professionals (sponsored by the Association for Washington Archaeology)

AWA Student Directors, Moderators: Emily Tabor and Lisa Catto

Are you interested in research and career opportunities in archaeology? Come to a panel discussion with representatives from state and tribal historic preservation offices, federal and state agencies, cultural resource management firms, and academia. Questions may be submitted online prior to the panel (http://bit.ly/1vk4bEf) or asked during the session. Examples of topics include advancing career work, interactions between panel groups, and what it takes to find work. Food/beverages provided.

Panelists: Mary Rossi (Applied Preservation Technologies); Dennis Lewarch (Suquamish Tribe THPO); Michelle Hannum (Plateau Archaeological Investigations); Stephanie Neil (Squaxin Island Tribe THPO; US Forest Service); Todd Koetje (Western Washington University); Robert Kopperl (SWCA); Stephenie Kramer (Washington SHPO).

Contributed Papers

Zooarchaeology, Subsistence, and Diet

Chair: Patrick O'Grady

Plateau Mass Fish Procurement: Who Did What? Kristina M. Hill and Janie R. Knutson.

Estimating Sturgeon Abundance in Archaeological Contexts: Controlling for Identifiability and Fragmentation, J. Shoshana Rosenberg and Virginia L. Butler.

Stranded on Sauvie Island: Making Use of Natural Fish Traps, Sarah Jenkins, Eva Hulse, and John Fagan.

New Evidence of Prehistoric Fishing in the Clearwater River Region, North Central Idaho, Robert L. Sappington.

The Emergence of the Commercial Dive Fishery for Sea Cucumbers and Its Impact on Individuals, Communities and the Ecology, Daniel Monteith.

Does Size Matter? Examining Changes in Shell Size and the Factors that Prompt Them at Cherry Point Archaeological Site in Washington State, Emily Taber and Katrina S. Chatburn.

The Holocene Occurrence of Mammals in the Clearwater and Lower Snake River Regions of Idaho, Jenifer Chadez.

From Household to Empire: the Zooarchaeology of Diouboye, Senegal, Auschere Caufield.

Archaeology of the Far West

Chair: Albert C. Oetting

35LA1245: A Long Term Camp Locale on the McKenzie River, Lane County, Oregon, Albert C. Oetting.

Archaeology of Susan Creek Campground, Robert R. Musil.

Lost in the Shuffle: A Look at Some Sites in the Douglas Fir Region, Ann Bennett-Rogers.

Homesteading in the Oregon Coast Range: Archaeological Investigations in the Indians Creek Watershed, Siuslaw National Forest, Lindsey Stallard.

Romancing the Debitage: The Lithic Debitage and Projectile Points at Bernard Creek Rockshelter, Idaho, Shaun Dinubilo.

A Changing Valley, a Changing People: The Prehistoric Occupation of Northern Warner Valley, Oregon, Donald Pattee.

Obsidian Procurement Patterns: XRF and Obsidian Hydration Results from Four of the Shoshone Complex Sites in Southeastern Oregon, Scott Thomas.

Archaeological Investigations at the Qiqéyt Village Site (DhRr-74) in Surrey, British Columbia, Sarah K. Smith.

Exploring Archaeological Methods and Applications

Chair: Chantel Saban

Investigating Historic Hydraulic Gold Mining Complex: An Evaluation of GIS/LIDAR Remote Sensing Methods, Grant County, Oregon, Wilbur Barrick and Don Hann.

Testing the Association of Chipped Stone Crescents with Wetlands and Paleo-Shorelines of Western North America: A GIS-based Spatial Analysis, Gabriel Sanchez.

Geoarchaeological Prospection for Buried Early Sites in the Lower Salmon River Canyon, Idaho, J.D. Lancaster and Loren G. Davis.

Calcined Bone as a Reliable Medium for Radiocarbon Dating in the Pacific Northwest, James C. Chatters, James Brown, Steven Hackenberger, and Patrick McCutcheon.

Untangling Depositional Palimpsests at Weasel Cave, North Ossetia, Russia, Todd Koetje.

Archie Field Data Recording: Increasing Site Recording Accuracy & Efficiency, Alex Nyers, Karl Vollmer, and Chantel Saban.

The Zooarchaeology of Bonneville Estates Rockshelter: 13,000 Years of Great Basin Hunting Strategies, Bryan Hockett.

Radiocarbon Dating the Fur Trade: A Bayesian Analysis of radiocarbon dates from the Meier Site, Lower Columbia River, Thomas J. Brown and Kenneth M. Ames.

Field Staples: A Look at the Subsistence Patterns of Archaeological Workers, Breanne Taylor and Josh Moss.

The Zooarchaeology of Bonneville Estates Rockshelter: 13,000 Years of Great Basin Hunting Strategies, Bryan Hockett.

Interpretation of Historical Sites, Artifacts, and Features

Chair: Jonah S. Blustain

Hot Stuff: The Archaeology of Oregon's Uranium Mining Industry, Jonah S. Blustain.

Building a History: The Inventory and Evaluation of CWU's Built Environment, Lauren Walton.

An Exploration of the Vernacular Architecture at the Robert Newell Farmstead (35MA41), Emily Modelski.

Reedsville Farm Data Recovery Project- Preliminary Results, Mini Sharma-Ogle, Karry Blake, and Ross Smith.

Fort Colvile, Washington—Now You See It, Now You Don't, William White.

Fun and Games: Evidence of Play at Fort Boise, Mairee K. MacInnes and Amanda C. Bielmann.

Power Belts, the Spermatic Economy, and Masculine Panic at the Turn of the Century, Dan Martin.

Message in the Bottles: Analysis and Interpretation of Site 45WH1001, Woodstock Farm Bottle Dump, Whatcom County, Washington, Ian R. Lewis.

Fillings, False Teeth and a Fluoride Tray: Dental Artifacts at the Kooskia Internment Camp. Kaitlyn Hosken and Kristen Tiede.

Lines in the Sand: Integrity, Identity, and NRHP eligibility criteria for historic-era linear landscape features at the project and praxis scales in Washington, William Schroeder and Christopher Landreau.

The Whole is Greater than the Sum of its Parts, or so it would seem: Case Studies Evaluating Irrigation Structures in Central Washington, William Schroeder and Christopher Landreau.

Public Archaeology and Heritage Management

Chair: Richard M. Pettigrew

By the People, for the People: Designing Archaeology Outreach Programs with Local Governments, Julia Rowland.

The Making Archaeology Public Project: Its Significance and Practical Applications, Richard M. Pettigrew.

Creative Mitigation and Community Outreach: A Smart (phone) Application, Brent Hicks.

Striving for Balance: Issues of Cultural Affiliation and Culturally Unidentifiable Remains in NAGPRA and the New Rule, Brittney A. Eubank.

Rest in Peace: The Implementation of the Native American Graves Protection and Repatriation Act at Southern Oregon University, Patricia Halleran-Cislo.

Seeing the Forest for its History: Interpreting Heritage Trees as Cultural Resources in Portland, Oregon, David-Paul B. Hedberg.

Addressing Burning Problems using Creative Solutions: Long Draw Fire Rehabilitation Project. Mini Sharma-Ogle, Tara Gauthier, Don Rotell, and Sally Bird.

What Went Right? Two Nez Perce CRM Projects, Patrick Baird and Alan G. Marshall.

A Career in Cultural Anthropology: Opportunities & Suggestions for Ethnographic Work with Native American Tribes in the Northwest, Donald Shannon.

Liglig, A Historically Important Site in Central Nepal: A Call for Archaeologists, Harvey Blustain and Malinda Stafford Blustain.

Using GIS to Assess Israeli-Palestinian Border Proposals, Christen Phaneuf.

Anthropology of Contemporary Society

Chair: Taylor Phillips

American Rape Culture: A Need for Education, Taylor Phillips.

Single Mothers and Welfare: A Theoretical Perspective, Amara Fiegel.

Exploration of Zef Culture, Racial Politics and Shifting Opportunities in Post-Apartheid South Africa, Casey Polmueller.

Schoolteachers and Popular Resistance in Honduras: Interrupting Neoliberal Education Policies from Within the State, Jordan Levy.

Heritage Tourism on a Personal Level, Jenny Dellert.

Enoethnography: A Cultural Study of Grape Growers and Wine Makers in Southern Oregon, Maureen Battistella and Mary Jane Cedar Face.

The Perfect Match: How Online Dating has affected courtship rituals in the Willamette Valley of Oregon, Joshua Lasky.

Current Issues in Physical Anthropology

Female-Female Bridging Behavior in Tibetan Macauqes (Macaca thibetana) at Mt. Huangshan, China. Grant J. Clifton, Lori K. Sheeran, R. Steven Wagner, and Lynch Jin Hua Li.

Traditional Medicine and Baby Clinics; Health care and politics on the Flathead Reservation 1900 to 1940, Christina Heiner.

A Unity of Meaning: Reconciling Medical and Anthropological Periosteal Terminology, M. Travis Shelley.

Eastern Oregon University Model of Chemical Profiles Released during Human Decomposition, Sarah Trotter.

Reading the Bones: Osteological Analysis of Human Remains from Barbados, Eastern Caribbean, Tiffany Hansen, Sarah M. H. Steinkraus, Lourdes Henebry-DeLeon, and Steven Hackenberger.

The Archaeological Evidence for Crucifixion, Christen Phaneuf.

Technological Studies

Leatherworking in Precolonial West Africa: Exploring recent archaeological evidence from Kirikongo, Burkina Faso and Diouboye, Senegal, Stephen Dueppen.

Ceramic Production in Korean State Formation, Rory Walsh.

Cooking Features, FCR, and Land-use Intensification in the Portland Basin, Paul S. Solimano.

Sticks With Stones: An Experimental Test of the Effect of the Atlatl Weight on Atlatl Mechanics, David I. Cain and Elizabeth Sobel.

The Search for Clovis Blade Technology in the Northern Great Basin, Michael F. Rondeau.

Navigating Identity, Attitudes, and History

Chair: Briece Edwards

A Critical Review of Reverse Ecopoiesis in the Anthropocene, Julie Raymond.

Indigenous Knowledge: Conveying Content through a Virtual World Format, Rodney Frey.

Understanding Gender Identity and the Two Spirits, Clarissa Cress.

Visualizing History on the Grand Ronde Reservation, Ian Kretzler and Briece Edwards.

Culture and Attitudes Towards Science in Idaho, Laura Putsche, Leontina Hormel, John Mihelich, and Debbie Storrs.

Cilantro, Anise, Cumin: Yum or Yuk? Sarah C. Keller.

Use of Hair Stereotypes in Celtic Folklore, Holly Anne Frazier.

Cultural Encounters, Past and Present

Chair: Michelle Lynch

Heiltsuk Adoption of Euro-American Material Culture at Old Bella Bella, British Columbia, Michelle Lynch.

The Expansion of Catholicism: An Exploration of St. Joseph's College, the First Catholic Boarding School for Boys within the Oregon Territory, Cayla Hill.

Crow Archaeology and Oral Histories: the Illustrative Story of Arrow Rock and the Little People of the Pryor Mountains, Victoria Bochniak.

Language Revitalization and the Socialization of Sociocultural Norms, Rebecca Wood.

Russian Colonial or Russian Colonial-Derived Architecture in an Alaskan Creole Village, Afognak, Alaska, Ann Sharley.

Non-Migration Redux, Donald Tyler.

The New Face in the Gaelic Community: Women in the Cultural Forefront, Diane Williams.

Migration, alterity and temporality: Migrants from Myanmar in south-western Thailand, Inga Gruß.

Whatever Happened to Zulay? An Otavaleña's Journey, Sharon Sherman.

Posters

Poster Symposium

Exploring the History of Brewing Across the Pacific Northwest

Organizers: Alexander Stevenson and Patrick Reed

Over the last thirty years, the craft beer industry has brought the Pacific Northwest to the cutting edge of beer brewing, but this industry has a long history in the region. Large and small breweries alike in Eugene and Lane County celebrate the history of the city through their beer and their buildings. Each year, the Northwest Anthropological Conference is hosted in towns with rich histories of brewing, and this convergence of beer lovers who are archaeologists, anthropologists, and architectural historians provides an excellent opportunity to explore the unique history of brewing in each town. Our session will present some of the stories from the region's nearly 120 year history of beer making and will hopefully have some beer on hand to make the experience that much more enjoyable.

Post-Prohibition Eugene and Lane County Brewing: Home brewing and the rise of the Craft Industry, Chrisanne Beckner.

Hops History in Lane County: Deep Roots, Personal Connections, Tiah Edmunson-Morton.

Material culture of Pacific Northwest Breweries, Patrick Reed.

Exploring the history of brewing across the Pacific Northwest through the lens of Northwest Anthropological Conference, Patrick Reed and Alexander Stevenson.

Early Breweries of Eugene and Lane County: Archaeological Potential and History, Alexander E. Stevenson and Chrisanne Beckner.

Posters

Peace, Love, Unity, and Respect: The Moral Economy of Rave Culture, Brittany Anderson.

Kerf Patterning on Animal Cremains: a Preliminary Analysis of Microscopy Methods, Christopher Barrett and Nambi Gamet.

Juvenile Javan Gibbons (Hylobates moloch) Vary Gesture Use by Recipient's Attentional State at the Gibbon Conservation Center (Santa Clarita, CA), Melanie Bell.

Settlement on the Baker River, 1880–1926; Claiming Land and Getting By—The Henry Edgar Homestead, Sharon Boswell and Christian Miss.

The Archaeology Roadshow: A Model for Community Engagement and Public Education in an Urban Area, Virginia Butler, Lyssia Coffey, and Virginia Parks.

Excavating Into the Unknown—Unearthing Historic Chinatown in The Dalles, Tobin Bottman and Larissa Rudnicki.

Preliminary Assessment of Primate Molar Morphology Using 2D Geometric Morphometrics, Amy Byers, Kathlena Anderson, Stephen Frost, and Michel Waller.

Excavation at The Manila Site (CA-HUM-321), Amanda Carroll, Cassady Williams, and Shannon Tushingham.

Macro Analysis: In the Field vs. In the Lab Use Wear Identification, Erin Chenvert, Desirae Probasco, and Patrick McCutcheon.

The Jim Rock Historic Can Collection Online Database at Southern Oregon University, Ashland, Kyle Crebbin, Chelsea Rose, and Shana Sandor.

Geophysical Survey at the Blackwell Island Site (10KA481), Kootenai County, Idaho, Steven Dampf and John Dorwin.

Archaeological Investigations of a Late Holocene Site (35MU234) on the Lower Columbia River Floodplain, City of Fairview, Multnomah County, Oregon, Michael Daniels, Kanani Paraso, and Daniel Gilmour

Digging Deeper: Where is the Geoduck (Panopea Generosa) in Archaeological Shell Middens? Ryan Desrosiers.

The Ground Slate Transition on the Northwest Coast: Establishing a Chronological Framework, Joshua Dinwiddie.

Compiling Excavated Archaeological Data at a Large-scale: Preliminary Results, Jonathan Duelks, Nathan Jereb, Kristin Leonard, and Paul Solimano.

Encountering the Unknown: Lessons Learned During Mass Excavation of the North Access Portion of the Alaskan Way Viaduct Replacement Project, Patrick Elliott and Tyler Graham.

Tell Me About It! Leah Evans-Janke, Ariana Burns, and Dakota Wallen.

Movement Progression in the Collective Movements of Tibetan Macaques (Macaca thibetana) at Mount Huangshan, China, Gregory Fratellone.

Stylistic Variation in Projectile Point Styles in the Columbia Plateau and Northern Great Basin at the Pleistocene-Holocene Transition, Jerry R. Galm, Stan Gough and Fred Nials.

The Sanders Site Stone Tool Collection – Macroscopic Lithic Analysis of Formed Tools from a Middle Columbian Upland Site, Patrick Garrison.

Preliminary Revision of Windust Chronology, Daniel M. Gilmour, Thomas J. Brown, and Paul S. Solimano.

Radiocarbon Dating and Long-term Economics at an Ancient Coast Salish Village in coastal southwestern British Columbia, Colin Grier, Valda Black, Tiffany Fulkerson, Paige Hawthorne, Lindsay Kiel, Juliet McGraw, Brandon McIntosh, Lori Phillips, Katie Richards, Adam Sackman, and Eric McLay.

Bioarchaeology, Barbados, Eastern Caribbean: Isotopic Analyses of Teeth and Bone from Human Remains, Tiffany Hansen and Steve Hackenberger.

Cobble Chopper Sites in the Vancouver Lake/Lake River Archaeological District, Dana Holschuh and Alexander Gall.

Say "Yes" to the Mess: The Archaeological Curation Crisis and Canoe Camp, Rowan Kaufman.

New perspectives on Native American occupation of the Puget Lowlands of Washington during the Late Pleistocene-Holocene transition from the Bear Creek Site (45KI839), Robert Kopperl, Amanda Taylor, Christian Miss, and Kenneth Ames.

Working to Death: The Rise of Chronic Kidney Disease in Central America, Nicole K. Larsen.

The Effects of Low Temperature Recrystallization and Isotope Depletion on Biogenic Aragonite Taxa of the Northwest Coast, Susan C. Larsen.

Learning to Shave: Experimental Archaeology of Antler Debitage, Ian R. Lewis.

Public Archaeology and Local History: A Collaboration Between Homeowners and Archaeologists at the Booker House in Jacksonville, Oregon, Sarah Lind.

Small Town Skid Row: Historical Analysis of Historic Block 3 Walla Walla, Washington, ca 1940, Kelsi McDaniel.

A Spatial Analysis and Reinterpretation of a Late Holocene Occupation Along the Yakima River, Washington, Christopher D. Noll and Charles Norred.

Wind, Waves, and a Hidden Spit: A Case Study from 45IS298 on Whidbey Island, WA, Michelle North.

Addressing Vaccine Hesitency in Portland, Oregon, Kelsey Paden.

Assessing the Nutritional Value of Freshwater Mussels on the Western Snake River, Jeremy W. Johnson and Mark G. Plew.

Exploring Public-Professional Relationships in Archaeology: Case Study from Sauvie Island, OR, Martin Plumer.

Site 35CO2: Finding Context Through Comparison, Kelley Prince Martinez.

Paleoamerican Parasitism: Infections that Signal the Origin & Route of Migration, Karl Reinhard, Elizabeth Rácz, and S. L. Gardner.

Archaeological Investigations at the Washington Portland Cement Company Cement Plant, Concrete, Washington, Brandy Rinck.

Smudge Pits of Fort Vancouver, Anna Robison-Mathes.

Age & Sex Class Differences in Sex Behavior of Immature Tibetan Macaques (Macaca thibetana), Anne Salow

A Comparison on Two Upland Campsites between Puget Sound and the Plateau, Kate Shantry and Michele Parvey.

Beverage Cans & Pull Tabs: A Refreshing Look, William Schroeder.

Childhood in a Pit—Artifactual Expression of Childhood in Early 20th Century Ellensburg, Washington, Stephanie Simmons.

Historical Chinese Opium Cabin in the Malheur National Forest, Mary Sutherland.

Assemblage Structure in the Yakima Uplands Foldbelt, Central, WA, Allie Taylor, John Davis, and Steven Hackenberger.

Field Staples: A Look at the Subsistence Patterns of Archaeological Workers, Breanne Taylor and Josh Moss.

Relative Dating of Petroglyphs at Hole-in-the-Ground, Malheur County, OR with Portable X-ray Fluorescence, Cyrena Undem and Jack Johnson.

Public Archaeology in Western Idaho, Dakota Wallen.

Do You Have Prince Albert in a Can? Kim Wesseler.

Preliminary Analysis of Shellfish Deposits at the Manila Site (CA-HUM-321): Species Typology and Resource Locality, Cassady Williams, Amanda Carroll, and Shannon Tushingham.

John Player and Sons Medium Cut Tobacco Tins, Diane Zentgraf.

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